LCC

LAND CONSERVATION COUNCIL



STATEWIDE ASSESSMENT OF PUBLIC LAND USE

VICTORIA

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VICTORIA, AUSTRALIA
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Mallacoota Inlet entrance and coast towards Cape Howe	*The 'Snow drifts' Pine Plains Mallee area*	*Snowy River at Bete Bolong*
N. Rosengren	*A. Shugg*	*N. Rosengren*

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FOREWORD

The Land Conservation Council was established under the *Land Conservation Act* 1970. The function of the Council is 'to carry out investigations and make recommendations to the Minister with respect to the use of public land in order to provide for the balanced use of public land in Victoria'.

One of the main purposes of this review is to identify issues concerning public land use which will need to be addressed in the future by the appropriate agencies and individuals.

As this report deals with public land which is a community asset and is managed on behalf of all Victorians, the Council is seeking the comments on the review and the issues raised in it, from government and community organisations and from individuals. After considering these, the Council will publish a summary of the major aspects of the State-wide Assessment and a consideration of the issues to be addressed in the future arising out of the review and community contributions.

Comments should be forwarded to the Secretary of the Land Conservation Council by 31 October 1988.

DAVID SCOTT
Chairman

Land Conservation Council
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ACKNOWLEDGEMENTS

This major assessment of the environmental and economic values of public land in Victoria and the review of public land planning procedures, has been a co-operative venture. The Land Conservation Council, as the vehicle for the review, expresses its appreciation and thanks to a great many people and organisations.

Sam Dimmick chaired the Council with great dedication and distinction from 1971 to 1984. A blend of determination and wit, combined with an ability to resolve differences through discussion and negotiation, contributed to his success as Chairman. His straightforward approach, appreciation of community needs, and judgement in proposing solutions to land use issues, earned him the respect of his fellow members and the different governments under which he served. During his 13 years as Chairman, the Council established many policies, published 65 reports, and made nearly 3800 recommendations, virtually all of which were accepted by the government.

Mr Alex Mitchell, former Chairman of the Soil Conservation Authority, was Deputy Chairman of the Council from 1973 to 1985. He played an important role in developing the processes followed by Council, and made a major contribution to Council's land use decisions.

Claude Austin was an original member of the Council and gave outstanding service over a period of 15 years until his retirement in 1986. He played a major role in the creation of the Council through his forthright public opposition to the farming development proposed for the Little Desert in 1968 and 1969.

The work of other former Council members is gratefully acknowledged and all made a significant contribution to public land use planning in the State. They were: Mr J.R. Ashworth, Mr J.D. Brookes, Dr W.S. Carroll, Mr E.J. Condon, Mr B.W. Court, Dr R.G. Downes, Mr A. Dunbavin-Butcher, CMG, Professor P.A. Eddison, Mr G.G. Griffin, Dr. R.J. Grose, Mr T. Gunnersen, Dr W.N. Holsworth, Mr A.J. Holt, Mr J. Landy, Mrs J. Lindros, Mr C.E. Middleton, Dr F.R. Moulds, Mr J.V. Mullaly, Dr G.G. Newman, Mr J.F. Pilbeam, Mr J.S. Rogerson, Dr D.F. Smith, Dr L.H. Smith, Dr D. Spencer-Jones, Mr G.L. Swartz, Mr R.H. Taylor, Mr A.J. Threader, Dr A.L. Tisdall, Professor J.S. Turner, Mr J.C.F. Wharton, Mr R.G. Whiting, Dr D.S. Wishart, and Mr J.J. Wright.

Council also wishes to place on record its appreciation of Ministers of the Crown responsible for its work: The Honourable W.A. Borthwick, MP; The Honourable W.V. Houghton, MLC; The Honourable E. Walker, MLC; The Honourable J.H. Kennan, MLC; and The Honourable T.W. Roper, MP.

Dr Mick Lumb, then the Council's Director of Land Use Planning, was largely responsible for the idea for this review

and its early planning. A committee of Council, comprising Mr Keith Bowen, Dr Malcolm Calder, Mr Donald Malcolmson, MBE, and Mr Don Saunders, provided editorial advice.

Information for chapters and maps was supplied by the Departments of Conservation, Forests and Lands; Agriculture and Rural Affairs; Industry, Technology and Resources; and Water Resources, and the Victoria Archaeological Survey.

The following staff from these organizations prepared or revised chapters and other data for the report: Chris Ashe, Chris Bell, Peter Brown, Neville Byrne, Peter Cabena, Greg Cahill, Pauline Clancy, Tony Cooney, Bill Emison, Ian Hamer, Nick Holmes, Doug Hooley, Don Hough, Mike McIntyre, Peter Menkhorst, Steve Moss, Gerry O'Brien, Pat O'Shaughnessy, Mark Parsons, Gary Presland, Peter Robertson, Mike Sandford, Steve Slater, Roger Smith, Bob Warneke, and David Williams. The Council is especially grateful for the assistance of Doug Frood, and for the work of Jim Rowan of the Land Protection Division (Department of Conservation, Forests and Lands) in remapping the land systems for this study. Others who assisted include Keith Dempster, Arnis Heislers, John Taylor, and the Department of Conservation, Forests and Lands' regional staff, particularly David Buntine, Moray Douglas, Pat Feehan, Don Forsythe, Rob Graham, Alan Holmes, John Hopper, Ian Leversha, Barry Lloyd, Roger Macauley, Doug Miller, Ken Morrison, Chris Phillips, Richard Rawson, Peter Richardson, Trevor Ritchie, and Peter Sheehan.

The text was edited by Yvonne Roberts. The maps were prepared by Nick Bateman, Margaret Coonan, Bernie Freeman, Debbie Grant, Jenny Hayes, Mark Hoffert, Aileen Lloyd and Bill Smith, under the direction of Ian Camfield, Paul Rigby and Steve Cooper. Clive Jackson of the Ministry for Planning and Environment designed the cover, figures and graphic tables used in the report. Tanner's cartoon is reprinted by kind permission of *The Age*.

Special studies were carried out by the following consultants: Nancy Chamberlain (Political Science Department) University of Melbourne; Associate Professor Jack Sinden, University of New England. Although unpublished, the reports of these studies are available for inspection at the Council's offices.

Many others also readily gave information, checked drafts, or contributed valuable discussion and advice. Included here are various government agencies of other Australian States and individuals with expert knowledge of specific disciplines or particular localities. Their assistance is gratefully acknowledged.

Past and present Land Conservation Council staff involved in the preparation of this report were Geoff Bellamy, Geoff Blackman, Lynne Bright, Mike Cecil, Pamela Dickson, Jenny D'Lima, Cheryl Fotheringham, Roger Fyfe, Janet Hainsworth, Roy Hunter, Max Kitchell, Kassi Kokkinos, Mal McKinty, Ian Miles, Geoff Port, Simon Ransome, Angela Sackmann, Mark Sheahan, Mark Smoljo, Marion Thompson, Brian Walsh, Grant Watkinson, and Sandra Whitty.

Part I
INTRODUCTION

1. INTRODUCTION

Public land, as its name implies, is land owned by and available for use by the public. Different individuals or groups sometimes have competing aspirations for particular areas of public land, and it was to resolve such issues that the Land Conservation Council was established in 1970.

The Council has three functions, which are to:

> carry out investigations and make recommendations to the Minister with respect to the balanced use of public land in Victoria
>
> make recommendations to the Governor in Council as to the constitution and definition of water supply catchment areas under the *Soil Conservation and Land Utilization Act* 1958
>
> advise the Minister administering the *Soil Conservation and Land Utilization Act* 1958 concerning policy on the use of land (whether public land or any other) in any water supply catchment area

These functions are provided for in the *Land Conservation Act* 1970, together with the composition and objects of the Council, which are described in chapter 3 of this report.

The aim of this Statewide Assessment Report is primarily to review the work and procedures of the Council since it commenced investigations in 1971. At that time, the Council divided Victoria into 17 study areas and, in 1986, completed an initial investigation of the whole State when the recommendations for the 17th, the Wimmera area, were presented to the government.

It is hoped the report will give some measure of the effectiveness of Council in attempting to balance competing aspirations for the various values of public land.

The report also has several other aims, which are:

* to provide an overview of the environmental values and resources on public land and assess the extent to which these are protected

* to provide an overview of the economic resources available to the community from public land and the extent to which these are available for utilization

* to identify gaps and deficiencies in the protection of environmental values or the availability of resources for utilization to meet community needs

* to discuss the methods of protecting public land values, whether by reservation or zoning

* to review the extent to which land managers have implemented those Land Conservation Council recommendations that have been accepted by government

* to discuss issues that have been raised over the last 17 years, and identify those that will need to be addressed in future public land use planning

* to make information on public land more accessible to land managers and interested members of the public

* to increase community awareness of the public land resource, the public land use planning procedure, and the opportunity for individuals and groups to be involved in the planning process

Finally, the report has been published to allow all those with an interest in the use of public land and the work of the Council to make written or verbal comments. The Council will consider all such comments, then prepare a summary publication detailing the major outcomes of its Statewide assessment. It is intended that this will incorporate views expressed in submissions.

Report contents

Part I continues with an introduction to the 'public land estate' of Victoria, followed by a history of the allocation and use of public land, from the perspective of the public estate. Part II describes the establishment and role of the Council, its public consultation process, and the system it has used to classify public land into various categories.

Part III discusses the present status of the public land estate, arising from the Council's recommendations, including the extent to which the government-approved recommendations have been implemented. Particular uses and values of public land are considered, and how the Council's recommendations have provided for them.

An approach to the economic valuation of public land is outlined in Part IV, followed by a description of ways to handle the large volume of environmental data relevant to public land and a discussion of Council's provision for, or recognition of, needs for research.

Most of the chapters end with a brief list of the pertinent issues arising. These issues, and others developed through this study, are discussed in Part V.

The text is accompanied by a series of maps, figures, tables, and appendices that provide additional information. Maps 1 to 4 comprise a set showing all approved recommendations for public land in the State, at a scale of 1:500 000. Map 14 shows water supply catchment proclamations and land use determinations considered under Council's second and third statutory functions. The land systems of Victoria are completely mapped, also at a scale of 1:500 000 on Maps 19 to 22. A table of land systems, to accompany these maps, is available from the Council on request, in microfiche form.

2. VICTORIA'S PUBLIC LAND ESTATE

Occupying about one-third of the State, Victoria's public land estate is a rich treasure-house of resources. Subsection 2(1) of the *Land Conservation Act* 1970 includes a definition of 'public land' as:

> '(a) land which is not within a city town or borough and is -
>
> (i) unalienated land of the Crown including land permanently or temporarily reserved under section 4 of the *Crown Land (Reserves) Act* 1978 and State forest and parks within the meaning of the *National Parks Act* 1975;
>
> (ii) vested in any public authority (other than a municipality or a sewerage authority within the meaning of the *Sewerage Districts Act* 1958); or
>
> (iii) vested in the Melbourne and Metropolitan Board of Works'

Subsection 2(2) provides for additional areas to be designated as 'public land' for the purposes of Land Conservation Council investigations, in consultation with the Ministers responsible for them.

Although broader than 'Crown land', which does not include land vested in public authorities, this definition excludes land vested in municipalities. The latter mostly comprises small areas held under freehold title, which are located in and around settled areas and used for buildings, depots, and other utilities.

It should also be noted that the definition of 'public land' in the *Land Conservation Act* 1970 excludes land in cities, towns, or boroughs. This is because at the time of preparation of that Act, the major land use issues in Victoria - for example, proposals to alienate large parcels in western Victoria, expansion of softwood planting, and pressure for more national parks - were associated with large tracts of public land in rural areas. The emphasis was more on broadly based planning rather than the detailed management planning that would be required for small parcels of Crown land in and around urban areas. Further, land use allocation decisions in the latter situation may be better dealt with under town planning legislation.

At present the draft Lands Bill, which is intended to replace the current *Land Act* 1958, defines 'public land' in different terms. For the purposes of that Bill, Crown land is divided into two classes - public land and government land. Public land has, on balance, conservation, historical,

recreational, tourism, or natural resource values, social or cultural significance, or special strategic value. Government land is the remainder of the Crown land estate, and can be sold, exchanged, leased, or developed. The Lands Bill is discussed further in chapter 6.

The two definitions of public land, in the *Land Conservation Act* 1970 and the Lands Bill, encompass most of the same Crown land. They differ in two respects.

* Public land under the Lands Bill includes Crown land in cities, towns, and boroughs.

* Public land under the *Land Conservation Act* 1970 includes all proposed government land and land vested in most public authorities (outside cities, towns, and boroughs).

In this report, all further references to public land are as defined in the *Land Conservation Act* 1970.

Extent of Victoria's public land

The public land estate occupies about 38.7% of the total area of Victoria, as shown in Table 1 and Figure 1. Public lands are all the coloured areas on Maps 1 to 4.

Table 1

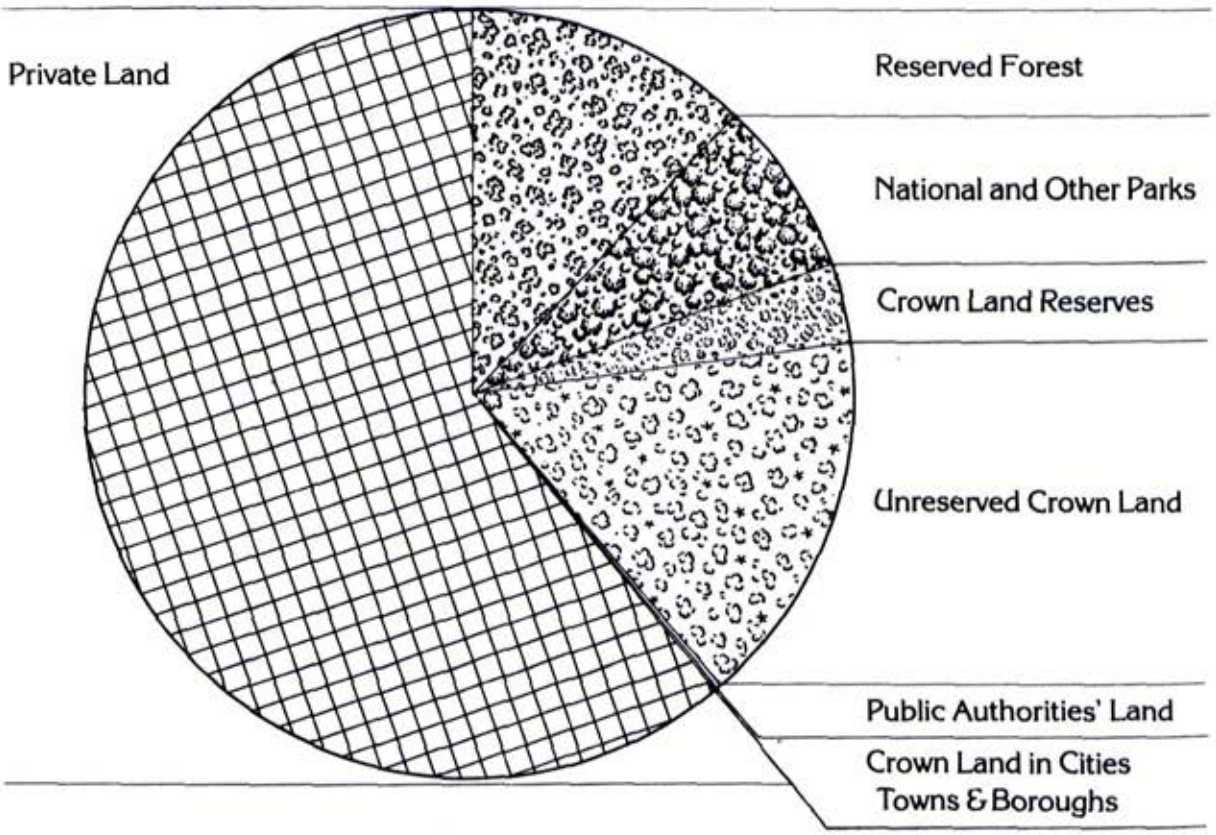
COMPOSITION OF VICTORIA'S PUBLIC LAND ESTATE

	Area (sq.km)
Public land	
Reserved forest under the *Forests Act*[1]	27 100
Parks under the *National Parks Act*[1,2]	16 830
Reserves under the *Crown Land (Reserves) Act*[1]	7 560
Unreserved Crown land[1,3]	36 050
Land vested in SEC, STA and other public authorities	480
Total public land	88 020
Crown land and reserves in cities, towns and boroughs[1]	210
Alienated land	139 370
Total area of State	227 600

Notes:
1. These areas together comprise Crown land, and total 87 750 sq.km.
2. Includes parks on schedules 2 and 3, and other parks and reserves.
3. About 50% of Victoria's unreserved Crown land is usually occupied under a variety of leases and licences. The unoccupied remainder, includes areas set aside for roads.

FIGURE: 1

COMPOSITION OF THE VICTORIAN LAND ESTATE



Interstate comparisons

Table 2 shows the area and proportion of Crown land in each of Australia's States and territories.

Table 2

CROWN LAND IN AUSTRALIAN STATES AND TERRITORIES

State or territory	Total area (sq. km)	Area of Crown land* (sq. km)	Crown land as % of total
Victoria	227 600	87 700	39
New South Wales	801 000	513 900	64
Queensland	1 727 000	1 387 800	80
Western Australia	2 527 600	2 340 200	93
South Australia	984 400	633 200	64
Tasmania	68 300	42 400	62
Northern Territory	1 346 200		
- Crown land		881 000	65
- Inalienable freehold		(461 200)	34
A.C.T.	2 400	2 400	100

* These figures include national parks, reserved forest, other Crown land reserves, land occupied under leases and licences, and unoccupied Crown land. This was used instead of 'public land' as defined in the *Land Conservation Act* 1970 for a better comparison with other States. As Table 1 shows, Crown land is broadly similar to public land.

Although Victoria has a low percentage of Crown land compared with other States, it is generally in a more natural condition. This may reflect the historical practice in Victoria of converting most areas used for agriculture to freehold, rather than leasing Crown land as has occurred elsewhere.

Large areas of Crown land in other Australian States and territories are committed to agricultural pursuits under long-term leasing arrangements. In New South Wales, for example, such leases cover about 80% of the unalienated land, while the figures for the other States and territories are also very high. Land management authorities regard these areas as effectively private land, even though leaseholders do not possess freehold title. By contrast, Victoria has very few leases of this kind, covering only 1.5% of the unalienated land.

Another variation in the Crown land estate occurs in the Northern Territory, due to the recent granting of inalienable freehold titles over sizable reserves to various Aboriginal land trusts. These areas cannot be sold privately, but at the same time they are no longer regarded as Crown land because they are held under freehold title.

Table 3

DISTRIBUTION OF PUBLIC LAND BY LAND CONSERVATION COUNCIL STUDY AREAS

Study area (in chronological order)	Total area (sq. km)	Area of public land* (sq. km)	Percentage of public land (%)
South-western 1	7 260	2 230	31
South Gippsland 1	2 280	770	33
North-eastern 1	3 180	1 540	48
North-eastern 2	3 500	850	24
Melbourne	26 500	8 700	33
East Gippsland	9 450	8 320	88
North-eastern, 3, 4 & 5	8 400	4 210	50
Mallee	45 000	17 450	38
Corangamite	15 000	2 270	38
Alpine	16 090	14 250	88
North Central	19 300	2 900	15
Ballarat	8 200	730	9
South-western 2	15 330	3 370	22
South Gippsland 2	6 000	2 100	35
Gippsland Lakes Hinterland	8 850	5 100	58
Murray Valley	15 600	1 340	9
Wimmera	16 700	1 930	11

* The figures for public land do not include road reserves, nor some water frontages and small areas of Crown land.

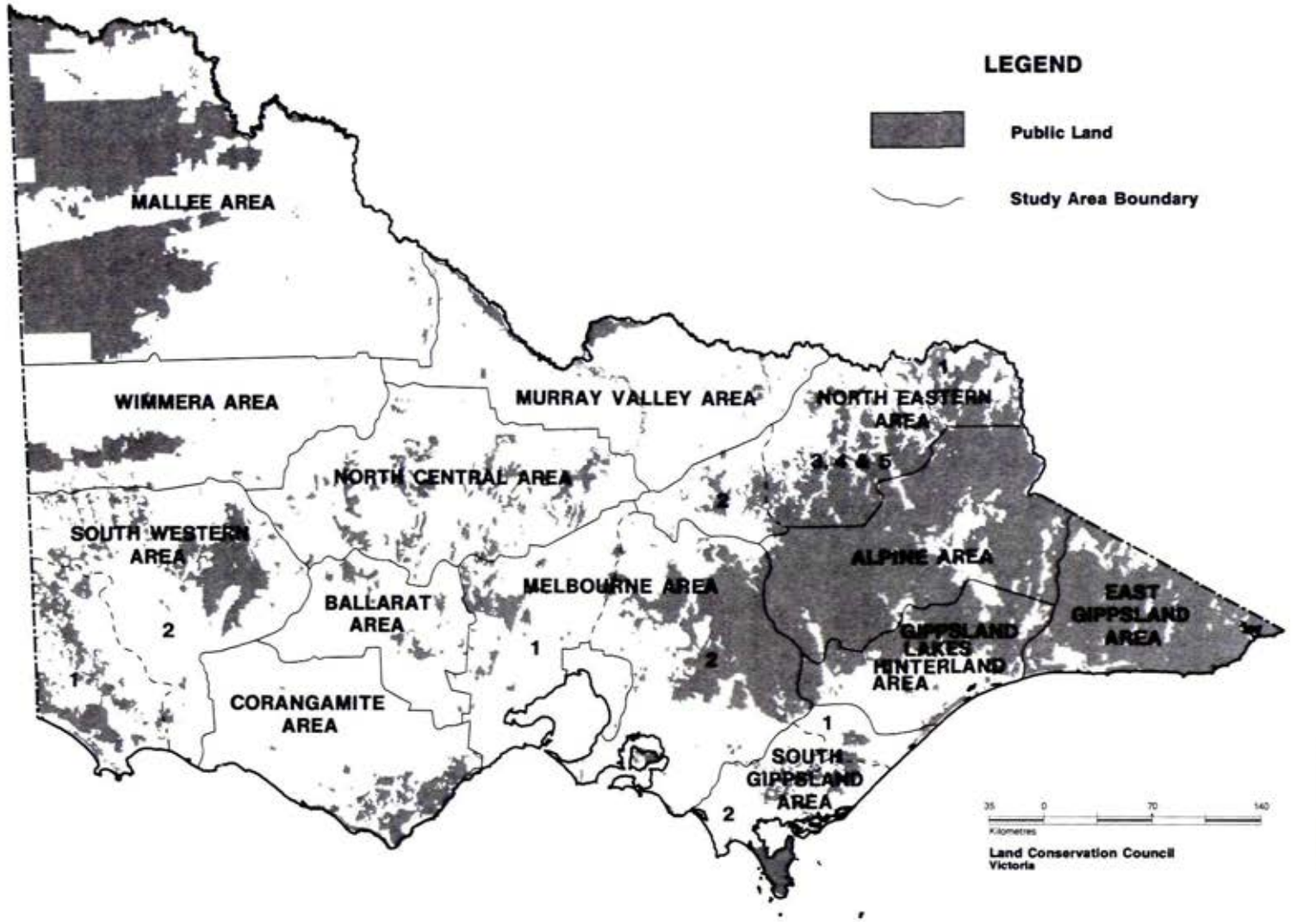
Distribution of Victoria's public land

The distribution of public land in Victoria is very uneven. A large proportion of the mountainous eastern part of the State remains in public ownership, as do sizable areas of semi-desert country in the Mallee. On the other hand central Victoria and the western and northern plains, which were perceived last century as being more suited to agriculture, are predominantly freehold. In these regions, small blocks of public land, along with road reserves and public land water-frontage reserves, have considerable importance for nature conservation, as they sometimes contain the only remnants of the original native plant associations. In New South Wales, on the other hand, many of the river and stream frontages were alienated in the early days of settlement, with the result that often frontages have been cleared and the public does not have access to many rivers and streams.

Table 3 shows the proportion of public land in each of the Land Conservation Council's 17 study areas.

Another important feature of Victoria's public land estate is the coastal strips. Many of these have scenic and nature conservation values, and also great importance for recreation. As with water frontages, the retention of coastal areas in public ownership is a fortunate legacy from the past, which facilitates public access to virtually all of

PUBLIC LAND AND LCC STUDY AREAS



MAP No. 5

Victoria's coastline, in contrast to many places interstate and overseas.

The study areas, and the public land within each, are illustrated in Map 5.

Table 3 and Map 5 show the variation in the proportions of public land between study areas - only 9% in Ballarat and Murray Valley, but 88% in Alpine and East Gippsland. This is one reason why the Council is undertaking this Statewide study in order to apply a consistent perspective to public land use planning across the State.

Native vegetation on public land

Approximately 83% or 73 170 sq.km of Victoria's public land carries native forest, woodland, or shrubland, as shown in Table 4 and Figure 2 below.

Table 4

VEGETATION ON VICTORIAN PUBLIC LAND AND RESERVES

Vegetation type	Area (sq.km)		Percentage of public land (%)
Dense forest[1]	44 170		50
Woodland[2]	8 275		9
Tall shrubland[3]	20 720		24
Total native 'forest'		73 170	83
Softwood plantations	950		1
Other (including native pasture, cropped land, sown pasture, lakes)	13 890		16
Total non-forest land		14 850	17
Total public land		88 020	100

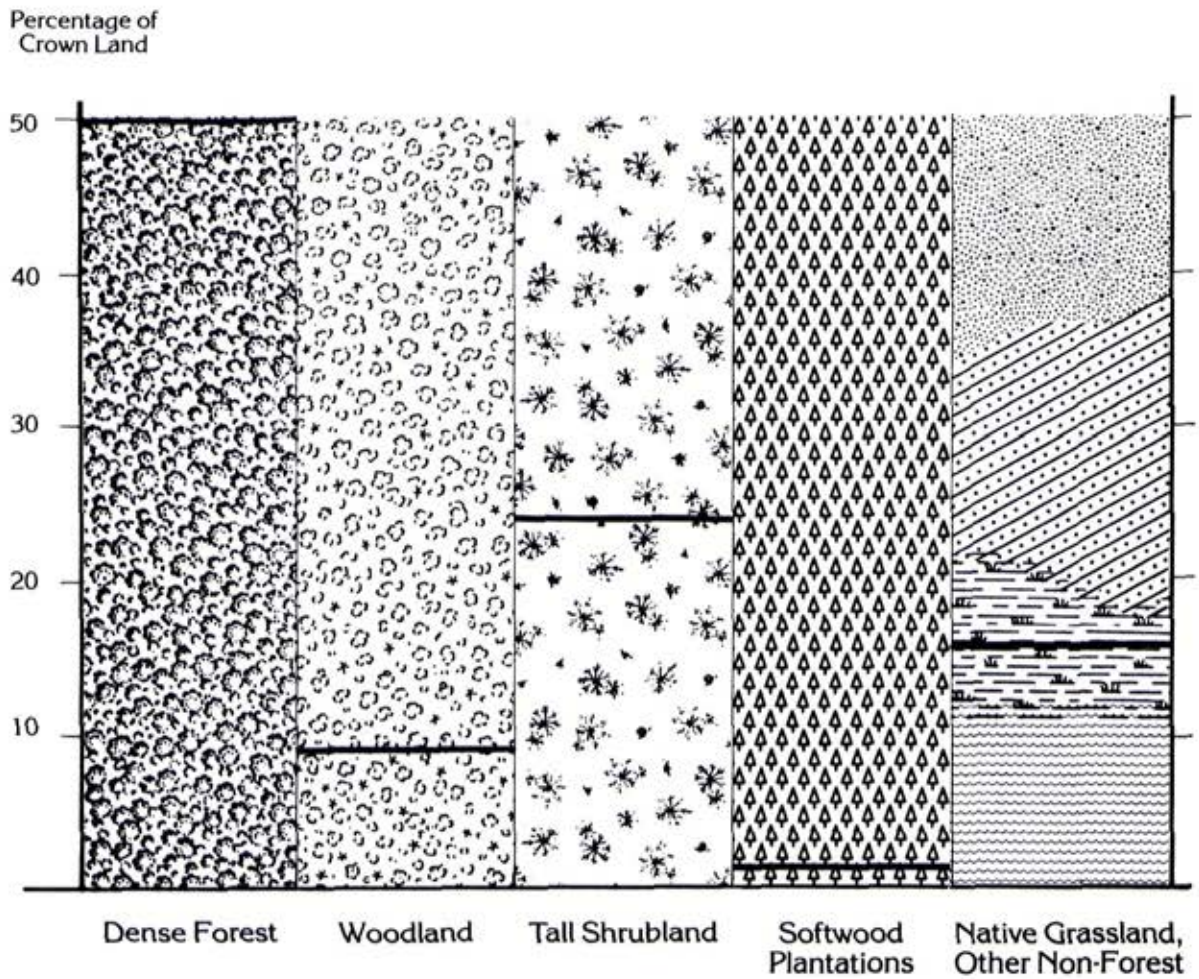
Notes:
1. 'Dense forest' consists of single-stemmed trees with potential top height exceeding 5 metres and foliage cover in excess of 30% of the land area.
2. 'Woodland' is dominated by trees with top height greater than 5 m, usually with single stem, with foliage cover in the range 10--30% of the land area.
3. 'Shrubland' has a top height in the range 2--8 m, with multi-stemmed shrubs including mallee-type eucalypts.

Source: Lands and Forests Division, Department of Conservation, Forests and Lands

The total covered by native vegetation of all forms is probably considerably greater than 83%, however, as this figure does not include native grasslands, heathlands, or other

FIGURE: 2

VEGETATION ON VICTORIAN CROWN LAND AND RESERVES



native vegetation types with a top height less than 2 m. Map 9 shows the current distribution of vegetation types across the State.

Victoria has a higher percentage of public land carrying native vegetation than the other States. Only 1.5% of it is occupied under long-term leases, compared with up to 80% elsewhere. This land is grazed, with extensive areas that are cleared and cultivated for crops or improved pasture. The vast bulk of agricultural activity on public land in Victoria takes place under grazing licences that are issued annually. Permission to cultivate has been granted on some of these areas, but most still retain a cover of native vegetation.

Marine areas

The *Coastal Waters (State Powers) Act* 1980 and the *Coastal Waters (State Title) Act* 1980, passed by the Commonwealth Government, vest in the State the management of the sea bed, the substrata, the air-space, and the waters out to a 3-nautical-mile limit from its shores. The State also controls Port Phillip and Westernport Bays, and others around the coastline.

Some parts of these marine areas are declared ports managed by the Port of Melbourne Authority, Port of Geelong Authority, or the Port of Portland Authority. Others have been declared marine parks or reserves following Land Conservation Council recommendations for the Melbourne Area and South Gippsland, District 2. An additional marine park was recommended in the Council's recently completed review of the western portion of the Melbourne Area - District 1. The remaining marine areas managed by the State are set aside in some localities as coastal reserves.

Marine margins in study areas other than Melbourne and South Gippsland, District 2 have not been closely examined by the Council, due partly to the fact that very little biological information is available for most offshore zones abutting the State. The lack of data has made it difficult to assess the conservation significance, and there is clearly a need for a State-wide survey of marine ecosystems to identify representative and significant marine environments, and environments under threat.

3. *HISTORY OF THE ALLOCATION AND USE OF PUBLIC LAND*

Phases of Change in the Public Land Estate

'*Terra nullius*' was the term used to describe land tenure in Australia when James Cook's expedition landed at Botany Bay in 1770. It means land of nothing, and by implication, unoccupied or possessed by nobody, and was used as justification for the British government taking possession of eastern Australia. By the same stroke that effectively dispossessed the Aboriginal people, Cook established the public land estate of Australia, in its best condition and greatest extent. Over the next 160 years, that estate diminished in extent and much of it deteriorated in condition.

This chapter considers the changes to the land and to the native flora and fauna. It is written from the perspective of the present, making no attempt at a complete history - it ignores, for example, the important roles played by gold-mining and sleeper-cutting for railway expansion in the development of Victoria and Melbourne. However, it discusses damage to the land and its values resulting from land use activities - although neither deliberate nor recognized at the time.

Diminution of the condition and extent of public land and its values can be divided into ten phases. These are introduced chronologically, and briefly described; however, those affecting the condition of public land, such as the squatting and gold-mining phases, necessarily overlap those of alienation, which progressively diminish its extent. The phases are listed in Table 5 and illustrated in Figure 3.

The earliest phase followed the arrival of the First Fleet, with 740 convicts, 550 seamen, soldiers, and officers and their families, and an assortment of livestock. To establish a penal colony, they pushed back the boundaries of undisturbed public land, the Aborigines, and the habitat of native flora and fauna.

The second phase, and the first along the southern coast, was effected by sealers and whalers, who made temporary camps in the early 1800s. As well as carrying out a continual harvest of Australia's wildlife, they introduced and spread European diseases, fatal to many of the previously unexposed Aborigines. In their reduced numbers, the Aborigines were less able to resist the further occupation of their land.

Pastoral settlement comprised the third phase, from the 1820s to 1890. Initially properties had been developed by immigrant settlers, and were contained in 19 counties grouped within 240 km of Sydney Cove.

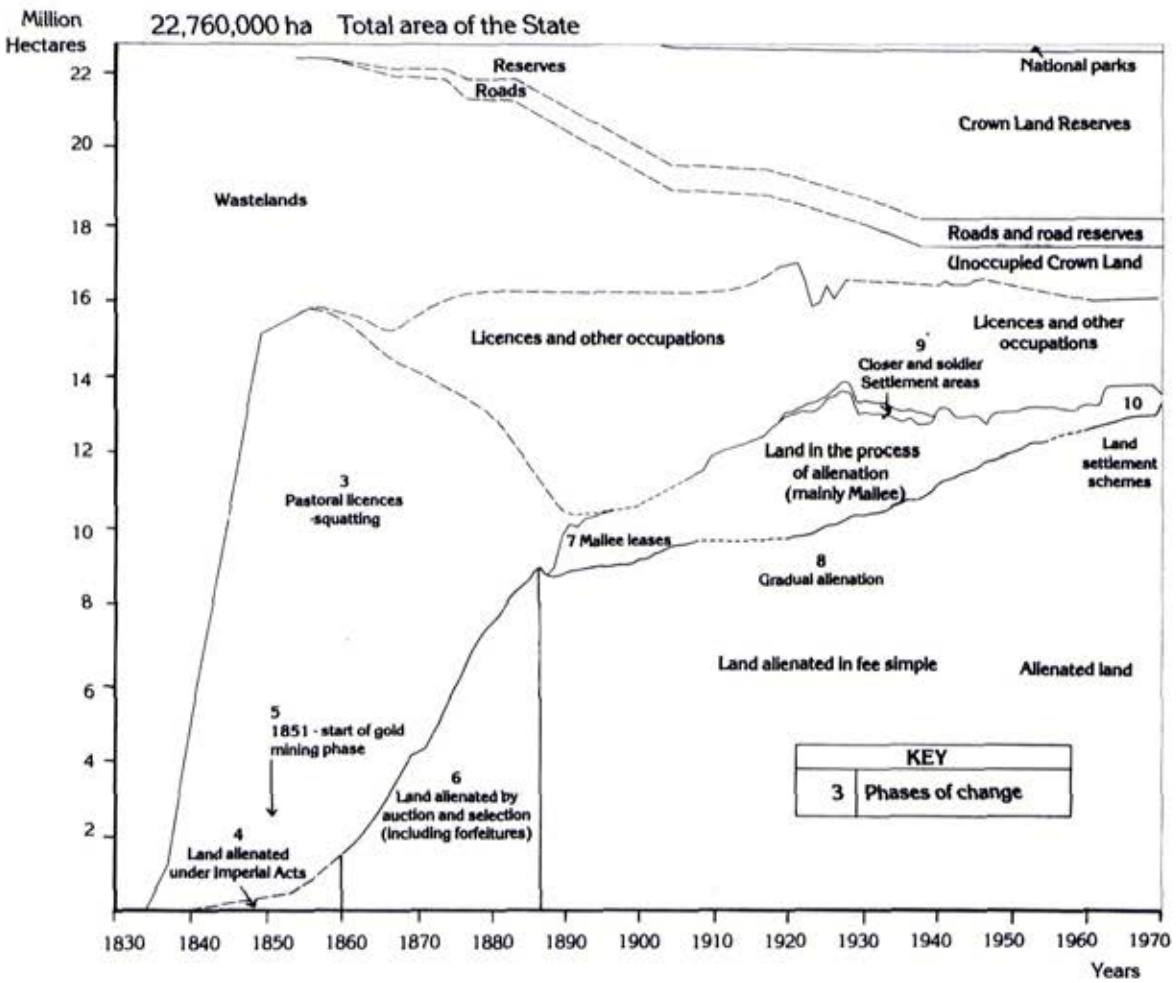
Table 5

PHASES OF CHANGE IN THE PUBLIC LAND ESTATE

Date	Phase	Effects on public land estate
1770	Cook's landing at Possession Island	Establishment of the public land estate of New South Wales, including the area later to become Victoria
1788	1. First Fleet	First European settlement - clearing of vegetation; hunting of fauna with firearms
Early 1800s	2. Sealers and whalers	Harvesting of native fauna
1820s to 1890	3. Pastoral settlement - squatting	Damage to ground flora; competition with grazing fauna; weed spread; erosion
1837 to 1860	4. Alienation under Imperial Acts	Loss of public land; clearing, cultivation, and destruction of flora and fauna
1851 to 1860	5. Gold-mining and associated settlements	Clearing, timber extraction; mining-sludge deposition; erosion; water pollution; flooding
1860 to 1887	6. Alienation under Victorian land Acts	Extensive loss of public land; widespread clearing, cultivation, and destruction of flora and fauna
1888 to 1928	7. Mallee settlement and other leasehold	Leasing and later alienation of the Mallee country; other new areas opened for selection; effects as above
1888 to 1970	8. Gradual alienation of public land	Loss of public land and its values as for 4 and 6 above
1919 to 1970	9. Closer, soldier, and rural settlement schemes	Some areas of public land developed by the State and alienated for farming; effects as above
1960s	10. Little Desert and other land settlement schemes	Limited areas settled; proposals stimulate changes in attitude to public land

FIGURE: 3

PUBLIC LAND ESTATE OF VICTORIA 1834 TO 1970



Notes for Figure 3:

1. Most figures are from the Department of Crown Lands and Survey annual reports. However, these have inconsistencies. Before 1888 the alienated area figures included land in the process of alienation and forfeitures. From 1918 to 1926, two methods of measuring area alienated were used. Over the whole period shown, several changes occurred between use of figures to 31 December and those to 30 June. In 1918, a summary table for the State was first provided.

2. As Wright described in 1985, you cannot depend on the annual report figures. Areas given to the nearest acre - six-figure accuracy in some cases - are in fact based on old approximations, adjusted annually for incremental changes. Road areas apparently accurate to six figures appear to have been not measured but calculated as 5.00% of the alienated area. Annual reports to 1969 include 410 000 acres of 'reserves in the Mallee', but this did not appear in the 1970 report.

3. The exact areas of occupied and unoccupied Crown land vary substantially from year to year, according to seasonal conditions, stock numbers etc. The dashed line is an average value.

4. A 'leftover' group used in annual reports to 1969, ('water frontages, beds of rivers, lakes, etc, unsold land in cities, towns and boroughs'), totalling 1 556 000 ha, has been included with Crown land reserves.

5. Areas under squatter occupation 1834--54 are approximate. After that time only three figures have been used.

6. From 1889 to 1907, the figures for land in the process of alienation are approximate, being based on incomplete data.

7. Closer and Soldier Settlement areas were obtained from the relevant annual reports. The figure only shows Crown land areas used, excluding pastoral runs purchased and re-subdivided.

8. In 1970, figures were subject to a reassessment, which made substantial changes to those that had progressed fairly evenly from the 1920s to 1969. In particular, the area of Crown land reservations was reduced by about 1.3 million ha. The 1970 figure is not shown.

9. Dashed lines indicate approximate alignment of curves.

Outside this vicinity the remaining public land was officially termed 'wastelands' - remote from Sydney, unsurveyed, and unpoliced. The name reflected the '*terra nullius*' doctrine - land of nothing - as well as the public's perception at the time that unsettled areas were useless. A proclamation in 1829 prohibited their development. This was to retain the colony within ordered limits, rather than from any concern for conservation.

However, other prospective settlers, including emancipated convicts, were keen to take up land and the phase continued actively through the early 1830s. Taking flocks of sheep, these settlers simply squatted on large areas of the wastelands, with the extent of their chosen runs being marked by shepherds, topographic features, and disputes. This practice was legitimized and licensed by Governor Bourke's *Squatting Act* of 1836.

The squatters favoured the grasslands and open woodlands and in general they cleared little timber

In the south the public lands were not settled for some decades after the First Fleet, although various attempts were made to do so. Collins unsuccessfully tried to set up a penal settlement in 1803 on Port Phillip Bay (near Sorrento); then, after the Hume and Hovell expedition of 1824 reported favourably about Western Port, Darling led another attempt there in 1826. The Henty family settled a small stretch around Portland in 1834, but the major squatters' phase only started following the Thomas Mitchell expedition in 1835--36.

Mitchell travelled overland from Sydney towards the Hentys' settlement, on the way charting large new grassland areas. His report contained accounts of 'Australia Felix', fortunately endowed with rich grasslands.

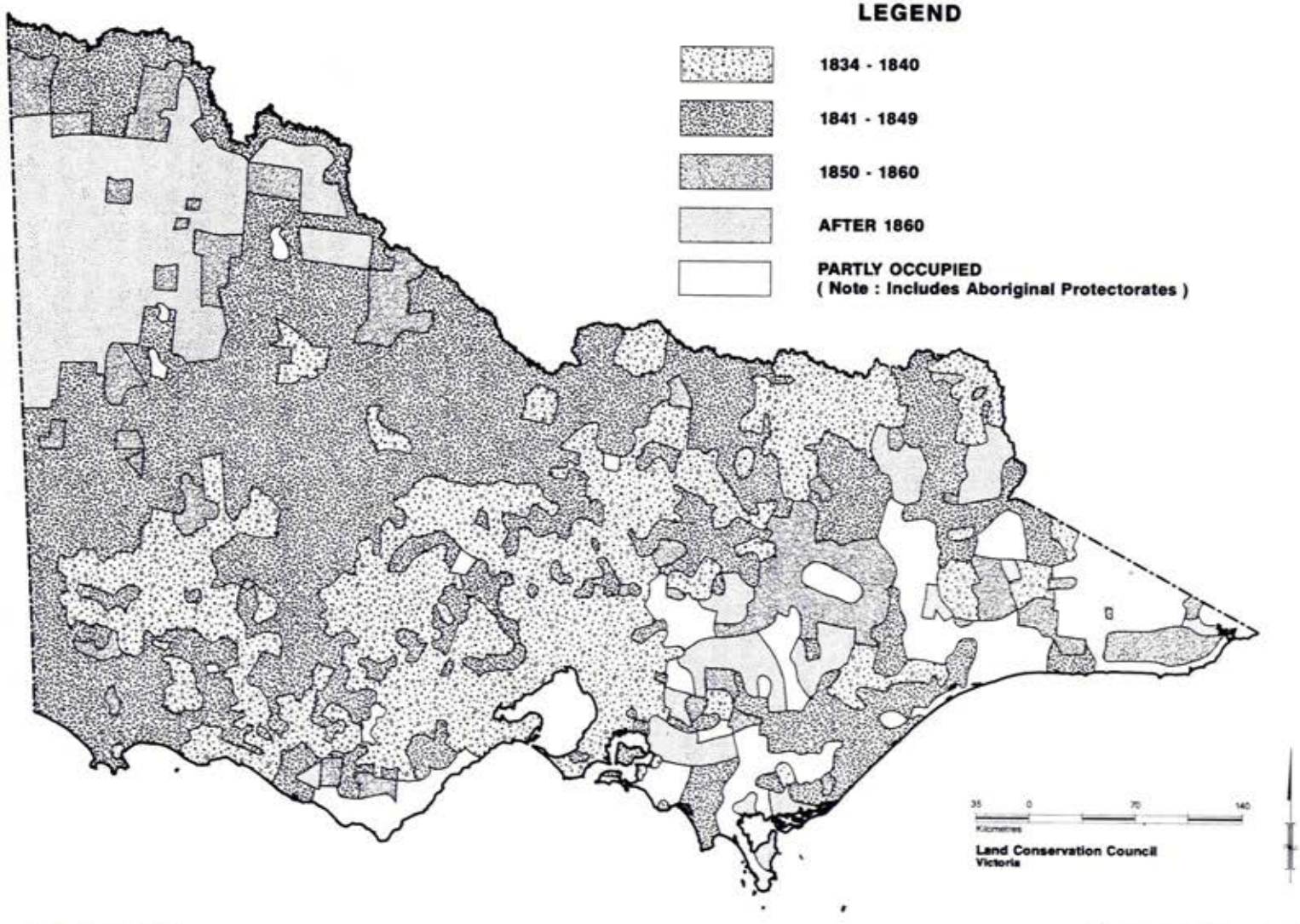
Soon after Mitchell's report was published, a rush took place to possess and use the available lands south of the Murray. Prospective settlers from the north occupied land in the Murray, Ovens, and Goulburn River plains, while those from Van Diemen's Land settled in the south-west of the State, and around the western portion of Port Phillip Bay.

Water was essential, for drinking and for washing sheep before shearing. Accordingly, the squatters chose runs with a good creek as a base. Many were mobile, setting up new outstations and pioneering new runs.

They took over the public lands of Port Phillip District at a high rate (see Map 6) and by 1855 occupied almost 16 million ha or 70% of Victoria's present area for grazing by sheep and cattle. They ignored only the dry mallee, the steep and cold alpine tracts, swampy or hilly South Gippsland, and remote East Gippsland areas. They held no secure tenure over their runs, which, although occupied, remained as public land.

A program of surveying Victoria's public land for sale was initiated in 1837, the fourth phase of change in the public

EXPANSION OF THE SQUATTERS' RUNS 1834-1860



MAP No. 6

land estate. The initial alienation into freehold title was by auction of township lots at Port Phillip and Williamstown in 1837. Outside Port Phillip township, the first sales took place in the Parish of Will Will Rook near Keilor in September 1838. This subdivision comprised rich alluvial land, sold for agriculture.

Through the 1840s and '50s, various provisions under Imperial Acts, such as the 1846 *Sale of Waste Land Act*, allowed squatters to purchase part of their runs. By 1860 this fourth phase, the first that had alienated Victorian public land from the Crown, had disposed of 7% of the colony at the rate of some 70 000 ha per year.

Gold-miners led the fifth phase. The earliest officially recognized gold discoveries were at Warrandyte and Clunes in July 1851. Gold rushes subsequently occurred at Ballarat, Mount Alexander (Castlemaine), and Golden Point (Bendigo) and in a succession of other areas nearby. The population of the colony grew from 77 345 in 1851 to 540 322 by 1861.

The gold rushes had intense impacts creating local demand for food and other supplies, and also great pressure to open nearby land for selection following the working out of each field. The survey emphasis therefore shifted from the Western District to the goldfields, and surveyed land was made available for selection, or for auction or ballot in the event of competition for a block.

The post-mining-boom selectors mounted the sixth phase, being responsible for the alienation of 27% of the State in the 1860s and '70s, at the rate of some 290 000 ha per year, much faster than during the fourth phase. Before this land could be removed from the public estate, however, it had to be taken from the squatters, who had established their runs strategically around the sources of water.

Across the colony, opposition to the landholdings of the often-absentee squatters was increasing, mainly on the basis that they locked up huge areas of the best land and used it for low-intensity grazing. This opposition was led by champions of the small farmer, who favoured settlement into small intensively cultivated freehold farms.

From the *Land Act* 1860 a succession of Acts were passed to break up the squatters' runs, putting into effect the sixth phase. Few had effective safeguards to ensure selections went to smallholders rather than back to the squatters. In 1862, for example, the Duffy *Land Act* attempted to open land for selection in surveyed lots of 16 to 260 ha, the size varying in accordance with the land quality. Selectors were required to live on their lot, fence it, and 'improve' it by clearing forested portions and cultivating at least 10% of its extent. Squatters in the areas made available managed to retain most of their runs, however, by purchasing the best land through various ruses.

Table 6, taken from the Department of Lands and Survey 1867 Annual Report, shows the early progress of these Acts, and Figure 3 illustrates the steep climb in alienated area.

Table 6

TENURE OF LANDS - VICTORIA
(1st January, 1867)

Description	Area (ha)
Lands held in fee-simple	2 971 820
Lands held under lease for agricultural purposes	1 040 550
Roads, &c., in connection therewith	200 630
Lands held under licence for residence and cultivation in the vicinity of the goldfields	91 520
Land occupied as commonage, principally around the various goldfields	746 850
Available land held under pastoral licence by squatters for grazing purposes	8 437 440
Unavailable land held by squatters	2 772 200
Waste lands unoccupied	6 258 180
	22 519 190

By 1881, 35% of the State had been alienated. Much of the remainder was held by squatters under pastoral licence or under grazing licence, so perhaps 20% of Victoria remained as unoccupied public land. A clear principle had developed for identifying the public land estate - it was simply the leftovers, those areas not wanted for grazing, cropping, and townships.

In 1883 and 1884, Tucker introduced two *Land Acts* that launched the seventh phase, focused largely on the Mallee. The 1883 Act offered much of the 5.7 million ha in this region for settlement, but under 20-year leases, not alienation in fee-simple. The 1884 Act offered 1.3 million ha for alienation, but identified a further 5.7 million hectares for pastoral and agricultural leases, outside the Mallee.

The eighth phase was a long period of gradual alienation of public land. Concerned that such settlement 'had nearly stopped', Lands Minister McIntyre initiated this phase in 1893 by bringing in a bill to establish village communities, homestead associations, and labour colonies. The severe economic depression and heavy unemployment in the cities at that time explain the basis of such provisions, but they resulted in only 22 000 ha being alienated.

McIntyre then turned his attention to the public land reserves. He considered that the Lands Department policies of reserving areas for timber production had 'restrained settlement', although State forest at this stage totalled only 3.5% of the State. Later in 1893 an Act was passed to revoke some permanent State forest reserves - for example, around Trentham and Blackwood.

The eighth phase continued, under a number of Land Acts, to the late 1960s, with the total area alienated showing a fairly steady climb. The early 1880s decision to retain

Crown ownership of Mallee public land while allowing use under lease was later reversed. The *Land Act* 1912 allowed the alienation of leased and licensed land, formalizing the loss of much of the Mallee from the public estate. In total about 4.1 million ha were alienated between 1888 and 1967, a rate of about 52 000 ha per year.

The 1884 and 1893 Acts made available for selection some 3 million ha of steep timbered land in the period to 1900, but many of the areas proved unsuitable for agriculture and were later returned to the public estate.

By 1925 the boundaries of the public land estate had effectively been reduced to their present position. At that stage, about 4.1 million ha of reserves and some 5 million ha of unreserved public land remained.

From the turn of the century, the ninth phase of diminution of the public estate was carried out under the various Closer Settlement and post-1918 Soldier Settlement Schemes. These mainly re-subdivided purchased freehold land, but also opened up marginal farm land - either by using new agricultural knowledge, as on sandy soils at Yanakie and in the south-west, or by providing the capital for the clearing of forest, as in the later Heytesbury scheme.

Lands Minister MacDonald initiated the tenth phase in the 1960s. Various schemes for accelerating development in his time included settlement of public land west of the Grampians and in the south-west of the State, the AMP Society Big Desert project, and the Little Desert scheme in 1968--69.

Table 7 summarizes land tenure in Victoria in 1970, and Map 18 shows the distribution of the then remaining public land and its status.

The Users of Public Land Resources

Two views of Victoria's public lands prevailed, associated with their early use. The first - that until they were cleared and used for farming or pastoral purposes, they were wastelands - was clearly expressed in the 1867 Annual Report of the Department of Lands and Survey, which refers to unoccupied public lands as 'still lying waste in the hands of the Crown'. The second view held that any commercial values in the public estate, once identified, should immediately be used. Examples abound - harvesting of seals and whales, grazing native grasslands, clearing of forests, diversion and consumption of the water, and extraction of gold.

The following section discusses various uses and their effects on the public land and its resources. In retrospect, these uses often impaired other values.

Pastoral and agricultural use

The squatters initially grazed the native grasslands and open woodlands, where feed already existed for their stock.

Table 7

STATE INVENTORY OF AREAS RESERVED, OCCUPIED, OR ALIENATED AS AT 30 JUNE 1970

	Areas (ha)	
Crown lands		
Occupied under various licences and leases		2 213 170
Reserves		
Reserved forest (Forests Act)	2 289 250	
National parks (National Parks Act)	205 000	
Wildlife reserves	51 380	
Forest and timber Reserves under Land Act	60 780	
Water, catchment and drainage purposes	86 590	
Public parks and recreation	47 530	
Water frontages; stream- and lake-beds	341 550	
Areas set aside for roads (1969 figure)	691 050	
Other	69 400	
Total reserves		3 842 480
Unoccupied and unreserved		3 091 730
Total Crown lands		9 147 380
Alienated in fee simple		13 441 320
In course of alienation		173 950
Total area of State		22 762 660

Source: Annual Reports 1969 and 1970, Department of Crown Lands and Survey

Their effect on the countryside was only slight at first, but gradually and collectively grew. As Thomson (1979) explains, they introduced

> '...large flocks and herds of hard-hooved sheep and cattle to graze on the native grasses where formerly a much smaller native population, of soft-footed marsupials and other animals, had grazed without disturbing the natural balance of the land'.

Sheep competed strongly with the native ground fauna and also brought the spread of nuisance weeds. Many squatters burnt off tall dry grass to encourage growth after rain of greener pastures that sheep preferred.

Overgrazing by the squatters' and selectors' mobs in poor years left exposed soil in grassland areas. Since sheep graze more closely and intensively than native animals, the grassland species-composition gradually altered.

The pressures to open land for selection resulted in decisions to release areas that should never have been alienated and cleared, particularly after the 1870s when the best land had already been taken up.

The situation was exacerbated by the selectors' obligations - under the terms of their purchases - to clear standing timber and to cultivate a proportion of their blocks. Each was a recipe for erosion under the current state of knowledge.

In the Mallee, large areas under pastoral licence were regularly eaten out. Following the *Mallee Pastoral Leases Act* 1883, however, tracts were opened for clearing and cropping. Extensive clearing began in earnest following the construction of stock and domestic water-supply systems after 1898.

Acclimatization

The Acclimatization Society was established in 1861 and had wide support for its efforts to introduce and 'acclimatize' various European animals, birds, and fish. But Rolls (1969) comments:

> '...there was never a body of eminent men so foolishly, so vigorously, and so disastrously wrong'.

At the time, Society members were respected for their efforts to establish self-supporting populations of their introductions. Their reasons varied, but the animals were primarily for public game, perhaps in reaction to the strict English poaching laws over which many early Australians had been transported. Other introductions were intended as 'useful species', and the songbirds were to eat caterpillars and add to the re-created English garden surroundings in towns and on many estates.

Notably, the Society introduced hares, deer, pigs, and goats; sparrows, starlings, thrushes, blackbirds, and Indian mynas; and trout and redfin. Members neither imagined nor felt any concern that these creatures could have any impact on the native fauna and flora. They tried and failed to acclimatize rabbits, but in 1866, when opposing a Society request for exclusive use of Phillip Island for acclimatization, Clement Hodgkinson drew attention to the 'more successful' mainland efforts of Mr Austin at Barwon Park.

Many nuisance plants were introduced over the same period. Blackberries were planted for their fruit and as food for certain birds, and later in attempts to control gully erosion resulting from land clearing and surface mining. Many other plants that were introduced as ornamentals - Scotch thistle, Cape tulip, furze, broom, tufted honey-flower, sweet briar, hawthorn, water hyacinth, etc. - spread widely towards weed status.

Mining

Gold-mining occurred in several stages. In the first rushes, miners panned for gold panned from topsoil on the hillsides and alluvium in stream-beds, floodplains, and terraces. In heavily mined valleys, their claims abutted, each with vertical shafts dug as deep as the alluvium, and with adjacent piles of spoil. They built a web of water races to bring water for their cradles or puddling tubs, and nearby forests provided winches, cradles, tubs, and fuel.

Mining attention then turned to the original source of the alluvial gold - primarily in quartz reefs in the Palaeozoic sedimentary rock widespread through central Victoria. Reef mining was too expensive for the individual, as the shafts were often sunk in hard rock to great depths. The ancient courses of rivers and streams in the gold country, buried deeply under basalt deposits, were also mined using deep shafts for access and long drives into the 'deep leads' to extract gold-bearing sediment.

In the later technique of hydraulic sluicing, operators directed high-powered water jets at stream-banks, treating the loosened material and separating the gold by the usual gravity or chemical methods. From early this century a further method of gold extraction used bucket dredges to rework some of the old alluvial gold-fields. In its most developed form, huge floating dredges progressively worked self-constructed ponds on stream terraces, or pools within the beds of stretches of the Ovens, Buckland, Mitta Mitta, Loddon, Avoca, and other rivers and tributaries.

Quartz reef mining continued into this century, using a range of methods including gravity, heavy metal, or other treatments to extract gold from the ore. A few mines continued to operate sporadically, subject to decreasing yields, difficulties with groundwater, and low gold prices.

The State Electricity Commission was set up in 1918 to co-ordinate supply of electricity to Victoria, using the Latrobe Valley brown coal resources. The open-cut method used since then for mining these reserves has resulted in huge excavations. The open cuts contrasted with the shafts and drives of the various South Gippsland black-coal-mines at Wonthaggi, Korumburra, and Powlett River.

Use of timber

In Victoria the gold rushes in 1851 made the first heavy demands on public forests, with the immense requirements of wood for building and mining. Durable timbers from local forests were cut for structural woodwork, props, and wooden railways in the bigger mines, and for firewood to drive quartz crushers and other machinery. In 1889, for example, mines used some half a million tonnes of firewood to fuel boilers.

Mining companies were major users of timber, and intense competition arose between sawmill-owners to supply mine props and other timbers. The colonial government imposed

minimal controls over timber-cutting, without restrictions on quantity, species, or size. The system required only a small licence fee to establish a mill, with additional payments for employees and equipment. No incentive was offered for efficient use of the forests or for reforestation, and supervising foresters were limited in both their numbers and powers.

On pastoral land the squatters physically marked the extent of their runs with plough furrows, marked trees, and heaps of stones. In the selection era, however, each selector fenced his block (usually with timber posts and rails), built timber sheds and huts, and eventually built a permanent house (also usually wooden). As well as being heavy users of wood, the selectors cleared or ringbarked much of the standing timber to establish croplands or pastures. Ring-barking had been recommended in wet areas to allow quicker drying out for prevention of footrot and liver fluke, but the practice also spread widely into dry areas and so the forests on this land were also greatly reduced.

Condition of the Public Estate

Land degradation

In a letter written in 1853, John Robertson - a squatter from the Wannon area - described the results of soil compaction caused by the introduced hard-hooved stock, overgrazing, and deliberately lit fires:

> '...springs of salt water were bursting out in every hollow or watercourse, and the strong tussocky grasses were dying out. The clay was left bare in the summer, cracks developed in winter and rain washed out the clay. Every little gully became a deep rut and, when rain fell, it ran off the hard, bare surfaces, rushed down these ruts into drainage lines and the larger creeks, carrying earth, trees and all before it... the clay hills are slipping in all directions, also the sides of precipitous creeks...' (Bride 1969)

Even then, sheet and gully erosion, salting, and landslides, all accelerated by the graziers' practices, were evident.

Occasionally the squatters' fires got away into forested areas, killing or damaging trees, destroying the understorey shrubs, and removing the leaf litter layer that protected the soil surface from storm rainfall and erosion.

Sheet erosion became widespread following such fires and overgrazing, droughts, rabbit infestations, compaction of the ground by stock, and grass-species changes induced by grazing. Excessive run-off from bared surfaces led to gullying, particularly in drainage lines from which large volumes of soil were removed. These deep incisions also intercepted groundwater, rendering the slopes even more arid.

Material eroded from hillslopes became deposited on farmland, in streams causing flooding, and in reservoirs. As a later example, the Melton Reservoir was built in 1915 as an

irrigation storage. However, massive erosion resulting from clearing for pastoral and agricultural use decades earlier, particularly in the sensitive Parwan Valley, has caused heavy siltation and the loss of about 22% of the reservoir's storage capacity.

Repeated cultivation for crops in some areas accelerated soil degradation. The natural paucity of plant nutrients (particularly phosphorus) in Victorian soils, with nutrient removal by harvesting, led to crop yield decline and failure in the 1850s and '60s. The response of some selectors was to sell their exhausted land for grazing, and choose a new cultivatable block further out.

In the Mallee, soon after the early clearing efforts at the end of last century, the light sandy soils started to 'blow'. By 1920, wind erosion had become a serious problem, particularly in drought years. The finer soil particles and fertility were lost, and coarser sand drifted onto crops, roads, and railways and into the water-supply channels.

Much of the public land that had been alienated became severely damaged.

Similar unwise treatment of public land was illustrated earlier this century in the summer grazing of the Bogong High Plains. Stock numbers were too high, fires were frequently started to stimulate grass growth, and the grazing period was too long. As a result, half of the ground area was bare, the herb carpets were reduced to isolated tussocks, and the sensitive moss beds were so trampled and cut that they dried out in summer and no longer held back water. Thomson (1979) records that visible erosion was commonplace. In the alpine environment vegetation is difficult to re-establish, and erosion rarely self-corrects. In 1946 the Stretton Royal Commission into forest grazing and mountain catchments endorsed the need for controls over stock numbers and removal of grazing from the most sensitive areas, and criticized the use of fire by graziers.

These problems were caused by ignorance, bad practices, and in particular a lack of recognition of the limited capabilities of different types of land to sustain different uses or management regimes. Further, the rabbits that were introduced as a game species in 1859 had acclimatized spectacularly, and by 1890 there were hundreds of millions. They out-competed the sheep and, of course, native fauna for the grass in poor years, and bred up quickly again after drought depletion. In infested areas, as well as causing economic difficulties, they left huge expanses of soil exposed to sheet erosion, and their burrows initiated tunnel erosion.

By 1900, sheet, gully, wind, and tunnel erosion, landslides, and saline seepage were widespread. Nutrient decline and damage to soil structure by compaction or repeated ploughing rendered many areas vulnerable to further erosion. Weeds and vermin added to the problems.

The gold rushes, too caused environmental damage. Auriferous valley bottoms, terraces, and hillsides were stripped of

their forests, and soil was washed into rivers and creeks. Once they had worked out the surface, miners dug shafts, placing the spoil so carelessly that it further blocked streams, causing flooding, erosion, and deposition of inert sediment over useful land downstream. Howitt observed in 1855:

> 'Little more than a year ago, the whole of this valley on the Bendigo Creek, seven miles long by one and a half wide, was an unbroken wood! It is now perfectly bare of trees, and the whole of it riddled with holes from ten to eighty feet deep - all one huge chaos of clay, gravel, stones and pipe clay thrown up out of the bowels of the earth!'

Disturbance of this magnitude was repeated on many goldfields, and at some fields more than once as mining methods changed. Hydraulic sluicing excavated alluvial flats for gold extraction, inevitably causing the loss of most of the soil material; and with a powerful water jet a single worker could shift up to 100 cu.m of material a day. In its destruction of alluvial flats, sluicing paralleled and in some areas surpassed the gully erosion caused by earlier mining methods.

The later dredges were necessarily located on alluvial flats, and in their first 12 operating years 2430 ha were worked over. According to Johnson (1974):

> '...the fertile soils were totally destroyed by the dredges, which left a wake of heaped and sterile shingle in their path. Following farmer complaints dredges were excluded from agricultural land, and strict conditions imposed. Despite the conditions, the Harrietville dredge (1941--56) caused the loss of all fine soil material in the area worked leaving "deserts of stones".'

Such loss of topsoil, and random replacement of soil profile and parent material - common in early mining - reduced the capability of extensive areas for future uses.

The Castlemaine, Chewton, Creswick, Clunes, Talbot, Maryborough, Daylesford, and Maldon goldfields all lie within the catchment of Laanecoorie Reservoir, built as an irrigation supply storage in 1890. Surface working, sluicing, reef, and deep lead mining all occurred in this catchment. The Loddon Valley was extensively dredged between Guildford and Newstead and, largely as a result of the associated massive erosion, the reservoir lost half its capacity through the deposition of some 8.6 million cu.m. of sediment.

The other north-flowing streams draining the goldfields around Bendigo, Avoca, St Arnaud, Dunolly, Wedderburn and Beechworth deposited their silt in the Murray River system. Much of the topsoil throughout the 'auriferous areas' was lost, leaving subsoil exposed over large areas, some of which remained partly bare for decades afterwards. Others, for example, the Loddon River flats at Newstead have been reclaimed and are used for grazing.

The forests

From the beginnings of settlement around the Sydney colony the impact of uncontrolled timber-cutting was noticed. The Hawkesbury Valley cedar forests were felled indiscriminately to build early houses and not regenerated, with the result that Hawkesbury cedar was largely cut out by 1810. Floods, exacerbated by forest clearing, devastated the Valley around 1800.

Up to the turn of the century Victorian forests were also greatly depleted in both extent and condition. Large areas of quality forest suffered clearance for settlement, including tall mountain ash forests in the Otways and Strzelecki Ranges. They were also heavily cut for timber.

In the mining areas. the method of felling was based on expedient use of the apparently limitless standing resource, with no attempts at regenerating the forests. Only the best trees were felled, and only the best parts taken, so the timber quality of the forests was greatly reduced while the wildfire risk and fuel left on the forest floor were greatly increased.

Lack of reservation of the forests, the destructive licensing system, and the absence of powers for forest managers combined to allow massive waste, and overcutting of the preferred species.

Mining, construction and the railways all demanded durable timber, and the ironbark forests from Bendigo to Rushworth and red gum forests along the Murray were heavily cut. The Conservator of Forests, Perrin, reported in 1897 that mine props cut around Maryborough since 1892 would stretch 800 miles if laid end to end. In 1899 the Railways Department required 70 000 sleepers, a 34% inroad on the State's total estimated supply of appropriate timber. In the Barmah forest at that time

> '...consistent and undisciplined malpractice had exhausted the forest of mature red gums for sleeper splitting' (Johnson, 1974).

Wastage was immense. Competition between sawmillers resulted in greater waste rather than efficient wood use, leaving forests with damaged standing trees, decaying felled and unused timber, and usable trees left to senesce. The mills sawed only the best, and Ribbentrop estimated in 1895 that fully three-quarters of the usable timber was wasted by the felling and milling practices of the day.

By the start of this century the forests had deteriorated badly. The Mount Cole forests, serving the mining areas at Stawell and Ararat, were exhausted. The Wombat forest had deteriorated in the 1880s and 1890s so far that the annual cut had been reduced from 142 000 cu.m to less than 11 000, and Perrin recommended closing it to the licensees. Deliberately lit and natural wildfires and inadequate staff and funds for fire protection led to the destruction of further large stands.

In some areas the sought-after durable species were logged in order of reducing species preference, as each was cut out. Preferential cutting severely altered the species composition of the forests, changing both their immediate and future marketability. Featherstone (1985) describes major changes in composition of an East Gippsland forest caused by durable-species cutting early this century. In Central Victoria the protracted cutting of ironbark and dense box species and fuel has apparently caused their depletion and replacement in remaining forests by less-favoured and prolific-seeding species such as long-leaf box.

The *Forest Act* 1907 provided the incoming Conservator of Forests with new powers, although he inherited a damaged forest estate.

Flora and fauna

Frood and Calder (1987) comment:

> 'Within two hundred years of European settlement of Australia, large tracts of intensively-used land totally lack indigenous (vascular and vertebrate) species, apart from scattered old trees, and a handful of the species of animal and plant which are tolerant of altered land use and capable of withstanding drastically modified environments'.

The introduction of exotic pasture species (and weeds) and the application of fertilizers have been responsible for the elimination of 95 to 100% of native grassland communities. Of the forest cover extant in 1836, 56% has been cleared and 70% of the remainder has been severely modified, greatly reducing the distribution of many plant species. In many forests, grazing, fires, erosion of topsoil, and introduced plants have also led to an altered species composition in the understorey.

The squatters regarded larger native animals as vermin, food, or game, greatly reducing their numbers in consequence by poison and gun. Rolls (1969) records the use of strychnine against

> '...everything that seemed at all likely to be troublesome... the wombat, the rat-kangaroo, the wedge-tailed eagle, any species of hawk, the raven, the dingo, the native cat and the tiger cat for poultry raiding, and the goanna for egg stealing.'

Freed from predator pressure the indigenous herbivores had the chance to flourish, but they soon suffered due to competition from sheep, cattle, and rabbits, and to hunting.

Many native mammals could not endure the major ecological changes and habitat destruction caused by settlement, and at least 22 species have subsequently become extinct in Victoria.

Arboreal animals possibly benefited from the damaged forests where the timber-extraction methods of last century left

increased numbers of tree hollows, suitable for nesting. However, more recent practices of cull-felling of damaged trees and burning to ensure regeneration, while important improvements in timber resource management, might have reduced the habitat value of some forests in the short-term.

The Managers of the Public Estate

In 1836, Port Phillip was declared a district of New South Wales. A superintendent administered the district, and Crown Land Commissioners were appointed to evict unlicensed squatters and settle boundary disputes. Under Imperial law, various Acts and Orders-in-Council were passed to regulate squatting, then carried out under an annual licence. After protracted argument, in 1847 the squatters were granted 15-year leases on their holdings.

The Lands Department

The colony of Victoria was established by separation from New South Wales in 1851, and in 1855 the Department of Public Lands was established, incorporating the Board of Land and Works, to administer licensing.

A survey branch had been set up at Port Phillip in 1837, and limited government sales of surveyed allotments followed. The series of selection Acts passed in the 1860s, however, changed the Department's emphasis from pastoral-area licensing to land survey and sale.

Clement Hodgkinson led the Department as Deputy Surveyor-General (1857--60) and Assistant Commissioner of Crown Lands and Survey (1860--74), bringing in policies to encourage selection, retain public land in reserves, and develop the first rudimentary town plans.

The *Land Act* 1869 was the most successful in getting small farmers onto the land, particularly by means of a clause reversing the 'no selection before survey' policy around auriferous areas. Accordingly the Lands Department was active through the 1870s in surveying and administering selected blocks.

The end of the gold rushes brought greatly increased demand for blocks for selection, and also for the small parcels of public land formerly occupied for mining purposes to be converted to residential areas.

The general policies of the Lands Department were to survey and sell much of the public land, and to administer the use of what remained. While some areas had been protected by reservation, towards the end of the century there was growing popular concern about the condition of public resources also managed by the Department - the forests, the soil, and the water.

Management of the forests

Local forest boards were set up in the early 1870s and in 1874 a Central Forest Board was established within the

Department of Agriculture. Although not formalized until 1908, this was the first diversion of control of public land from the Lands Department, which apparently resented intrusions on its powers. Its bureaucracy afforded both Alexander Wallis (as founding Secretary for Agriculture) and later George Perrin (first Conservator of Forests) the minimum of office space and staff, and apparently allowed them little access to the joint Minister.

In the 1880s and 1890s various reports and a Royal Commission were critical of the licence system and the lack of permanent reservation, fire protection, and forester training. Several Acts were passed but not implemented, until in 1908 the State Forests Department, with its own Minister, was set up under the *Forests Act* 1907, which also made provision for the control of forest produce from public land, for the dedication of areas of reserved forest, and for the collection of royalties. The licence system was thus abolished, allowing the early steps in proper management. In 1918 the Forests Commission was established, with experienced foresters to implement a comprehensive Act.

Timber production

Initially the Commission sought to repair the past damage resulting from large-scale use of land for agriculture and the unregulated production of mining timbers. The 1986 report 'Victoria - Timber Industry Strategy' describes how efforts were eventually concentrated on controlling the yield and sale of timber.

Around the goldfields, group selection and coppice methods of timber harvesting and regeneration were employed, while elsewhere seed trees were retained, with some coppice regrowth. Seed-bed preparation consisted mainly of soil disturbance during clearfelling (in mountain forests) or of slash burning (in the coastal and foothill forests).

In 1939 wildfires burnt about 1.3 million ha of forest land, claiming 71 lives and destroying sawmills, houses, bridges, tramways, machinery, and livestock. Salvage operations subsequently supplied most of the heavy wartime demand for timber. The post-war housing boom then placed unprecedented demands on Victoria's forest resources, with the State being 90 000 houses short of immediate requirements, and more than 300 hardwood sawmills were set up to cope with this.

As supplies from salvage logging dwindled, trunk roads were constructed into the mountain forests of north-eastern Victoria and north-central Gippsland, which then became the main source of high-quality timber. In the 1960s East Gippsland became another major source of hardwood sawlogs.

To complement hardwood timber output, plantations of *Pinus radiata* were established in Victoria in the 1920s and '30s. In the 1930s the Forests Commission initiated ambitious reforestation schemes on purchased derelict farmland in the Otways and the Strzeleckis. Over the same period, it established plantations near Ballarat and in the Ovens Valley to rehabilitate mined areas.

To meets its object of achieving forest self-sufficiency by the year 2000, the Commonwealth government provided long-term loans between 1967 and 1977 through Softwood Forestry Agreements. Since the program was terminated, the States have been responsible for financing softwood plantations.

Soil conservation

The Sludge Abatement Board was established in 1905, after more than 50 years of mining operations, to provide for some control over the quantities of mining sludge permitted to enter watercourses.

To start the process of repairing other areas of eroded land, from various causes, a series of committees was established.

The Erosion Enquiry Committee (1917) considered '...the serious problem of erosion in Victorian streams and valleys'; a River Murray Commission conference (1927) discussed land use in the Lake Hume catchment; the Sand-drift Committee (1933) investigated the problem of wind erosion in the Mallee; and the Erosion Investigation Committee (1937) looked at soil erosion of all kinds.

Governments of the day took no action to implement the various recommendations of these committees (Thomson, 1979).

However, in 1939 the Stretton Royal Commission reported, *inter alia*, on the acceleration of soil erosion caused by wildfires, and in the same year a symposium on soil erosion outlined the suggested content for a soil conservation bill.

Finally in 1940 a *Soil Conservation Act* was passed, but only in 1949 did a comprehensive Act give wide duties and powers. From 1950 the new Soil Conservation Authority acted to 'mitigate soil erosion', and 'promote soil conservation' as required by the Act.

Noxious weed and vermin control

The *Thistle Act* 1856 required the Surveyor General to employ labour to destroy 'thistles' (i.e. all noxious weeds) on unoccupied public land. After years of understaffing, and repeated rabbit plagues and weed infestations, the *Vermin and Noxious Weeds Act* 1922 established a separate division within the Lands Department, with 92 vermin and weed control districts. An amendment in 1948 extended responsibility to all land controlled by government and local authorities. In 1959 the Vermin and Noxious Weeds Destruction Board was formed as an independent statutory authority reporting to the Minister for Lands.

Protection of native fauna

In order to protect their delicate introduced species, the acclimatization societies pressed for a game law, which, when passed in 1862, specified year-round protection or no-hunting periods for various imported species. Later Acts

added several native species to the protected list, but no protection of habitat occurred, other than in the small national parks, until after 1896.

As part of a wider movement seeking to establish major nature reserves, pressure for native wildlife protection resulted in a *Game Act* amendment in 1896, which allowed the reservation of sanctuaries. In 1902, 35 species of native birds and all native fauna except snakes were added to the protected game list. By the end of 1916 at least 100 reserves had been established, with 205 sanctuaries by 1945. Of these areas some 20 000 ha were set aside exclusively for the protection of wildlife.

The implementation of wildlife protection laws required staff, although at first this was limited to rangers at a few of the major reserves. Fisheries and wildlife matters were the responsibility of the Trade and Customs Department before federation then, after 1901, the Departments of Public Works, Agriculture, and Chief Secretary. Work was limited to stocking streams with fish and enforcement of the game laws.

Fisheries and Game, and later Fisheries and Wildlife organizations have actively administered fishing, hunting, researching and stocking fish, and (since 1948) researching native mammals and birds. Establishment of the Arthur Rylah Institute in 1969 was a major step towards protection of Victoria's wildlife.

Crown land reserves

No attempt was made last century to systematically retain examples of different types of land in its natural state. Crown land reserves were set aside for purposes complementary to agricultural or other uses - that is, for roads, water supply, and timber, and for recreation and public purposes.

The history of reservation and revocation of Crown land reserves to 1884, and the individuals responsible is fully discussed by Wright (1985). Reserves under the Land Act were commonly managed by local Committees of Management.

The 1883 *Land Act* required retention in public ownership of a water frontage reserve along many rivers and creeks, which vary from a 20 to 60 m wide setback from the stream-bank, to a surveyed fixed boundary. Such reserves have great importance, as they provide access to rivers, instead of the stream-bank being for the exclusive use of the adjoining land-owner.

Various national parks were established under the Land Act in the first half of this century, generally being controlled by Committees of Management, without an integrated policy. By 1956 they totalled 126 670 ha and were revoked as Land Act reserves, being instead included in a schedule to the *National Parks Act* 1956, with responsibility vested in the National Parks Authority that was established in 1957.

Water supply

Alfred Deakin's *Irrigation Act* 1886 initiated water resource management in Victoria, establishing important principles for the control and distribution of water. After many local irrigation trusts failed, the State Rivers and Water Supply Commission was created by the *Water Act* 1905, to develop irrigation systems and to construct major storages to supply them. The Act contained two important provisions, vesting in the Crown not only control and right to the use of water, but ownership of the bed and banks of any river, creek, lake, or watercourse.

The Commission has acted since to provide water for irrigation, township supplies, and the extensive 'stock and domestic' channel supply systems in the Wimmera and Mallee.

Land Utilization Advisory Council

A special report was considered by the Soil Conservation Board in 1943, covering changes to legislation and including a recommendation

> 'That a State Natural Resources Council be formed to coordinate the policies and activities of departments for the alienation, occupation and utilization of Crown lands and the development of natural resources'.

The Board rejected the recommendation.

In 1944 the Commonwealth Rural Reconstruction Commission recommended that each State should set up a Land Utilization Council comprising the heads of the Departments of Agriculture, Forests, Lands, Survey, Water Supply, and Soil Conservation. Its task would be to advise the government on the allocation of land for farming, forestry, water, and nature conservation as well as ways of controlling soil erosion. This recommendation also was not taken up.

The 1946 report of the Stretton Royal Commission recommended establishment of a Land Utilization Authority, to be charged with the duty of protecting all land.

Finally in 1949, the *Soil Conservation and Land Utilization Act* established the Land Utilization Advisory Council, comprising the Secretary for Lands, the Chairmen of the Soil Conservation Authority, Forests Commission, and State Rivers and Water Supply Commission, and the Director of Agriculture. The Secretary for Mines and Director of Fisheries and Wildlife were added in 1966.

Ideally, such a body would be independent, with a full-time executive head and technical staff capable of investigating land use proposals.

In fact the Advisory Council was not independently staffed and relied on the resources of the constituent departments. The Minister for Lands could preside at any of its meetings he attended.

The Council had two functions:

* to make recommendations to the Soil Conservation Authority on the constitution and definition of water supply catchment areas

* to advise the Minister for Conservation and the Authority concerning policy on the use of land (whether Crown land or otherwise) in any catchment area

The operation of these functions is discussed in chapter 15.

In 1966, the Council had its terms of reference widened with a Premier's directive asking it to provide advice on the long-term use and care of both Crown and freehold land, that is, which areas should be alienated and which retained as Crown land for various uses. The Lands Department therefore no longer had the primary responsibility for this function, although it still surveyed and administered the recommended alienations. The Council initially investigated the south-western part of the State, and Table 8, in the next chapter, summarizes recommendations made to the Minister to 1969.

The Land Utilization Advisory Council was expanded in 1970, in responsibilities and membership, to form the basis of the Land Conservation Council.

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Part II
ROLE AND PROCESS OF THE LAND CONSERVATION COUNCIL

4. LAND CONSERVATION COUNCIL - ORIGIN AND OPERATION

In 1968 and 1969 considerable controversy arose over a government proposal to subdivide public land in the Little Desert for new farms. A portion of the eastern block was to become a new national park, while a 500-ha reserve was to be created around The Crater in the central block. The remainder - some 81 000 ha - was to become agricultural land. In the public debate that followed, it became clear that the proposal was being questioned by both community groups and government bodies, on ecological and economic grounds.

Agricultural economists publicly queried both its profitability as outlined by the government and the effectiveness of its contribution to decentralization strategies, and voiced strong opposition to the expenditure of scarce capital for agricultural development in areas of marginal agricultural potential. It also received adverse comments from a number of government agencies, and the report of the advisory body, the Land Utilization Advisory Council, was never published.

The proposal stimulated the increasing community awareness of conservation issues. New and vocal organizations had come into being, and pointed out the ecological significance of the whole of the Little Desert and the contribution that each of these blocks made to the total ecological diversity. In *The Age*, Tanner expressed his view of the development strategy (Figure 4). The measure of public concern was soon reflected in political reversals for the government of the day, firstly in a by-election and later in the general election of 1970, when it was only narrowly returned.

The existing procedures for allocating Crown land were perceived to be controlled by an individual minister and public reaction indicated that this was no longer acceptable.

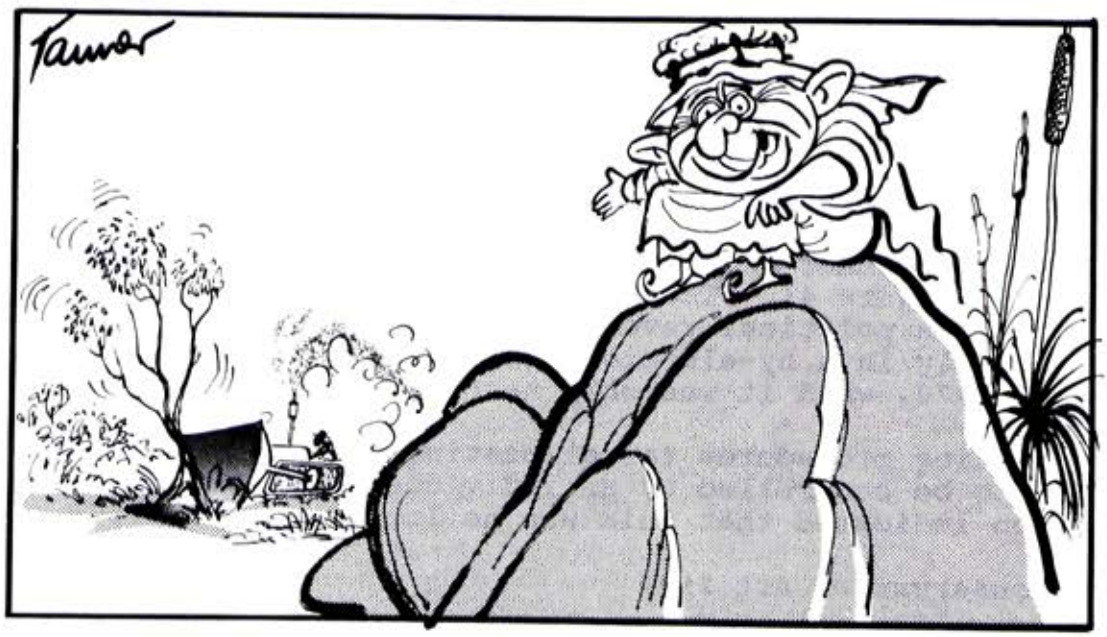
Land Conservation Act **1970**

Following passage of the *Land Conservation Act* in 1970, the first chairman of the new Land Conservation Council, Mr S.G.McL. Dimmick, was appointed in February 1971.

Initially the Council consisted of 12 members, eight being heads of government agencies or departments responsible for soil conservation, forests, Crown lands, agriculture, rivers and water supply, minerals and stone, fisheries and wildlife, and national parks. Three were appointed from outside the public service - two with expertise in aspects of conservation and a third skilled in the conservation techniques used in primary production.

Membership additional to that of the Land Utilization Advisory Council thus comprised the Director of National Parks and the conservation members, reflecting both the broader role and the intended emphasis on nature conservation. The

FIGURE: 4



"We're developing the Little Desert - into a big desert"

(Reproduced by kind permission of "The Age")

latter was emphasized in Conservation Minister Borthwick's second-reading speech. In 1981 a fourth member from outside the public service was appointed to contribute expertise in business and commerce.

The Council is a body of people with established expertise based on long-standing and extensive involvement with the ecology of plants and animals, the use of natural resources, and the protection and administration of public land. It is a technical advisory body and was not established to provide a forum for the many different community groups with an interest in a particular aspect of public land use, nor for the commercial utilization of any resource on or within it.

The legislation recognizes a major concern of the 1960s, namely the need for an independent body to examine competing uses and to determine the way that public land could best be allocated in order to accommodate those with legitimate interests, as well as the needs of the general community.

Further, recognizing the need for an independent Council, the Act provides for the appointment of a chairperson from outside the public service, and confers on that person the rights and powers of a permanent head of a government department. It also causes the chairperson to be responsible directly to the nominated Minister, and the Council is regarded as a separate administrative unit within the public service.

Two important factors assist in the practical operation of the Council: firstly its independence; and secondly the appointment of a small research staff together with an administrative backup. The latter allows data held by government, industry, and community groups to be integrated and independently assessed during the preparation of resource reports and land use proposals.

The major feature of the legislation, however, was the introduction of new and innovative provisions for determining how Victoria's Crown lands would be used in the future. For the first time, the legislation provided for:

* the opportunity for the public to participate directly in determining how public land in the State should be used

* publication of all the Council's reports and recommendations

* inclusion of experts from outside the public service, thus ensuring that views from outside the bureaucracy would contribute to the resolution of land use issues

* reports to be tabled in Parliament, which gives every member the opportunity to raise land use issues arising from recommendations, in either House

* a process that includes implementation provisions directing Departments to give effect to the government's land use decisions

Section 5(1) of the *Land Conservation Act* 1970 states that:

'the Council shall:

(a) carry out investigations and make recommendations to the Minister with respect to the use of public land in order to provide for the balanced use of land in Victoria

(b) make recommendations to the Governor in Council as to the constitution and definition of water supply catchment areas under the *Soil Conservation and Land Utilization Act* 1958, and

(c) advise the Minister administering the *Soil Conservation and Land Utilization Act* 1958 concerning policy on the use of land (whether public land or any other land however vested) in any water supply catchment area.'

The legislation emphasizes that the Council has the role of providing scientific and expert advice based on technical investigations and that it should make recommendations only after all the available information about the land being studied has been assembled and assessed.

Of interest is a comparison between this Council's recommendations and those of the Land Utilization Advisory Council for the same area. Table 8 shows this comparison for parts of the south-west of the State. Note several major changes in recommendations - for example, from alienation for agriculture or forestry (Land Utilization Advisory Council) to national park, reference area, flora reserve, and wildlife reserve (Land Conservation Council). These changes arose from the wider membership of Council, the public consultation process, the more-comprehensive data base, and the statutory requirement to have regard to conservation needs.

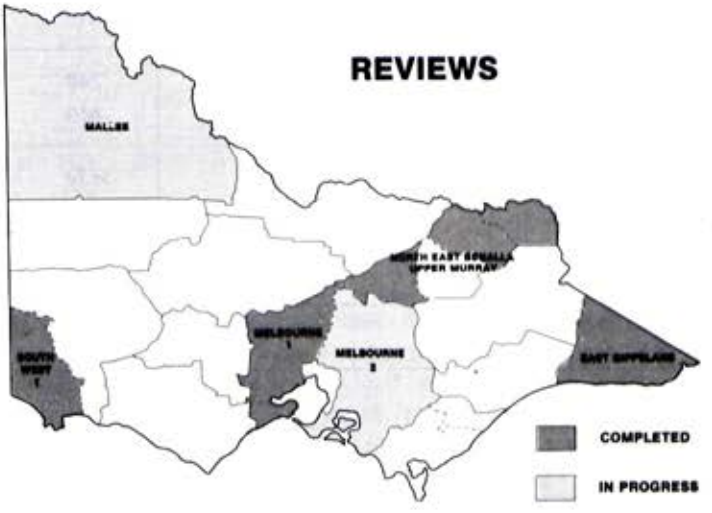
Study areas

To enable the orderly investigation of public land, the Council divided the State into 17 study areas. Although substantially based on municipalities, the boundaries reflect land forms and the availability of information, and particularly the issues prevailing when the Council was first established. Hence the first study areas investigated were the South-western Area, District 1, for which the Land Utilization Advisory Council had already assembled a report, and areas in the North-east and South Gippsland, where rapid decisions were required on the availability of public land for pine planting.

All study areas have now been investigated, with the last - the Wimmera - being completed in 1986. Four of those previously studied have been reviewed, with the investigations of any one area generally being about 10 years apart (see Map 7). In addition, the Council has conducted six special investigations as provided for in section 8 of the Act. These investigations are instigated by the government and conducted according to specified terms of reference. Their duration is fixed by the government.

LAND CONSERVATION COUNCIL INVESTIGATIONS 1971-1987







MAP No. 7

Table 8

RECOMMENDATIONS OF THE LAND UTILIZATION ADVISORY COUNCIL 1966--69 AND SUBSEQUENT LAND CONSERVATION COUNCIL RECOMMENDATIONS

Location (parish)	Total area (ha)	Alienation for agriculture (ha)	Forestry (ha)	Water (ha)	Conservation reserves (ha)	LCC recommendations	
						Area (ha)[1]	Recommendations
Palpara	9040	2900				2900	Agriculture
Wanwin Malanganee			6140			3080	Softwood production
						3040	Uncommitted
Killara	4860		4860			2830	Softwood production
						2020	Flora reserve
Drik Drik Balrook	4090	3190				2400	National park
						390	Reference area
						410	Hardwood production
			900			240	Softwood production
						660	Hardwood production
Tullich Byjuke Nagwarry Tooloy	6070		5260[2]			3730	Softwood production
						810	Uncommitted
						410	Wildlife reserve
						320	Flora reserve
					810	810	Wildlife reserve
Glenelg Warrain Kentbruck	6940				6940	6940	National park
Meereek Durong	4290	2960				1540	Uncommitted
						1420	Hardwood production
			1340			1010	Hardwood production
						320	Flora reserve
Drajurk	2020			2020		2020	Water production

Notes:

1. Figures have been remeasured in some instances.
2. Softwoods.

Study groups

Central to the Council's ability to put forward soundly based proposals has been the assistance given by government agencies who either control public land or have a statutory responsibility that involves the use of public land.

Using a technique developed for the Land Utilization Advisory Council's 1966--69 studies, the new Council formed a

working group for each investigation consisting of people from the government agencies most closely associated with the use or management of the public land under study. Each agency was asked to supply information and provide drafts for sections of the resources reports. These were integrated and assembled by Council officers to provide readers with basic information about the areas under study and the values they contain.

The study group also inspected each area and provided a technical input to the drafting of land use proposals before these were circulated to the Council.

While most of the information included in reports was derived from data held by government agencies, substantial segments were based on information originating from local government and various community groups, usually local.

Resources reports are primarily produced to allow all those interested in public land use to share a common information base. These reports, now completed for the entire State, provide a comprehensive inventory of the known resources on public land and a detailed description of its values and features. The State-wide coverage given by the maps and the detailed information in the appendices cause them to be highly valued as a teaching resource, and they are particularly used at tertiary and late secondary levels.

Commissioned research

During preparation of resources reports and land use proposals, it frequently became clear that key information critical to the understanding of an issue was not available. Where such gaps could be filled by short-term research or data collection, the Council therefore commissioned research groups, both within and outside the government bodies, to provide the information. The Council's recommendations have drawn attention from time to time to the need for research into different aspects of management and data collection that are necessarily long-term in nature, as is further discussed in chapter 22 of this report. However, the Council has specifically funded such investigations only for the extraction of faunal distribution records by the Museum of Victoria, a project that spanned some 5 years.

The investigations funded by the Council cover a wide range of topics, although they have tended to concentrate on identifying the various natural and man-made features, and the nature conservation values of public land. They include:

* vegetation surveys
* faunal surveys
* surveys of historic features
* Aboriginal history
* grazing effects on public land
* economic/employment evaluations

A full list of studies commissioned by Council is contained in Appendix XVII.

Land use proposals

The basic approach adopted by the Council has been to assign land to one of several different types of reserve so that all land within a particular category of reserve is used in essentially the same way. The Council has generally chosen to identify areas of land for permanent reservation rather than propose that a form of land use be achieved by management strategy only. Where the proposed uses are to be directed towards the protection of ecosystems or natural features, the vehicle for reservation has in most instances been the *Crown Land (Reserves) Act* 1978 or the *National Parks Act* 1975. A full discussion of the Council's land use classification system is given in chapter 6.

From the inception of its program of investigating public land, Council also recognized the need to provide a broader policy context for its recommendations. Principles and guidelines applying to particular categories of land use were developed by committees, for subsequent consideration and approval by the Council. Council also identified where changes to legislation were required, to give effect to its recommendations. Specific policy recommendations were prepared for many land use categories, in addition to those recommendations that were area-specific.

The Council's recommendations cover public land use, with broad policies for management of the land where needed to clarify the recommendations for use. Preparation of management plans and day-to-day land management are the responsibilities of the land managers - most frequently the Department of Conservation, Forests and Lands.

Progress to date - some statistics

Over the past 17 years the Council has completed 17 original area investigations, four reviews, and six special investigations. Two further reviews and a special investigation are in progress. These studies have involved the preparation (as at May 1988) of a total of 81 publications incorporating 350 colour maps and 382 black and white maps prepared by the Council's cartography staff working in the Department of Property and Services.

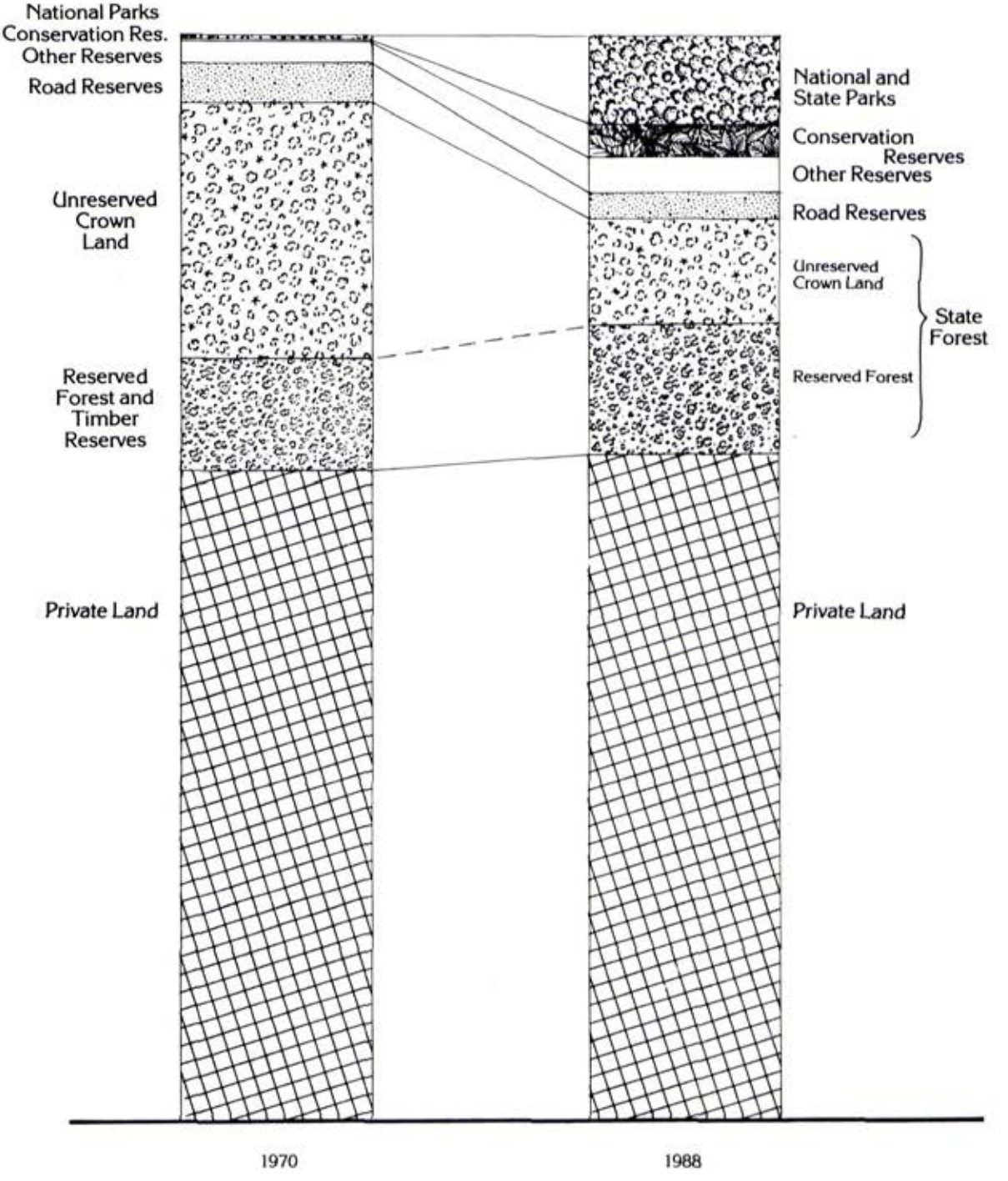
More than 5000 recommendations have been presented to government and virtually all have been accepted, with a small number being varied to some extent by the government before acceptance. This is further discussed in chapter 7.

A comparison between the public land estate in 1970 and in 1988 is shown in Figure 5. Tables 7 and 12 list the respective areas, while Maps 1 to 4 (1988) and 18 (1970) illustrate the distribution of public land.

In addition, the Council has considered 61 reports on water catchments and these have been recommended for proclamation. A further 21 Land Use Determinations have been assessed and advice on these forwarded to the Department of Conservation, Forests and Lands.

FIGURE: 5

THE VICTORIAN LAND ESTATE - 1970 TO 1988



Issues

One outcome of this review of the Council's operation and output in the past 17 years is an attempt to identify the public land use and policy issues that are likely to arise in the next 10 years or so. The report also identifies discrepancies and inconsistencies in the recommendations made in the past.

Where it is appropriate the Council will examine its existing procedures to determine whether they are the most effective way of dealing with public land use issues. Particular procedures that could be reviewed include the following.

Initiation of reviews and special investigations

At present, initiation of reviews is provided for under subsection 5(1)(a) of the Act, and this is done in accordance with a program in which study areas are investigated about every 10 years. Special investigations may be initiated by the government under section 8 of the Act, with no constraint on the area covered or nature of an investigation except that a time must be fixed for it to be completed. It has been suggested that the special investigation process should also be able to be initiated by requests to the Minister from community groups.

Membership of Council

Various concerns have been expressed about the membership of the Council. Following the amalgamation of certain former government departments the 13-member Council now includes five representatives of the Department of Conservation, Forests and Lands. The size of this representation causes some concern, especially since, should these five members vote as a unit, the Department could tend to dominate decision-making. Another problem is that previously the Council received five separate submissions, whereas now it only receives one. There have also been suggestions that other interests should be represented on Council. These include local government, tourism, regional industry, and the Ministry for Planning and Environment.

Amendments to the Act

Amendments that could be considered include:

* expansion of the definition of 'public land' to include Crown land in cities, towns, and boroughs

* provision for the Council to conduct investigations of changes to public land use for particular blocks of public land, rather than waiting until a scheduled review of the whole study area

* alterations to the membership of Council, as outlined above

* improvements in the public participation process, as discussed in chapters 5 and 23

* specific reference to the need to consider the productive uses of public land in section 5(2) of the Act

In the draft proposals for the Lands Bill, currently under discussion, section 76 proposes that Council investigate land in cities, towns, and boroughs in certain circumstances and that there be additional membership of Council in such cases.

Need for continued reviews

It has been suggested that, with the completion of initial investigations for all of the 17 study areas, the allocation of appropriate uses for public land in Victoria has been achieved and that there is no longer a need for reviews of entire study areas. Instead further land use decisions could be made through investigations of proposed land use changes for specific areas of land as they arise. On the other hand, it can be argued that the availability of new information, the development of new issues, continuing public interest in land uses, the potential for disagreement among public land users, and the need to monitor public land use all support the need for reviews at regular intervals. The suitability of 10 years as the interval between reviews could also be examined.

5. PUBLIC CONSULTATION PROCESS

The *Land Conservation Act* 1970 requires that the Council advertise the commencement of its studies or reviews and that for two periods of 60 days it receive submissions from interested organizations and individuals.

The Concept of Public Participation

The Council's statutory provision for participation was notable, when set up in the early 1970s, as an unusual opportunity for public input to government decision-making. It was partly a response to a notion that had gained ground in the 1960s that the structure and legitimacy of representative parliamentary democracy could only be maintained if individuals were able to be involved in government advisory and decision-making bodies through membership or by the provision of information and ideas. These measures would help to reduce the widening gap between local people and centralized governments.

Another rationale was that participation would improve the quality and acceptance of decision-making by eliciting information and ideas that would not otherwise be available. Furthermore, participation may be seen to enrich the lives of people as well as the democratic process. It can enhance self-esteem and confidence, and widen the horizons of those whose interest in particular issues is encouraged by opportunities for participation.

There is continuing debate about the basis for and effectiveness of participation. Many observers see the method used by Council as an effective process. Participation is not a substitute for lobbying political parties and Members of Parliament directly, or indirectly through the media, and should not be seen as such. It does not take decision-making responsibility away from government. It does not offer direct involvement in making decisions or directly change the balance of power between people and government, although it may influence the nature of the decisions that are made.

Sandercock (1975) provides three reasons for supporting participation.

* It can elicit informed and useful responses on questions of local detail planners might not have considered.

* It provides people with access to both information and planners, and can reassure people that their views are considered.

* It can keep public authorities honest, humane, and thoughtful, and more considerate of the people they are serving.

The concept of public participation has been incorporated in the government's Social Justice Strategy, which has as an object 'expanding opportunities for genuine participation by all Victorians in decisions which affect their lives'.

The Land Conservation Council's Public Participation Process

The *Land Conservation Act* 1970 acknowledges the importance of individual and non-government participation in two ways. Firstly, its structure provides that four members of the Council will be from outside the public service. Two members are appointed from a panel of five names submitted by the Conservation Council of Victoria, a third member has experience in conservation principles applied to primary production, and a fourth in industry and commerce. Secondly, the Council releases its reports and proposed recommendations publicly, and provides for interested groups and individuals to make submissions.

In the Land Conservation Council context, the inclusion of non-government members on the Council, the requirement to be public about processes, and the requirement to consult all acknowledge the value of buttressing parliamentary democracy by popular involvement in the processes. As well, there is an acknowledgement that the information and opinions of individuals and non-government organizations have equal value with those from official sources. These measures also establish a right for people to express their opinions as to where the Land Conservation Council should find a balance: between immediate needs and long-term considerations; between nature conservation and the use of public land for commercial production; between public and private requirements; and between local, regional, State, and national interests.

When introducing the Land Conservation Bill to Parliament in 1970, the then Minister for Conservation, Mr Borthwick, drew particular attention to the provisions for public participation. He noted that these provisions would ensure that the public would be notified about investigations, that they would have access to the information collected by Council, and that interested parties would have opportunities to make submissions for the consideration of Council.

Operation of the Council's consultative process

Before commencing its investigation of any area, the Council advertises its intention to both government and non-government bodies and individuals by placing notices in the *Victoria Government Gazette* and major newspapers in the region to be studied.

With the assistance of an interdepartmental study group and other individuals or organizations with expert knowledge of specific disciplines or localities, Council research staff collect information forming the basis of a report. This report sets out to describe and assess the natural resources of the public land in the study area and brings together

'information that is relevant to making decisions on the future use of public land in the study area'. It thus provides a factual basis on which members of the community may base their submissions to Council and on which land use recommendations can be formulated. The report, published and available to all members of the public at a small cost, ensures that all persons and bodies who have an interest in the use of public land can study the basic information and so make informed and constructive suggestions to the Council for its consideration.

The first stage of the public participation process begins with the report's release to the public, at which time the Council again advertises widely, inviting individuals and interested bodies to make written submissions on how public land in the study area can best be used to meet community needs. These submissions are to be received by the Council within 60 days of the report being published.

From a consideration of the submissions, in conjunction with field inspections, departmental advice, reference to published information, and current policies, Council develops its proposed recommendations.

The second stage of the public participation process then follows, with copies of these proposed recommendations being sent to all who made submissions, at the same time also being made available to the wider public. A further period of 60 days is allowed for additional submissions, thereby giving the best opportunity both for the public to participate in the Council's investigations and for the Council to consider the widest possible range of views in preparing its final recommendations.

After due consideration of this second group of submissions, Council's final recommendations are submitted to the Minister for Planning and Environment and are tabled in both Houses of Parliament.

An effective participation process requires that every person or organization wishing to contribute should be able to do so. This implies that they must know that a study is proceeding and that their views will be welcomed. To meet the obligations of effective participation, the process may need to involve measures to ensure that people are physically able to meet representatives and/or prepare a written submission. They must feel that the reviewing body is not remote in a physical sense or remote because of the way it exercises its responsibility.

The Council's approach has been to advertise its submission periods, after publication of descriptive reports and proposed recommendations, in local newspapers and a metropolitan daily. The Chairman and senior officers of the Council visit all municipalities in the study area and accept invitations from community organizations seeking to discuss public land issues. Many interested groups and individuals visit the Land Conservation Council office in Melbourne to make their views known to the Chairman and staff.

On occasions, when a study area has been remote from Melbourne or some of the issues regarding public land use have been particularly controversial, the Council has adopted such further public participation measures as public meetings and personal consultations within the study area. In the 1985/86 review of public land in East Gippsland, for instance, Council took additional measures to ensure an opportunity for public participation, based on the realization that many people and organizations in East Gippsland felt remote from Melbourne. Some were also apprehensive about the economic and employment implications of possible reductions in timber-harvesting levels.

Additional measures taken in East Gippsland included the Chairman's being available to meet interested people by appointment at locations in the study area, distribution of an 'issues paper' listing questions and concerns likely to emerge during the review, wide circulation of an economic and employment report prepared by the National Institute of Economic and Industry Research, and organization of a public meeting in Orbost at which the Chairman and staff presented and explained the Council's proposals. A total of 1942 written submissions were received during the first public response period and 4807 during the second, indicating a high level of public awareness and interest.

As part of the Council's current review of the Mallee area, the Chairman and senior staff recently met with some 70 interested people at Mildura, Ouyen, and Robinvale by appointment. The main concerns expressed were about the future use of limited cultivation leasehold (F2) and grazing licence areas.

When the need has arisen the Council has assisted groups who have needed additional resources to express their case to the Council. For example, in the review of the East Gippsland area, Council provided funds for an Aboriginal Liaison Officer to facilitate responses from Aboriginal communities in Gippsland. In the special investigation of the Alpine area the Council surveyed all of the sawmillers obtaining timber from the area to obtain detailed information on the impact that resource withdrawals would have on individual operations.

Initially, Council treated all submissions as confidential documents. In 1982 it changed this policy to make them usually available for public scrutiny after the closing date for their receipt. Subsequently, the *Freedom of Information Act* 1982 gave the right of appeal over any documents withheld. Generally such documents are those containing personal, business, or financial details. Individuals can approach the Chairman and make confidential submissions should they wish. This ensures that people in small communities can make their views known to the Council without running the risks of being criticized by others who have opposing views, or of having their financial position made public. Some confidential submissions have subsequently been released with identification of the submitter deleted, and following reference back to the submitter. Under the *Freedom of Information Act* 1982 the public can also obtain access to

other information used by the Council in formulating its land use decisions.

Analysis of submissions

In order to review the effectiveness of written submissions as part of the Land Conservation Council's consultative process, the Council commissioned a report by the Political Science Department, Melbourne University (Chamberlain, 1986) analysing a random sample of second-round submissions received by the Council for all the initial area studies. This analysis discerned the following trends.

* By far the greater number of submissions (92%) came from the non-government sector, and of these the majority (48% of the total) were from individuals rather than organized groups.

* In general about half of the submissions came from within the study area concerned. Understandably, however, the proportion was much lower for those with small populations, such as the Alpine area, for which only 7% came from people living inside the study area.

* On average more submissions came from people living in rural areas (62%) than from people living in Melbourne or other Victorian cities (38%). However, in study areas where conservation was a important issue, such as the East Gippsland, Alpine, and Wimmera areas, urban submissions were in the majority.

* The public's most frequent broad area of interest was primarily on 'conservation' issues (37%), followed by 'recreation' (29%), 'agriculture' (18%), 'timber industry' (13%), and 'education' (2%). Urban respondents were the most likely to submit from 'conservation' and 'recreation' viewpoints.

* There appears to have been a general increase in the numbers of submissions received for each study since the Council's first investigation in 1972. The most important factor, however, is the nature of the study area and its issues.

Comparison of submission content between study areas

The most common theme in submissions has been environmental concern and nature conservation, but it is interesting to note that the types of conservation concerns have varied between study areas, as have the issues raised in submissions.

Conservation-oriented submissions have often advocated new or larger national parks. This applied especially in the Alpine area, where many submissions were in favour of a large contiguous alpine national park. Calls for new or expanded national parks were also prominent in submissions for the East Gippsland, Corangamite, South-western District 2, and Wimmera areas. In other cases opposition to expanded softwood planting was the main focus of conservation-oriented submissions. This was particularly so in the North-eastern

and South Gippsland areas, which included sites of extensive pine-planting programs on public land. In all areas conservation-oriented submissions have highlighted the need to preserve localized sites of conservation significance including those containing rare or endangered species of plants and animals.

Recreationists have also featured strongly in submissions received by the Council, with the nature of submissions varying with the suitability of study areas for different activities. In the Alpine area and South-western area, District 2, for example, many submissions came from bushwalkers calling for new national parks, but many others from four-wheel-drive enthusiasts who were opposed to national parks because they believed their activities would be restricted. Hunters too have sent large numbers of submissions in areas where hunting is a popular activity, such as the Gippsland Lakes Hinterland, Alpine, and Murray Valley areas.

Agricultural interests have expressed a variety of concerns in their submissions. Where grazing of public land makes an important contribution to agricultural enterprises, a considerable response came from those affected. This applied particularly in the Alpine area, where the mountain cattlemen feared the loss of their high-country grazing runs, and in the Mallee, where large areas of public land are used for agriculture under leases and licences. Where large national parks were proposed, such as in the South-western District 2 and Wimmera areas, adjoining landholders and rural fire brigades expressed concern about fire protection. Applications to purchase public land were also received from agricultural interests in most study areas, especially in those such as the Mallee, where sizeable tracts of public land were already being used primarily for agriculture.

In study areas where the timber industry made an important contribution to the regional economy, such as the Alpine and East Gippsland areas, many submissions were received from sawmill companies and employees, and from other people dependent on the timber industry.

As well as the general themes discussed above, submissions often reflected local issues peculiar to a particular study area. A good example of this occurred in the North Central area, where two of the major issues raised in submissions were the availability of public land for gold prospecting and fossicking, and for eucalyptus oil production.

Sectors that the Land Conservation Council process has not reached

The Melbourne University analysis indicated that in the earlier studies by the Council both employers and employees in the timber industry seemed to record low submission numbers. Recent reviews of the Alpine and East Gippsland areas, however, have seen a great increase in the number of submissions from this sector. This is probably due to increased efforts to publicize the Land Conservation Council process through public meetings, better advertising, and to an increased awareness on the part of the timber industry as to

the importance of the submission process. Numbers would also be influenced by the significance of the industry in the study areas.

Females were also under-represented - possibly because many of the industries and recreational pastimes pursued on public land are male-dominated. Among pro-conservation submissions, however, women were better represented.

Occasionally people in remote locations - for example, landholders adjoining proposed conservation reserves - are not aware of Land Conservation Council investigations until after final recommendations have been published. While it would be impossible to achieve 100% coverage, more comprehensive advertising would achieve an improvement.

Evaluation of the Council's Public Consultation Process

As stated previously, the aims of incorporating public consultation in the Land Conservation Council's procedures were: to give the public a chance to be involved in the decision-making process; and to improve the quality of this process by eliciting information and ideas that would not otherwise be available.

Public involvement

One measure of success in involving the public in the Land Conservation Council's process may be the number of submissions received. The number of first- and second-round submissions received by the Council for each of its investigations is listed in Table 9.

As the table shows, the Council has received a total of 41 400 public submissions since its inception. On average, it has received about 350 responses during the first period for public consultation of each investigation and 1190 during the second. The latter figure was greatly inflated by the extraordinary public reaction during the second round of submissions for the Alpine area, which elicited 14 013 submissions. If this 'bulge' is removed, the second-round submissions average about 690 for each investigation.

These figures are remarkably high compared with public responses obtained during similar investigations undertaken by other government authorities in recent years. The Upper Yarra Valley and Dandenong Ranges Authority, for instance, received 287 submissions over a 5-month period during the preparation of its Regional Strategy Plan. This was a rural land use planning document covering a sizeable area and therefore analogous to a Land Conservation Council investigation.

Environment effects statements on proposed developments, which are also followed by periods for public submissions, have had varied success in drawing public interest. Some major projects that might have been expected to draw large public responses received comparatively few submissions.

Table 9

WRITTEN SUBMISSIONS

Investigation area	First submission period	Second submission period
South-western, District 1	151	91
South Gippsland, District 1	119	58
North-eastern, District 1	100	44
North-eastern, District 2	98	45
Melbourne	408	1 014
East Gippsland	456	328
North-eastern, Districts 3,4, & 5	241	136
Mallee	368	582
Corangamite	178	220
Alpine	1 538	14 013
North Central	288	1 198
Ballarat	155	80
South-western, District 2	343	1 546
South Gippsland, District 2	282	290
Gippsland Lakes Hinterland	211	345
Murray Valley	278	471
Wimmera	117	139
Mallee	191	N/A
Reviews		
South-western, District 1	55	55
North-eastern (Benalla-Upper Murray)	65	65
Melbourne, District 1	99	235
East Gippsland	1 942	4 807
Special investigations		
Stradbroke	68	38
Gellions Run	267	57
Ovens Softwood Plantation Zone	371	1 946
Hill End	36	26
Alpine	1 090	4 152
Latrobe Valley	51	44
Totals:	9 375	32 025

The proposal for a radioactive-waste store at Dutson Downs, for example, drew 63 submissions, while the Port Melbourne bayside redevelopment scheme drew only 60. On the other hand, projects that are essentially small-scale and local, but provoke a great deal of localized opposition, may attract a much larger number. This occurred with the Sorrento Marina proposal (563 submissions) and a proposed quarry-filling development at Niddrie (550). In general one could say that the numbers of submissions received during the Land Conservation Council's investigations compare more than favourably with those received by other government authorities undertaking public consultation.

The number of submissions received may reflect public opinion on an issue, but it is sometimes difficult to assess whether this is spontaneous or the result of organized activities by interest groups. In the Alpine, North Central, and Murray Valley investigations, for instance, more than half of the second submissions were *pro formas* signed by the correspondent, rather than submissions written in the correspondent's own words. Recreation groups in particular have often used this method in response to the Council's public consultation process.

Another method of measuring the success of attracting public involvement is to see whether people who would be expected to have an interest in Land Conservation Council investigations do in fact respond to calls for submissions. The likely 'target audience' for Council studies would comprise conservation organizations and conservation-minded individuals, recreation organizations and individual participants in recreational activities, the timber industry and its employees, the mining industry, people who use public land for grazing or bee-keeping, landholders whose properties adjoin public land, local government, and State government departments and authorities. All of these sectors were well represented among those tendering submissions to the Council.

Success could also be measured by the changes that have been made between proposed and final recommendations as a result of public response following the release of the former. In several cases the Council has made major changes to its recommendations after receiving new information, and in part in response to strong reaction to its proposals. The two examples that follow demonstrate the Council's sensitivity to public feelings and desires, as expressed in submissions.

The Council's proposed recommendations for the Alpine area, released in 1978, favoured including most of the public land in a multiple-use Alpine Reserve that would be zoned for a variety of uses. Public reaction against this proposal was very strong and more than 14 000 submissions were received. Many people believed that the area should be divided into national parks, hardwood-production areas, recreation areas, and so on, as had occurred in previous Council recommendations. In making its final recommendations, the Council abandoned the concept of a zoned Alpine Reserve.

Similarly, in the investigation of the South-western Area, District 2, the Council initially proposed that only part of the Grampians become a national park. This resulted in a strong response from conservationists in the second submissions. The Council subsequently included nearly all of the Grampians in the national park in its final recommendations.

Provision of extra information and ideas

The second major aim of the Council's public consultation process has been to elicit information and ideas that would not otherwise be available. During an investigation, the Council's staff gather as much information as possible on the study area, both by using written texts and information held by government departments and by talking to government

experts and other individuals and organizations with local knowledge.

Given the size of study areas and the limitations on time and staff numbers, however, the compilation of information about an area cannot hope to be complete. Public submissions can provide a valuable supplement to the Council's knowledge of a study area. In many instances, public involvement has provided new knowledge or insights into an area of public land. Data include the location of rare plants or animals, the identification of archaeological or historic sites, the significance of an area to local communities, and previously unknown uses of specified areas.

Cost of public consultation

If the Land Conservation Council's investigation process did not include a public consultation phase, the publication of the descriptive report would be followed by a period in which the Council would examine the information available for the area and formulate its final recommendations without a proposed recommendations stage. Thus the cost of the public participation process could be estimated to be the costs of processing and analysing two rounds of submissions, plus those of preparing, printing, advertising, and processing one set of recommendations.

For a recent investigation this total has been estimated at about $100 000.

Comparison with other consultation processes

Proposed planning schemes are placed on exhibition at the offices of local councils, relevant regional authorities and the Ministry for Planning and Environment. Notice of the exhibition is advertised in the *Government Gazette* and in an appropriate newspaper. It may also be announced on a community notice-board and is sent to affected individuals or organizations. Anybody who wishes to submit comments for or against the proposed planning scheme may then do so. Major planning schemes usually have an exhibition period of 3 months. After this, submissions are examined by the planning authority and the Ministry for Planning and Environment, as a result of which the authority may modify the scheme.

The advantage of exhibitions is that they provide the opportunity for visual displays that can be used to enhance the understanding and interest of the public. Their major disadvantage, however, is that they do not provide multiple copies of printed documents and maps that people can examine at their leisure.

Planning schemes have only one submission period, but, where complex issues are involved, it is often longer than those of the Land Conservation Council. This gives people time to make more detailed or better-researched submissions. However, having two submission periods separated by some time provides a second chance to alert some people who did not hear about the investigation initially while allowing an airing of initial reactions. With planning schemes a second

public viewing is sometimes provided for, revised schemes being exhibited again where alterations are sufficiently important.

The Timber Industry Inquiry, which completed its report in 1985, conducted a lengthy series of formal hearings in different parts of the State; as well as recording of the evidence that was presented, those giving evidence were questioned by the Board of Inquiry. Formal hearings - also used by Parliamentary Committees of Inquiry - have the disadvantage that members of the public may feel intimidated by them. Forbiddingly legalistic proceedings in a formal atmosphere and the attitudes of members of certain tribunals may discourage participation.

Significantly, when it developed its Timber Industry Strategy following the release of the Report of the Timber Industry Inquiry, the government allowed for two periods for written submissions, rather than formal hearings, before the Strategy was finalized.

Issues

The Land Conservation Council's public participation process has operated successfully in that it has attracted relatively large numbers of public submissions, has attracted responses from the groups and individuals who would be expected to show interest in public land use, has provided the Council with additional information and ideas, and has influenced the Council's final decisions. Even so, amendments to the Council's public consultation process may be considered. These include:

* exhibitions, using visual displays, to enhance public awareness (note that this was carried out for the East Gippsland Area Review)

* further use of public meetings and personal consultation within the study area under investigation

* preparation of a report on the results of each consultation period, classifying submissions and indicating action resulting, and perhaps included with each of the published proposed and final recommendations

* establishment of informal but structured hearings for verbal submissions, perhaps with a committee of Council

* extension of the length of submission periods to allow voluntary groups and individuals time to make better-researched submissions

* advance notice of report publication, for the above reason

All these methods would add appreciably to the cost and duration of studies, either directly or by diversion of staff from other duties. Provided the existing procedure is effective, they need not be adopted, unless they suit specific

circumstances. Should new methods of consultation be adopted, the Act may need to be amended accordingly.

References

Chamberlain, N. (1986). 'An Investigation of the Effectiveness of the Written Submission Process as part of the Council's Consultation Process'. Unpublished draft report.

Sandercock, L. (1975). 'Public Participation in Planning'. Unpublished report for the Monarto Development Commission.

6. PUBLIC LAND CLASSIFICATION

Before the inception of the Land Conservation Council, the assignment of public land to particular uses had been the function of a number of land management agencies. In many cases the decisions were biased towards specific productive uses, with little environmental data by which to measure and assess their impact.

The criteria outlined below demonstrate the concern being progressively felt for nature conservation, and uses and values other than those of exploitation. Section 5(2) of the *Land Conservation Act* 1970 stipulates that:

> 'In making any recommendation the Council shall have regard to the present and future needs of the people of Victoria in relation to -
>
> (a) the preservation of areas which are ecologically significant
>
> (b) the conservation of areas of natural interest, beauty or of historical interest
>
> (c) the creation and preservation of areas of reserved forest
>
> (d) the creation and preservation of areas for national parks
>
> (e) the creation and preservation of areas for leisure and recreation, and in particular of areas close to cities and towns for bushland recreation reserves
>
> (f) the creation and preservation of reserves for the conservation of fish and wildlife
>
> (g) the preservation of species of native plants, and
>
> (h) land required by government departments and public authorities in order to carry out their functions'

This section forms the basis on which the Council began the development of a land classification system of conservation/land use reserves, which has evolved over the years into the system it uses in all its considerations and recommendations today.

The Council's public land classification system

In accordance with the requirements of the Act, the Council adopted the basic approach of assigning public land components into a series of particular categories, as determined by proposed use or purpose. Further, it recommends secure reservation of most categories, in order to protect their

values. It has used a total of 48 different land use categories in its recommendations and these are listed the left-hand column of Table 10. Appendix I contains the standard wording for each category.

Table 10

PUBLIC LAND USE CATEGORIES

Present categories	Proposed classification
Reference area	Reference area
National park	National park
State park	State park
Wilderness area	Wilderness
Regional park	Regional park
Multi-purpose park	Regional park
Coastal park	Regional park
Marine reserve	Nature conservation reserve
Marine and wildlife reserve	Marine park
Gippsland Lakes reserve	Natural features reserve
Wildlife reserves	Natural features reserve
Wildlife co-operative management area	Natural features reserve
Flora reserve	Nature conservation reserve
Flora and fauna reserve	Nature conservation reserve
Natural features and scenic reserve	Natural features reserve
Water production	Water production
Water supply regulation and drainage	Water production
Education area	Education reserve
Historic area	Historic reserve
Historic reserve	Historic reserve
Coastal reserve	Regional park
Scenic coast	(No equivalent)
Public land water frontage reserve	Natural features reserve
Streamside reserve	Natural features reserve
River Murray reserve	Natural features reserve
Geological reserve (or Monument)	Natural features reserve
Cave reserve	Nature conservation reserve
Bushland reserve	Natural features reserve
Scenic reserve	Natural features reserve
Lake reserve	Natural features reserve
Roadside conservation	Natural features reserve
Highway park	Regional park
Recreation reserves	Community use reserve
Alpine resort	Alpine resort
Hardwood (timber) production	State forest
State forest	State forest
Eucalyptus oil production	State forest
Softwood production	Forest plantation reserve
Forest area	State forest
Minerals and stone	Public utility reserve
Coal production	Public utility reserve
Hydroelectricity production	Public utility reserve
Agriculture	(Government land)
Utilities and survey	Public utilities reserve
Township land	Uncategorized public land
Uncommitted land	State forest
Other reserves and public land	Uncategorized public land
Revegetation areas	Uncategorized public land

The Council has developed a system of conservation reserves that all include, as a major aim of management, the protection and enhancement of natural systems. Each type of reserve within this system, however, differs from the others in terms of its extent or the uses to which it may be put. National and State parks, for example, have similar basic characteristics and uses: their differences lie mainly in their relative sizes, the diversity of landforms within them, and the absence of major features of national significance from State parks. Reference areas are also conservation reserves, but, whereas an important use of parks is recreation, access to reference areas is restricted to non-manipulative scientific investigation.

Table 11 shows a suggested combination of the 48 types of reservation recommended by the Council into 17 category groups, with similar objects. Each individual type of reservation, however, has a specific purpose and has been separately recommended by the Council. The seventh group on the table (natural features reserve), for example, includes bushland reserves (remnant stands of trees in an otherwise agriculturally dominated landscape), scenic reserves (scenic features, lookouts, and other outstanding features of the landscape), geological reserves, cave reserves, and scenic coasts. The right-hand column in Table 10 shows the simplified system of classification, with equivalent present categories.

The Department of Conservation, Forests and Lands is at present drafting a new Lands Bill to facilitate the management and reservation of public lands in the State, in order to accommodate the integration of the various Acts that preceded the amalgamation of the public land management authorities. A draft of the Lands Bill, released for public comment, includes a series of categories of public land.

The groupings in Table 10 are similar to, but differ in some details from the public land categories in the draft Lands Bill. Major differences include the identification of reference areas and education areas as separate categories and appropriate descriptions of national parks, State parks, and wilderness. The Council also recommends that certain areas be made available for agriculture and that such land be alienated. In these cases, it is expected that the Lands legislation would classify them as 'Goverment land'. Therefore, such areas would not appear in the public land categories listed in Table 10.

The order of the categories in Table 10, from reference areas to utilities, demonstrates the range of provisions for the protection of the natural environment that the Council has incorporated in its recommendations. The large number of land categories also reflects the evolution of the Council's classification system in accommodating the diversity of environments and land uses across the State.

Land use planning entails protecting known values and allocating resources to satisfy known or predicted needs. However, some changes in society's needs cannot be foreseen and the resources inventory will change as further studies

are made and as investigation and technology progress. Provision for future demands is made by placing land under flexible forms of use - ones that do not affect natural ecosystems detrimentally - and by retaining as much land as possible in an uncommitted state.

For most of the regions studied the Council classified such areas as uncommitted land, the aim of management being to keep them in a condition that would leave the maximum number of options for future use. In practice, uncommitted land has been managed and used similarly to areas set aside for timber production. The Council's recent recommendations have included within a single land use category - 'State forest' - all those areas that would previously have been set aside under the separate categories of hardwood production and uncommitted land.

The individual categories reflect variations in the intensity and type of use. However, each depends on the others in providing for community requirements to protect natural systems, to promote recreation, and to provide extractable and renewable resources.

Other systems of classification and reservation

Council recognizes that the present 48-category system is complex. Tables 10 and 11 show one simplified classification system, and others are discussed below.

The *National Parks Act* 1975 contains three schedules and schedules 2 and 3 list 'national parks' and 'other parks' respectively that are protected by the Act. New areas are added to the appropriate schedule when amending legislation is introduced and passed in State Parliament. The schedules are published in each year's annual report of the National Parks and Wildlife Division, Department of Conservation, Forests and Lands.

The schedule to the *National Parks Act* 1970 as enacted listed 23 such parks. In the 1975 consolidation and amendment to the Act, all of these, plus the Organ Pipes and Brisbane Ranges, were scheduled as national parks without reference to the system of classification that the Land Conservation Council had established by then (North-eastern Area, District 1, Final Recommendations, November 1973). In 1975 Victoria's 'national parks' therefore ranged in size from 36 ha (Bulga) to 565 sq.km (Wyperfeld).

Several of the smaller national parks, established before the Council had developed its comprehensive public land classification system, would have been more appropriately classified as other types of reserve depending upon their inherent characteristics. These include Morwell, Mount Richmond, and Tarra--Bulga. Their current designation devalues the true concept of a national park.

There may be a need to review the national park schedules so that only areas with national park values are retained on schedule 2, separating them from, for example, State parks, wilderness, and other parks. The transfer of some existing

national parks from schedule 2 to schedule 3 would in no way lessen the protection afforded to them; an Act of Parliament would still be required to revoke any park. However, successive State governments have been reluctant to remove small parks from schedule 2 of the *National Parks Act*.

Concern expressed in many submissions to Council about proposals to remove long-standing items from schedule 2 caused the Council, in the cases of Lind and Alfred National Parks, to continue to identify these as national parks (East Gippsland area, Final Recommendations 1986) despite the fact that they do not meet the Council's policy requirements for this type of reservation.

The introduction of the third schedule to the *National Parks Act* 1975 permitted the reservation under the Act of areas that are not national parks. Except for the Langwarrin Flora and Fauna Reserve, the areas listed in schedule 3 are classified as parks to enable them to be managed within the provisions of the Act. By this means, the management policies for these areas reflect the policies and uses set down by the Council in recommending reservations.

Amendments to the *Forests Act* 1958 provide for the setting aside and declaration (under section 50) of areas for the uses listed in Council recommendations. To this extent the *Forests Act* recognizes the Council's land use categories. Section 50, however, is relatively temporary as it does not provide security for reserves; revocation may be carried out by Order-in-Council. Council's recommendations other than for national parks have therefore usually specified permanent reservation under the *Crown Land (Reserves) Act* 1978, which can only be revoked by an Act of Parliament. Section 4 of the *Crown Land (Reserves) Act* sets out the various classes of land that may be reserved under the Act and these accommodate all the categories listed by the Council.

The categories contained in the draft Lands Bill have been mentioned previously.

IUCN classification of conservation reserves

In 1978 the International Union for the Conservation of Nature and Natural Resources (IUCN) listed the following eight categories of reserve under which the protection of conservation values could be achieved, a full description of each being listed in Appendix II:

I Scientific Reserves/Strict Nature Reserves

II National Parks/Provincial Parks

III Natural Monuments/Natural Landmarks

IV Nature Conservation Reserves/Managed Nature Reserves/ Wildlife Sanctuaries

V Protected Landscapes

VI Resource Reserves

VII Anthropological Reserves/Natural Biotic Areas

VIII Multiple Use Management Areas/Managed Resource Area

The criteria for the selection of the Category I reserves are similar to those used by the Land Conservation Council in setting aside Reference Areas.

For national parks to be included on the United Nations List of National Parks and Protected Areas, the IUCN previously specified a minimum surface area of at least 1000 ha free of zones modified for administrative or tourism purposes or used for exploitation of natural resources on a continuing basis.

Under these criteria, many of the 'national' parks on the schedule to the *National Parks Act*, including some recommended by the Council, would be excluded from the United Nations listing because of size or of continuing activities such as grazing. Nevertheless, interpretation of the criteria could permit listing of core zones that are free of such activities in some of the parks. Many of Victoria's national parks, and indeed State parks, fulfill the IUCN physical category II definition of:

> '... a relatively large area where one or several ecosystems are not materially altered by human exploitation and occupation, where plant and animal species, geomorphological sites and habitats are of special scientific, educative, and recreative interest or which contains a natural landscape of great beauty'.

An article in 1985 in the Victorian National Parks Association (VNPA) newsletter, *Parkwatch*, adopted part of this IUCN categorization in a proposal to bring all conservation reserves in the State into a simplified three-category system and place them under the aegis of the *National Parks Act* 1975.

The proposal acknowledges the strict criteria for the selection of the IUCN Nature Reserves (Reference Areas) and National Parks, but would place in a third category - 'conservation park' - all remaining reserves that provide in some way for the protection of a feature of the natural environment. This proposal does not accord with the Council's public land classification system in that it does not recognize the wide range of recreational or exploitive uses to which the reserves may be put, nor the hierarchy of provisions for conservation accommodated in the existing system in Victoria.

Australian categories for conservation reserves

The Australian Council of Nature Conservation Ministers (CONCOM) in 1985 released a report entitled 'Identification and Management of Wilderness Areas in Australia', with a view to developing a consistent approach to this matter.

The report proposed the criteria for the identification and evaluation of land having wilderness area potential as:

'...a large area, preferably in excess of 25 000 ha, where visitors may experience remoteness from roads and other man-made facilities', and

'... with minimal evidence of alteration by people'.

This report recognizes, as does the Land Conservation Council, that wilderness areas are a recreational resource, and that protection and conservation of the natural environment are integral to the protection of wilderness values. The issue is further discussed in the recreation chapter.

In 1986 CONCOM received for discussion a paper prepared by the Australian National Parks and Wildlife Service (ANPWS) concerning the Service's program to prepare a National Index of Ecosystems in Australia. The Service envisages the long-term outcome of the Index to be the co-operative establishment of a comprehensive system of reserves throughout Australia that would include all major ecosystem types. This endeavour by the ANPWS parallels the policy of the Council to provide representation of the major land types of the State within the system of nature conservation reserves.

In its *Occasional Paper* No.12, 1986, the Service listed by each State and territory of Australia the numbers of nature conservation reserves set aside at that time. The inventory is incomplete, inasmuch as for Victoria it only records those nature conservation reserves or schedules to the *National Parks Act* 1975, and State Wildlife Reserves. Furthermore, certain conservation reserves included private lands. This document does provide, however, a ready comparison of the definitions and nature of conservation reserves across Australia, and places those in Victoria in context. Appendices III and IV list each reserve type and attempts to provide an interstate comparison.

Issues

The large number of different types of reservations recommended by the Council reflects the development of Council's policies over time to meet the various issues that were raised in different parts of the State. A number of suggestions for rationalization or modification of Victoria's public land classification system have been made. These have included:

* reduction of the number of categories of parks and reserves, so as to achieve a degree of uniformity with classifications in other Australian States

* modification of Council recommendations so as to conform with IUCN definitions of conservation reserves

* grouping of Council recommendations into like-use categories such as those shown in Tables 10 and 11

It may be appropriate also to review the schedules of the *National Parks Act* 1975 so these better reflect the hierarchy of parks according to their values and size.

The classification system developed by the Council is not well understood by the general community and knowledge of the State-wide representation in various reserves is also very limited. Ways of overcoming these problems require further attention.

Table 11

SIMPLIFIED PUBLIC LAND CATEGORIES

Description	Objects
1. *Reference area*	
A substantially undisturbed tract of land containing representations of major land systems in the State	protection of natural ecosystems for use as scientific references restricted use for non-manipulative scientific investigation
2. National park	
A substantial tract of land of nation-wide significance because of its outstanding natural environments and features, scenic scenic landscapes, and diverse land types	protection and conservation of native flora, fauna, and natural features and the protection of sites of archaeological and historical significance supply of water and protection of catchments recreation and education associated with the enjoyment and understanding of, and compatible with protection of, the natural environment limited areas of development for more-intensive recreation
3. State park	
A tract of land containing natural environments and features, scenic landscapes, and one or more land types complementing those found in national parks to provide a system representing the major land types of the State	protection and conservation of native flora, fauna, and natural features and the protection of sites of archaeological and historical significance *supply of water and protection of catchments* recreation and education associated with the enjoyment and understanding of, and compatible with protection of, the natural environment limited areas of development for more-intensive recreation
4. Nature reserve	
An area of land and/or water of particular importance because of its significant floral or faunal values or natural habitat	protection of species of communities of native plants and animals education, scientific study, and limited informal recreation compatible with that protection
5. Wilderness area	
An extensive tract of relatively undisturbed land and/or water offering opportunities for isolated non-mechanized recreation in a challenging natural environment	solitude, and unconfined and challenging forms of non-mechanical recreation in controlled numbers protection and conservation of the natural environment

Table 11 (continued)

Description	Objects
6. Marine park	
An area of coastal, intertidal, or subtidal land that, because of its nature or the nature of the waters that cover it or because of its natural environment, is of conservation or scientific significance	protection and conservation of native flora, fauna, natural features, and sites of archaeological or historical importance diverse recreation and education associated with the enjoyment and understanding of natural environments compatible with the protection of park values development of selected areas for more-intensive recreation controlled commercial utilization of natural resources in marine parks
7. Natural features reserve	
An area of land containing important elements of the natural environment, landscape, and/or geological or geomorphological features that are of scenic or conservation significance	protection and maintenance of the identified landscape and/or other values recreation and education where appropriate and where compatible with the above controlled low-intensity exploitation of natural resources compatible with both the above
8. Education reserve	
An area of land containing a diversity of land types capable of providing for a range of educational experiences and having safe access	provision of opportunities for students to compare and study the nature and functioning of natural ecosystems and to conduct field analysis and manipulative experiments maintain the integrity of the ecosystem so far as is compatible with the above
9. Historic reserve	
An area of land containing significant relics and/or artefacts of historical or cultural importance	protection and maintenance of identified historical relics and artefacts recreation and education associated with the understanding of the history of the region, compatible with the above limited exploitation of natural resources compatible with both the above
10. Regional park	
A tract of land containing indigenous or non-indigenous vegetation readily accessible from urban centres or major tourist routes and capable of providing opportunities for informal recreation for large numbers of people	recreation for large numbers of people associated with enjoyment of the natural surroundings protection and conservation of native flora, fauna, and natural features compatible with the above limited exploitation of natural resources in specified areas and where compatible with both the above
11. Water production	
An area of land in the catchment of or adjacent to a water supply storage or offtake	protection of the water supply and the operation of the water supply system

Table 11 (continued)

Description	Objects
11. Water production (continued)	
	restriction of access to protect water quality
	conservation of the natural environment, landscape, and features of cultural significance where compatible with the first object
12. Community use reserve	
Land appropriate or developed for particular community use	to promote appropriate use of the land by the community
	to provide facilities for community use of the land
	to provide means of access by the general public where compatible with the first management object
	to conserve the landscape, the natural environment and features of cultural significance where compatible with the first two management objects
13. State forest	
An extensive area of land supporting native forests and other native vegetation and containing a mosaic of land types, diverse conservation and recreation values, and a range of resources needed to supply community demands	provision of timber and other forest products on a sustainable-yield basis
	supply of water and protection of catchments.
	protection and conservation of native flora and fauna, landscape, and other natural values, and archaeological and historical values
	provide opportunities for public recreation and education and other public services
14. Coastal waters of Victoria	
An area of intertidal and subtidal land within the jurisdiction of the State of Victoria but not described in any other category	to protect the natural environment and features of cultural significance
	to provide for the controlled exploitation of natural resources including wildlife and fish
	to allow for aquaculture activities
	to provide for the use of land for a diverse range of recreational and educational purposes
	to provide for the necessary navigational and safety aids and associated facilities for boating and fishing
15. Alpine resort	
An area of land described in an Order of the Governor-in-Council for the time being in force under Section 19(1) of the Alpine Resorts Act 1983	to use the land, or to promote its use, for establishment and development of alpine resorts, having regard to environment and ecological factors and the safety of the public in such a way as to encourage the use of the land in all seasons of the year
	to provide for: * the orderly establishment of alpine resorts, the orderly continuation of existing alpine resorts, and their orderly continuation and development

Table 11 (continued)

Description	Objects
15. Alpine resort (continued)	
	* a range of accommodation facilities and services for tourists of a kind that will encourage people, whatever their income, to use and enjoy alpine resorts
	* for facilities and services for persons who live or work in alpine resorts
16. Forest plantation reserve	
An area of land supporting a man-made softwood or hardwood forest plantation	to promote the production and utilization of public land produce and the use of intensive silvicultural techniques
	to provide other goods and services compatible with that
	to allow for the use of land for a diverse range of purposes, including recreation and education activities and the taking of wildlife and fish
17. Public utility reserve	
Land appropriate or developed for use for public utilities	to provide for the provision of the public utility for which the land is to be used
	to protect any area of land minimally affected by the carrying out of activity under the above, and the preservation and conservation of the landscape and natural environment of that area
	to provide for the controlled exploitation of natural resources, including wildlife and fish, where compatible with those management objects
18. Uncategorized public land	
Land not included in any of the above categories	to conserve the landscape and the natural environment
	to provide for limited exploitation of natural resources compatible with that
	such other objects as are prescribed

Part III
USES AND VALUES OF PUBLIC LAND

7. STATUS OF PUBLIC LAND USE

When final recommendations for a study area are published, the Land Conservation Council presents them to the Minister for Planning and Environment for consideration by the government. Copies are also tabled in both Houses of Parliament.

Following consideration of the recommendations, the Minister formally notifies affected government agencies of his intention to accept them - either as presented or, in some instances, as varied by the government. At least 14 days after this notification, the Governor-in-Council may direct government bodies to implement those recommendations that affect land for which they have management responsibility. Once such Orders in Council are signed, recommendations become government-approved land uses.

Government-approved Uses

Table 12 below shows the main land use categories recommended by the Land Conservation Council and the areas of public land in each. It includes recommendations for the Council's 17 areas or districts, special investigations required by the government, and reviews by Council. It also reflects amendments that the government has made to the Council's recommendations. Figure 6 illustrates the relative proportions of the major reserve recommendations, and groups the smaller ones.

Since 1971, the Council has made some 5480 recommendations, of which 5270 have been subject to government decision. Of these, 98% - that is, all but 127 - have been accepted for implementation by the relevant agencies. Another 82 recommendations have been varied in some way by the government prior to their acceptance. The remaining 210 are currently under consideration, and relate to the Council's Melbourne Area District 1 Review and the Latrobe Valley Special Investigation.

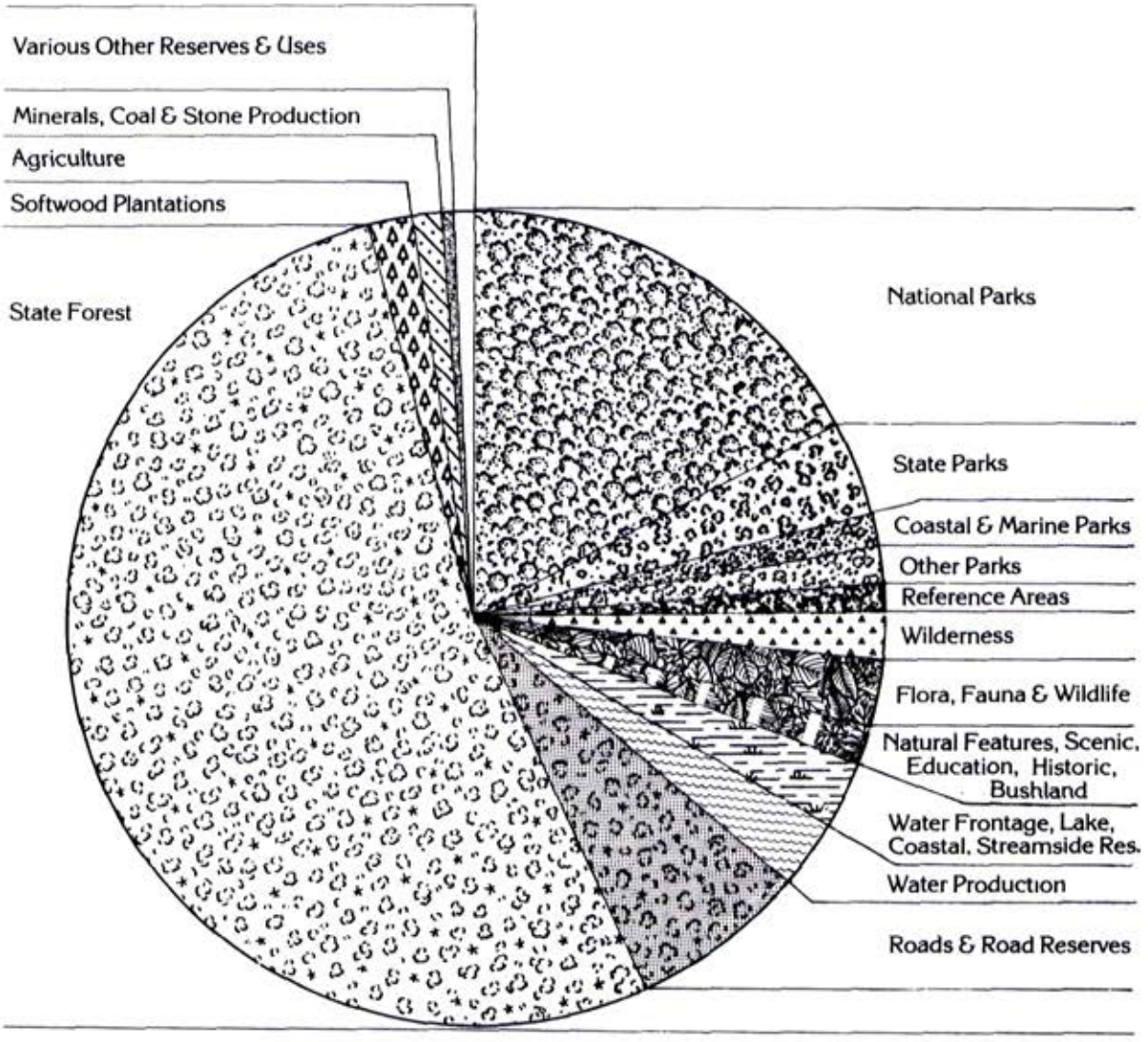
That the vast majority of recommendations for public land use made by the Council have been accepted by the government of the day is illustrated in Table 13. Of those that were not accepted, most were contrary to revised government policy, while others were related to special circumstances arising after the publication of final recommendations.

For example, both the Hill End and Ovens Special Investigations were initiated by a Liberal Government to recommend whether or not more public land could be designated for softwood planting, and to identify appropriate areas. However, the Council's final recommendations were not accepted by the subsequent Labor Government, as clearing of native vegetation for softwood planting was contrary to the new government's policy. In the Alpine Special Investigation,

FIGURE: 6

PUBLIC LAND USE

RECOMMENDATIONS OF COUNCIL APPROVED BY THE GOVERNMENT



certain recommendations relating to mining were amended to conform with government policy.

Also, in some instances special circumstances have arisen that have caused the government to defer implementation of Council's recommendations. In the North-eastern area, District 2, two were deferred because the land was in part required for the planned construction of the Hume Freeway. In the Melbourne area, a recommended education area was not accepted because it was to be partly inundated following a decision to construct the Blue Rock dam.

Table 12

GOVERNMENT-APPROVED PUBLIC LAND USE*

Land use category	Area (ha)	Percentage	
		State	Public land
National parks[1]	1 434 470	6.3	17.2
State parks	316 980	1.4	3.8
Regional parks	73 670	0.3	0.9
Coastal parks[2]	52 800	0.2	0.6
Marine parks	56 460	0.2	0.7
Multi-purpose parks	46 870	0.2	0.6
Reference areas	84 460	0.4	1.0
Wilderness	152 700	0.7	1.8
Flora and flora and fauna reserves	89 260	0.4	1.1
Wildlife reserves[3]	137 650	0.5	1.6
Natural features and scenic reserves[4]	35 920	0.2	0.4
Bushland reserves	35 240	0.2	0.4
Education areas	18 160	0.1	0.2
Historic areas and reserves	41 370	0.2	0.5
Public land water frontage reserves	92 930(E)	0.4	1.1
Streamside reserves[5]	18 300	0.1	0.2
Lake reserves	97 710	0.4	1.2
Coastal reserves	6 270	<0.1	0.1
Water production	218 000	1.0	2.6
Recreation reserves[6]	27 370(E)	0.1	0.3
Road reserves	567 400(E)	2.5	6.8
Highway parks	500	<0.1	<0.1
State forest[7]	4 416 000	19.5	52.8
Softwoods[8]	153 500	0.7	1.8
Agriculture	96 500	0.4	1.2
Minerals, coal and stone production	40 800	0.2	0.5
Utilities and services[9]	33 700	0.1	0.4
Township land	4 700(E)	<0.1	<0.1
Other reserves and public land[10]	10 750(E)	<0.1	0.1
Total		36.7%	100.0%

* The table covers all study areas. Special investigations and reviews have been incorporated. It reflects recommended uses approved by the government together with government variations, and the Council's final recommendations as at 31 May, 1988 where these are yet to be considered by the government. It does not reflect actual reservations or current listings in the *National Parks Act* 1975. Figures are rounded, and those marked (E) are estimated.

Notes:

1. The park categories reflect the Council's final recommendations, except that the Lakes National Park is included, although not recommended by the Council. The Alpine Park system as recommended by the Council is also included under the category of national parks.

2. Includes Gippsland Lakes reserve.

3. Includes Wildlife Management Co-operative Areas.

4. Includes cave and geological reserves.

5. Includes River Murray Reserve.

6. Includes alpine resorts.

7. The Council has recommended that in future uncommitted land and reserved forest, (except that used for softwood production), be reserved as a single land use category known as State forest. This also includes forest areas around softwoods, and areas for production of eucalyptus oil.

8. Gross area, of which a net area of 107 240 ha has been planted or recommended to be planted, plus 15 250 ha (gross) of leasehold. The Council has indicated a further 23 000 ha net of uncommitted land could be used, should the government decide further areas of forested public land were required.

9. Includes State Transport Authority land and public land used for sewage disposal at Werribee and Dutson Downs, and small service and utility areas. Other areas used exclusively by utilities, for example, State Electricity Commission, Gas and Fuel Corporation, have not been included.

10. Includes revegetation areas.

A further instance where the government of the day altered or did not accept Council's recommendations followed the first study of the Alpine area. Here, the recommended phase-out period for grazing was extended in some places and further areas in recommended national parks were allocated for once-only logging. This occurred as a result of strong representations to the government by grazing and timber interests.

Table 13

GOVERNMENT ACCEPTANCE OF LAND CONSERVATION COUNCIL RECOMMENDATIONS

Investigation area and year of acceptance	Number of recommendations		
	Total	Varied*	Deferred/ rejected
South-western, District 1 (1974)	62	-	-
South Gippsland, District 1 (1975)	29	-	-
North-eastern, District 1 (1974)	41	-	-
North-eastern, District 2 (1977)	57	-	2
Melbourne (1979)	540	33	36
East Gippsland (1979)	96	1	3
North-eastern, Districts 3, 4 and 5 (1979)	165	-	-
Mallee (1979)	579	5	-
Corangamite (1979)	300	4	3
Alpine (1980)	160	12	6
North Central (1982)	612	6	-
Ballarat (1983)	293	-	-
South-western, District 2 (1983)	382	1	-
South Gippsland, District 2 (1984)	200	-	6
Gippsland Lakes Hinterland (1984)	172	-	-
Murray Valley (1986)	429	2	1
Wimmera (1987)	559	1	-
<u>Reviews</u>			
South-western, District 1 (1984)	119	-	-
North-eastern (Benalla-Upper Murray) (1987) (Districts 1, 2 and 4)	267	1	-
East Gippsland (1987)	87	8	1
Melbourne, District 1*	110	-	-
<u>Special investigations</u>			
Stradbroke (1979)	8	-	-
Gellions Run (1982)	2	-	-
Ovens Softwood Plantation Zone (1982)	56	-	56
Alpine (1985)	40	8	-
Hill End (1984)	16	-	13
Latrobe Valley*	99	-	-
Total	5480	82	127

* currently being considered

Implementation of Approved Recommendations

Once Land Conservation Council recommendations are approved by the government, Orders in Council are forwarded to government departments and agencies directing them to implement those that affect land for which they have management responsibility.

The Council has generally recommended that land be reserved in conformity with its accepted use, requiring administrative implementation. In addition, the pressures on particular areas of land require that resources also be provided for management. These separate aspects of implementation of Council's recommendations are discussed below.

Administrative implementation

Most recommendations made by the Council require some form of administrative implementation. This may involve legislation, as with the proclamation of parks under the *National Parks Act* 1975. Temporary or permanent reservation, usually under the *Crown Land (Reserves) Act* 1978 may be required in other cases. For reference areas and wildlife management cooperative areas, implementation of the recommendation is effected through proclamation under specific statutes, rather than reservation. Where Council's recommendation endorses the existing land tenure of an area, there is no requirement for an administrative process.

Each administrative process involves some element of delay, and departments are provided with finite resources to achieve work programs including implementation of approved recommendations. By far the greatest majority of the approved recommendations relate to land for which the Department of Conservation, Forests and Lands has administrative responsibility.

Of the 5480 recommendations made by the Council up until the end of 1987, 4961 require some administrative action through legislation, reservation, or proclamation. Of these, some 1011 have been finalized, and some progress has been made on a further 242. At the same time, for many of the remainder, Department of Conservation, Forests and Lands Regions reported that the relevant land is being managed 'in accordance with the recommendations'.

The areas first investigated by the Council in the 1970s generally have a higher proportion of recommendations implemented than those studied more recently. Table 14 shows that of the 1841 accepted prior to 1981 and requiring legislation, reservation, or proclamation, some 805 or 44% have been implemented. After that date only 448 or 14% of the 3120 recommendations have been implemented.

Recommendations relating primarily to policy matters and approved by government total 393, accounting for the difference between the total number and the number requiring administrative action.

The approved recommendations that have been administratively implemented are shown in Table 14 for each of the Council's study areas and by land-use categories in Table 15. It reflects the considerable discrepancy between different land use categories in the proportions. For instance, many of the recommended parks have been implemented because these have been given a high priority by governments. However, very few education areas have been, and reasons are discussed in chapter 11.

Table 14

IMPLEMENTATION OF RECOMMENDATIONS BY STUDY AREA

Study area	Year of approval	Fully implemented	Partially implemented	Policy recommendations	Not implemented	Not accepted	Total
North-eastern 1	1974	20	2	8	11	-	41
South-western 1	1974	22	14	7	19	-	62
South Gippsland 1	1975	16	3	3	7	-	29
North-eastern 2	1977	25	4	18	10	2	57
Corangamite	1979	83	72	17	123	3	300
East Gippsland	1979	19	8	18	48	3	96
Mallee	1979	172	11	12	384	-	579
Melbourne	1979	194	28	19	263	36	540
North-eastern 3, 4 & 5	1979	56	10	14	85	-	165
Stradbroke S.I.	1979	2	1	3	2	-	8
Alpine	1980	34	12	27	81	6	160
North Central	1982	62	11	20	519	-	612
Gellions Run S.I.	1982	2	-	-	-	-	2
Ovens S.I.	1982	-	-	-	-	56	56
Ballarat	1983	35	4	17	237	-	293
South-western 2	1983	60	5	19	298	-	382
Gippsland Lakes Hinterland	1984	34	5	19	114	-	172
South Gippsland 2	1984	52	9	21	112	6	200
Hill End S.I.	1984	-	-	-	3	13	16
South-western 1 Review	1984	10	1	21	87	-	119
Alpine S.I.	1985	-	22	8	10	-	40
Murray Valley	1986	22	2	36	367	1	428
North-eastern (Benalla-Upper Murray Review)	1987	35	6	21	205	-	267
Wimmera	1987	50	4	16	489	-	559
East Gippsland Review	1987	11	2	17	57	1	88
Melbourne 1 Review	-	7	6	24	73	-	110
Latrobe Valley	-	1	-	8	90	-	99
Total		1024	242	393	3694	127	5480

Table 15

IMPLEMENTATION OF RECOMMENDATIONS BY LAND USE CATEGORY (June 1988)

Land use classification	Recommendations		
	Total*	Implemented	
		No	%
National parks[1]	56	27	48
State parks	47	30	64
Coastal parks	5	3	60
Regional parks	58	15	26
Highway parks	13	2	15
Multi-purpose parks	5	-	0
Marine and wildlife reserves	11	4	36
Wilderness	3	3	100
Reference areas	130	50	39
Wildlife reserves	285	58	20
Flora reserves	131	16	12
Flora and fauna reserves	89	24	27
Education areas	58	1	2
National features, geological, cave reserves	55	8	15
Historic areas and reserves	75	4	5
Bushland reserves	1185	181	15
Scenic reserves	67	8	12
Streamside and river reserves	274	38	14
Recreation reserves and alpine resorts	171	67	39
Water production, use, regulation and drainage	861	138	16
Coastal reserves	29	4	14
Lake reserves	106	1	1
State forest[2]	229	82	36
Eucalyptus oil production	5	5	100
Softwood production	92	40	44
Agriculture	181	16	9
Mineral, stone and coal production	328	68	21
Utilities and survey	122	80	66
Other reserves and public	288	51	18
Total	4937	1024	21

* Excluding policy recommendations and those not accepted by the government

Notes:

1. This figure includes 33 recommendations that are essentially recently accepted additions to existing parks. Several are quite small additions. Of the 33, 22 are areas forming additions to the Alpine Park. This park has been accepted by government, but legislation to establish it has not been passed by the Legislative Council.

2. Includes hardwood production areas and uncommitted land recommendations.

Nearly 40% of the reference areas have been implemented fully. However, the *Reference Areas Act* 1978 requires the Reference Areas Advisory Committee to prepare a management

plan for each one prior to proclamation. As this may require several meetings to discuss draft plans it is a fairly lengthy process.

Implementation also reflects priorities given by the designated land managers prior to the establishment of the Department of Conservation, Forests and Lands in 1983. Each separate department determined its own priorities.

The gazettal of new areas of reserved forest by the then Forests Commission Victoria, proceeded, as did amendments to section 50 of the *Forests Act* 1958, permitting reserves that better reflected the categories of land use accepted by the government. Section 50 reserves totalled nearly 65 000 ha by the end of 1983. However, this form of reservation is effectively only temporary and can be easily revoked, as discussed in chapter 6.

Priority for implementation has certainly been given to the major conservation reserves recommended by the Council - namely, national and State parks, reference areas, flora and flora and fauna reserves, and special-use areas such as wilderness and alpine resorts. This setting of priorities has been necessary because of constraints on departmental resources.

The administrative processes associated with legislation, reservation, or proclamation are often complex and time-consuming, especially where boundaries and excisions for roads and easements need to be established by survey. In other cases, the land may already be reserved for another purpose, making it necessary to first revoke the existing reservation before implementing the new recommendation.

The former Department of Crown Lands and Survey followed this procedure when implementing reservation under the *Crown Land Reserves Act* 1978. As a consequence, reservation fell behind government acceptance.

Another concern arises where areas have been reserved or scheduled in legislation in a way that is at variance with the government-approved recommendations. Certain State and regional parks approved for reservation under section 4 of the *Crown Land (Reserves) Act* 1978 have instead been reserved as 'national' parks in the *National Parks Act* 1975 - that is, included in the second schedule to that Act. The third schedule might have been more appropriate in these cases. Some education areas, approved for permanent reservation under the *Crown Land (Reserves) Act*, have been incorporated in national parks without separate reservation. Other parks and reserves have been afforded limited protection or have been reserved under section 50 of the *Forests Act* 1958, a form of reservation that does not give the permanent protection necessary for important reserves.

Reservation not in accordance with Council's recommendations has led to some confusion in the community, particularly in relation to the listing of areas as parks on the schedules to the *National Parks Act* 1975. It also causes concern that important reserves such as certain recommended education

areas and flora reserves are not being given the protection they require; that is, in most cases, reservation under the *Crown Land (Reserves) Act* 1978.

In other cases, areas recommended for permanent reservation are currently only temporarily reserved under section 4 of the *Crown Land (Reserves) Act* 1978. This procedure can be used as an interim measure prior to permanent reservation. It enables the land manager to make regulations for particular reserves while the necessary work is completed to enable the area to be permanently reserved.

The present approach to reservation under the Act involves boundary surveys of areas proposed for reservation and, as previously discussed, this has been a major factor in implementation delays. Yet national parks and reserved forests are not usually surveyed, the ordinance being accompanied by a 'record plan' that indicates the official boundaries. The use of this technique to formalize *Crown Land (Reserves) Act* 1978 reservations would greatly speed the process, with surveys being used only where disputes arose as to the boundaries.

The Department of Conservation, Forests and Lands has also expressed concern at the time and resources involved. There is a need to investigate other ways of streamlining the process in order to speed up the implementation of land use recommendations and to enable management of the areas to be formalized.

Legislation giving effect to recommendations is required in some cases, and it is the right of Parliament to pass, amend, or reject legislation brought before it. In the case of the Alpine National Park legislation, the bill was not passed in the Upper House. Before passing the legislation establishing the Barmah State Park, Parliament amended it to permit grazing, logging, and hunting of feral animals in that park.

Management Implementation

In addition to the administrative process described above, implementation of the Council's recommendations also involves appropriate management in accordance with government-approved uses, in order to maintain or enhance the values of public land. This may be initiated either before or after the administrative implementation procedures have been completed.

Management can take many forms. As well as the statutory requirements - to protect water catchments, to protect public land from fire, to control resource harvesting, and to protect against vermin, weeds, and erosion - it can also involve the preparation of management plans, or regulations. It includes: the development of recreational facilities, walking tracks, and nature trails; preparation of interpretative information and of prescriptions regulating productive uses on public land; collection of data relating to flora, fauna, and history; in addition to supervision and maintenance.

In other cases, in accordance with Council's recommendations, it may involve removal of certain incompatible uses - such as grazing and extractive industries - from particular conservation areas.

Information provided by the Department of Conservation, Forests and Lands indicates that some form of management implementation has been or is being carried out for a further 387 recommended areas. Thus, of the 5144 approved recommendations requiring some action, some progress has been made on about 1630 - about one-third of the total.

Management implementation is expensive. Due to constraints on resources, much of the emphasis to date has been given to major nature conservation reserves, State forest, and softwood plantations. It is not expected that all recommendations could be implemented over a short period, given limited budgets and competing priorities for expenditure.

Changes in the Status of Public Land

Public land in the State within the jurisdiction of the Council totals 8 802 000 ha. As Figure 5 and Maps 1 to 4 and 18 show, substantial changes in the way in which it is to be used have taken place since 1970. Only a few categories of public land are directly comparable because of the range of reserve categories established by the Council. For example, the area in national parks has increased from just under 1% to more than 6%, while reserved forest has increased to almost 12% (in contrast to the prior reserved forest area of 10%) within the total State forest area of over 19%. In 1970, a substantial total area was set aside under the *Land Act* 1958 for a range of public purposes, but few of the reservations were for the protection of flora, fauna, or natural values. Less than 3% of the State was reserved specifically for conservation, compared with almost 10% in 1987, although many parcels included in the 1987 figures have yet to be formally protected by legislation, reservation, or proclamation.

The area of reservations shown in 1970 includes Crown land within cities, towns, and boroughs. This is not public land under the *Land Conservation Act* 1970 and so was not considered by the Council. The 1970 and 1988 figures are therefore not directly comparable, particularly within categories such as public purposes reserves, recreation reserves and utilities.

A number of sources have been used to obtain information about the change in status of various categories of land over time. Annual reports of the former Department of Crown Lands and Survey and Forests Commission provided some figures. There is also good information for national, and other parks going back to the establishment of Victoria's first park in 1866 (see Table 16). This table and Figure 7 also show that since 1971, when the Land Conservation Council began operations, parks scheduled under the *National Parks Act* 1975 have increased to some 1 582 526 ha, an average of about 86 000 ha per year.

Table 16

NATIONAL PARK RESERVATIONS AND AREAS 1866--1988

Year	Park*	Area addition or minus (ha)	Cumulative area (ha)
1866	National	586	586
1882	National	166	752
1892	National	2	754
1898	National	1 165	1 919
1904	National	20	1 939
1905	National	30 150	32 089
1908	National	19 867	51 956
1909	National	10 788	62 744
1916	National	-70	62 674
1918	National	2	62 676
1921	National	2 590	65 266
1922	National	3 108	68 374
1926	National	3 353	71 727
1927	National	1 454	73 181
1928	National	5 723	78 904
1929	National	89	78 993
1930	National	2 590	81 583
1934	Nationa	526	82 109
1938	National	22 979	105 088
1941	National	20 979	126 067
1943	National	205	126 272
1948	National	429	126 701
1956	National	-30	126 671
1957	National	58	126 729
1958	National	3 301	130 030
1960	National	18 505	148 535
1962	National	467	149 002
1964	National	404	149 406
1967	National	138	149 544
1970	National	55 454	204 998
1972	National	269	205 267
1976	National	21 006	
	Other	1 035	227 308
1978	National	17 934	
	Other	14 850	260 092
1979	National	183 773	
	Other	215 101	658 966
1980	National	55 634	
	Other	59 673	774 273
1981	National	14 185	
	Other	3 821	792 279
1982	National	188 000	
	Other	3 600	983 879
1984	National	615	
	Other	520	985 014
1985	National	167 032	
	Other	15	1 152 061
1986	National	106 865	
	Other	72 012	1 330 938
1987	National	15 126	
	Other	7 629	1 353 693
1988	National	207 050	
	Other	21 783	1 582 526

* National parks are those on schedule 2 of the *National Parks Act* 1975, while 'other parks' are those on schedule 3, and include State parks, regional parks, and other areas.

FIGURE: 7

NATIONAL PARKS - RECOMMENDATIONS AND RESERVATIONS

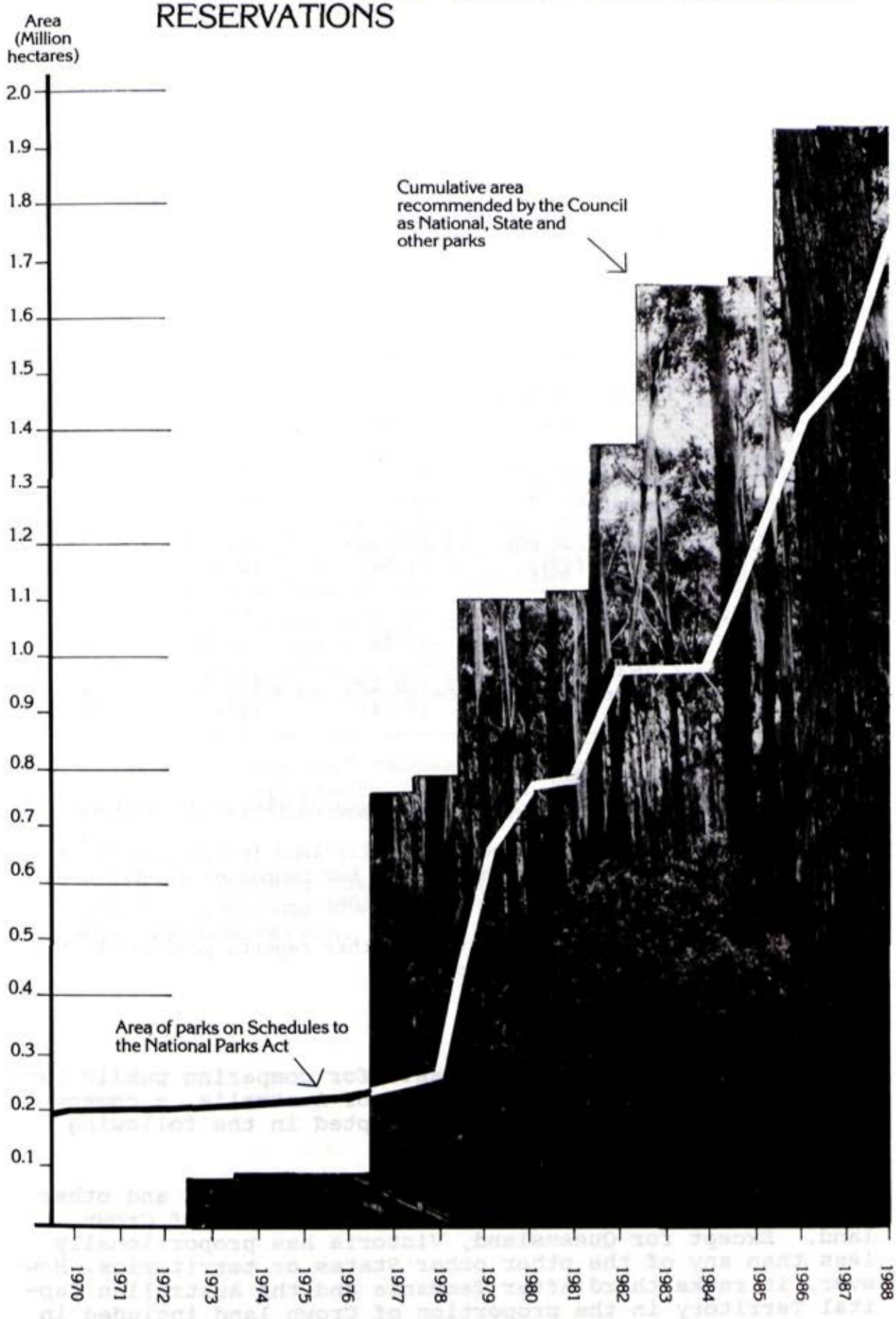


Table 17

COMPARISON OF LAND USE FOR AUSTRALIAN STATES AND TERRITORIES

State or territory	Crown land area (ha)	Conservation reserves	Crown land available for commercial uses	
			Forestry	Agriculture
South Australia	63 320 000 (64%)	6 725 000 (6.8%)	240 000 (0.3%)	41 030 000 (42%)
Western Australia	136 360 000 (54%)	14 348 000 (5.5%)	2 076 000 (1.5%)	95 440 000 (70%)
Tasmania	4 243 000 (62%)	904 000 (13%)	1 610 900 (23.5%)	200 000 (3%)
New South Wales	51 390 000 (64%)	3 380 000 (4.2%)	3 745 000 (4.7%)	42 049 000 (52%)
Queensland	11 380 000 (6.5%)	3 460 000 (2%)	4 638 000 (2.6%)	94 985 000 (55%)
Northern Territory	134 220 000 (99%)	1 972 000 (1.5%)	313 000 (0.2%)	67 310 000 (50%)
Australian Capital Territory	240 000 (100%)	100 000 (41%)	66 200 (28%)	68 000 (28%)
Victoria	8 770 000 (38%)	2 100 100 (9.2%)	4 569 500 (20%)	132 000 (1.5%)

Notes:
1. All figures are rounded.
2. Figures shown in brackets are percentages of the total land area for each State or territory.
3. The Northern Territory figures for public land include Aboriginal land that is held under freehold title but cannot be alienated (see chapter 2 for a more detailed explanation).

Source: Department of Lands reports and other reports produced by the various States and territories

Comparison with other States

In the absence of any common basis for comparing public land in Victoria with that for the rest of Australia, a common category of Crown land has been adopted in the following discussion.

Table 17 makes some comparisons between Victoria and other Australian States regarding the current status of Crown land. Except for Queensland, Victoria has proportionally less than any of the other other States or territories. However, it ranks third after Tasmania and the Australian Capital Territory in the proportion of Crown land included in

conservation reserves. The table also highlights the importance accorded to timber production.

The other notable difference is that very little Crown land is occupied under long-term agricultural leases, whereas Western Australia, South Australia, New South Wales, Queensland, and the Northern Territory all have a large proportion of Crown land committed to various agricultural pursuits. This reflects somewhat different philosophies in the way governments have responded to requests for use of this land. In Victoria, the object appears to have been to alienate Crown land used primarily for agriculture, while in other States governments retained large areas of similar land in public ownership. This accounts for the lower proportion of Crown land in Victoria compared with most other States and Territories.

Issues

Since the Council began its work in 1971, a number of important issues have arisen concerning the current status of public land.

* Although successive governments have approved most of the Council's recommendations, it has taken a considerable time for many of them to be implemented. This is primarily because of inadequacy of the resources provided to agencies, and other constraints, and the consequent need to establish priorities for implementation.

* Existing administrative implementation procedures are often complex and time-consuming, and there is a need to streamline or modify existing procedures to enable the implementation of approved recommendations to proceed more rapidly

* Government-approved recommendations are being varied during the implementation stage, thereby modifying the integrity of the reserve system established by the Council.

* There is concern that damage to significant reserves is occurring during the period between government approval and implementation.

8. NATURE CONSERVATION

Conservation is concerned with the way in which the human race utilizes the resources available to it. The term 'conservation' implies both protection and use of a resource, but in such a way that ensures wise exploitation in order to provide maximum benefit to society.

It is important to view the conservation of resources from a long-term perspective rather than to capitalize on the short-term benefits of a rapid rate of resource use at the expense of future generations. Conservation must also take into account the nature of the resources being utilized - that is, whether they are finite or renewable.

Why nature conservation?

The need for conservation of economic resources, both finite and renewable, is obvious, as society uses these for many of the material needs of modern life. The conservation of native flora and fauna, however, is equally important, although the benefits are less tangible and harder to quantify. In recent times, society has come to place a greater emphasis on the conservation of the State's flora and fauna in view of the mounting body of evidence that they and their habitats are being depleted at an alarming rate. Human activities have resulted in the loss of valuable genetic material from the global 'gene pool', reductions in the availability of essentially unmodified ecosystems, and the loss of other natural values and, potentially, of our own ability to survive.

Each species of plant or animal is a unique assortment of biological characteristics that makes a contribution to the richness and diversity of the natural environment in which we live. It is part of our heritage, and society therefore has a moral responsibility to protect it and pass it on to future generations. The environment, with all its interwoven complexities, has the potential to enrich our quality of life and our knowledge. The loss of individual species, habitats, or ecosystems results in the diminution of the value of the natural environment.

Conservation strategies

International concern led in 1980 to the release of a World Conservation Strategy prepared by the International Union for Conservation of Nature and Natural Resources, with the United Nations Environment Program and the World Wildlife Fund. This Strategy stresses as a matter of urgency that human beings, in their quest for economic development and enjoyment of the riches of Nature, must come to terms with the carrying capacities of ecosystems and must take account of the needs of future generations. It argues that a reconciliation between development and conservation is a major

requirement for human survival, pointing out that each is necessary for prosperity and well-being. The need to integrate conservation with development is also the theme of the National Conservation Strategy for Australia, prepared jointly in 1983 by industry, conservation, and government groups.

As a reflection of the concerns being increasingly felt in the community, the Victorian Government released its State Conservation Strategy, 'Protecting the Environment', in June 1987. The document adopted the same theme as the World and National Strategies and quotes some interesting statistics in connection with flora and fauna:

* more than 60% of the State has been cleared of its original vegetation

* of the two-thirds of the State that is privately owned, only 5% retains its bushland cover

* 95% of the native grassland communities have been eliminated or modified, due largely to the introduction of exotic species and the application of fertilizers for agriculture

* of the original forest cover, 56% has been cleared and 70% of the remaining forest has been severely modified

* less than 3% of Victoria can now be classified as wilderness and this area is still decreasing

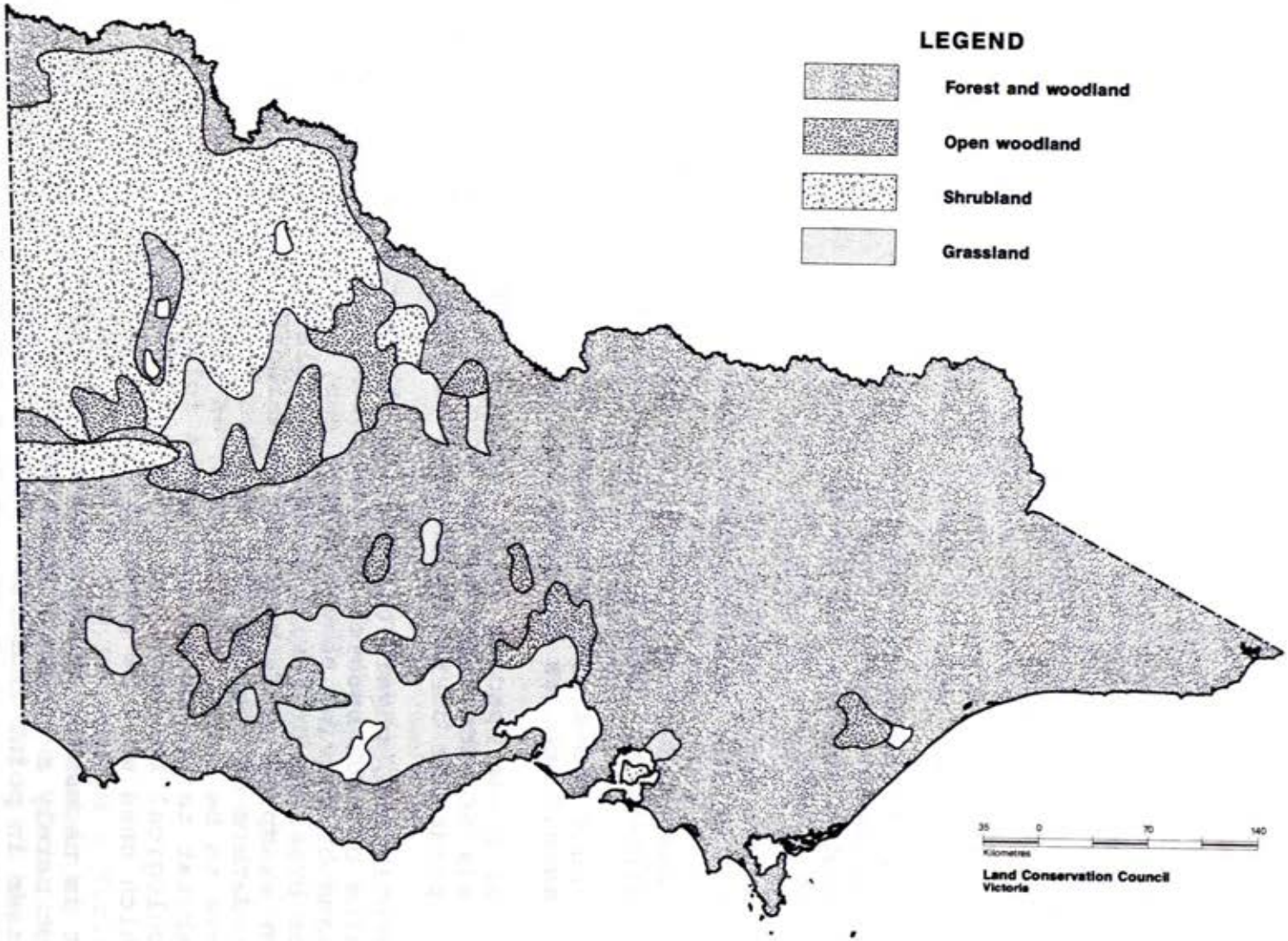
* about one-sixth of the State's original complement of mammal species has been lost

* of those species still remaining, approximately one in six of Victoria's native vertebrate animals and vascular plants is currently in need of careful protection

Geneticists, physiologists, and other scientists place a value on each species for its potential to provide the means of solving research problems, or to act as the stock for breeding or revitalizing essential plants or animals. For example, it is sensible to maintain the gene pools of predators of species that may become pests. Species do not have to be large, significant, or abundant in their original habitat to become serious pests following shifts in the ecological balance, and it is not possible to predict which ones will be potentially useful or harmful.

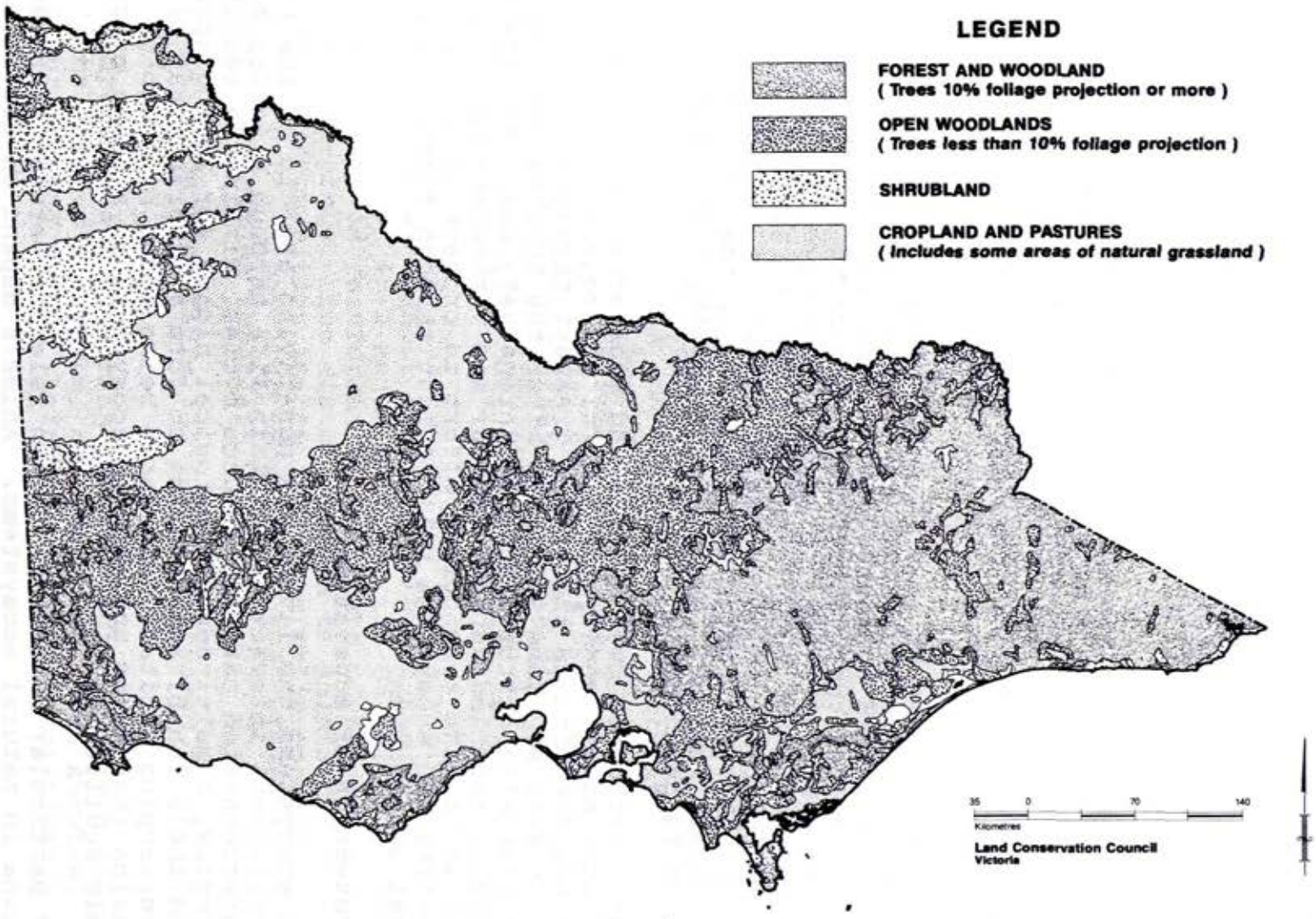
It is necessary to approach the pest issue from a global not merely a local or national perspective, as the following cases in point indicate. Skeleton weed is not a problem in its Mediterranean home, but is a serious weed in Australia; biological control has been achieved by importing a rust fungus. Localized salt-tolerant variants of river red gum from north-western Victoria are successfully planted in saline areas of the Middle-East. On the other hand, some eucalypt species planted widely in India and California early this century are becoming pests there, by over-using water and by out-competing native flora.

VEGETATION COVER AT TIME OF SETTLEMENT



MAP No. 8

CURRENT VEGETATION



MAP No. 9

The advantages of using indigenous species to solve management problems is only just beginning to be appreciated. We therefore have a responsibility to future generations to retain as many species as possible.

Furthermore, it can be argued that species should be allowed to exist in their own right and continue to flourish, and that we should not merely conserve those things that are perceived to be of economic worth to the human race. In this connection, the National Conservation Strategy for Australia 1983 states that:

> 'Australians have obligations to other living things and ... activities must at times be modified to respect the natural cycle of other life forms and their ecosystems'.

Drawing from both that Strategy and the World Conservation Strategy (1980), Victoria's Conservation Strategy notes:

> 'Many people believe that Australians have obligations to other living things and that activities must at times be modified to respect the natural cycles of other life forms and their ecosystems. According to the World Conservation Strategy, because humans have become a major evolutionary force with the power to radically change ecosystems and cause the extinction of species, we are morally obliged to act prudently in the interests of other species. The State Conservation Strategy supports this principle'.

Human influence over species and ecosystems is increasing as we continually modify the natural environment and this kind of modification is the single greatest threat to the survival of Nature. Some 200 years after the European settlement of Australia, large tracts of intensively used land almost totally lack indigenous vascular and vertebrate species. Unless we make a concerted effort to protect what remains, species and ecosystems will be lost through further piecemeal destruction.

Protection of ecosystems

In ecosystems the living and non-living aspects of the broad environment interact to maintain life through a series of interconnected natural resource cycles. Within the resulting complex, a multitude of ecological niches (or living spaces) and their inhabitants combine to form a diverse array of overlapping habitats, the whole being bound by a web of food chains that keeps undisturbed ecosystems in a state of dynamic equilibrium.

Of particular importance is the relation between flora and fauna in natural ecosystems. Animals depend on floral habitats not only for food, but also for territorial spaces, breeding places, and shelter at different times in the cycle of life. In the often harsh environments of this country any major changes become critical to the natural inhabitants of the areas concerned, particularly where special adaptations to conditions have been built up over thousands of years.

To maintain maximum flexibility in land use planning and conservation in the future, we need to know how such ecosystems work. This involves intensive, ongoing research, as current knowledge is very imperfect. Thus, as Specht *et.al.* (1974) concluded, at present it is wisest to aim at conserving samples of all major ecosystems.

Even so, it is inappropriate to preserve exactly what we see today. Ecosystems are dynamic entities; what we need to conserve are the processes that maintain life and enable it to continue and respond to change.

In recent geological time, for instance, a considerable number of species, especially animals, have become extinct. The causes of their demise are not yet fully understood, but could range from climatic shifts, habitat destruction, and diseases, to hunting and the use of fire by the Aboriginal people.

These kinds of threats are ongoing. Within the last 150 years of European settlement the continuing impact of human activities on the natural environment has been well recorded, and is clearly illustrated by comparing Maps 8 and 9, which show vegetation cover before European settlement and at the present time. Land-clearing, reduction of natural bush, hunting, trapping, and changes in water quality, as well as the introduction of competing plants, animals, and diseases have all been responsible for the disappearance of a range of native plants and wildlife from Victoria. These include at least 2 bird species, 20 mammal species, and 21 species of plant. Of the remainder, about 110 of Victoria's 700 or 800 vertebrate animal species are considered to be under threat, as are more than 500 of its 3160 vascular plants. Table 18 lists the fauna affected, and identifies those regarded as facing the higher degrees of risk.

Frood and Calder (1987) discussed the futility of protecting faunal species without equal concern for their habitat. Habitat protection is a major focus of the Council's recommendations, and is reinforced by the State Government's Conservation Strategy. The aim of both is to maintain native species and communities in the long term while concentrating efforts on protecting rare, endangered, and vulnerable species and communities immediately.

Goals for conserving flora and fauna, expressed in the Strategy, are to:

* ensure that all Victorian native species of flora and fauna, native ecosystem, and communities can survive, flourish, and retain their potential for evolutionary development

* protect representative and ecologically viable samples of all Victoria's natural ecological systems, including land systems, native vegetation types, and native animal species

* preserve genetic variability within Victorian plant and animal species

Table 18

THREATENED WILDLIFE IN VICTORIA

A. ENDANGERED

Eastern barred bandicoot
Brush-tailed rock-wallaby
Long-footed potoroo
Little tern
Orange-bellied parrot
Regent honeyeater
Black-eared miner
Yellow-tufted (helmeted) honeyeater
* Aprasia aurita
* Tympanocryptis lineata pinguicolla

B. VULNERABLE

Mountain pygmy-possum
Leadbeater's's possum
Eastern horseshoe-bat
Common bent-wing bat
Large-footed myotis
New Holland mouse
Plains-wanderer
Australian bustard
Bush thick-knee
Fairy tern
Red-tailed black-cockatoo
* Litoria maculata
Baw Baw frog
* Delmar impar
Alpine water skink
Australian grayling
Murray cod
Golden perch
Yellow belly
Silver perch

C. RESTRICTED

Tiger quoll
Brush-tailed phascogale
Paucident planingale
Squirrel glider
Mitchell's hopping-mouse
Heath mouse
Smoke mouse
Southern Right Whale
Freckled duck
Osprey
Brolga
Painted snipe
Glossy black-cockatoo
Superb parrot
Ground parrot
Turquoise parrot
Masked owl
Red-lored whistler
Rufous bristlebird
Giant burrowing frog
* Mixophyes balbus
Blue Mountains tree frog
* Ctenotus brachyonyx
* Egernia coventryi
Oak skink
Diamond python
Bardick
Coral snake
* Unechis spectabilis
Freshwater herring
Mountain galaxias
Broad-finned galaxias
Spotted galaxias
Tasmanian mudfish
Freshwater hardyhead
Lake Eyre hardyhead
Western chandra perch
Australian bass
Yarra pigmy perch
Striped gudgeon
Cox's gudgeon
Southern purple-spotted gudgeon

D. INDETERMINATE, POSSIBLY THREATENED

Yellow-bellied sheathtail-bat
Greater long-eared bat
Square-tailed kite
* Ramphotyphlops broomi, R. ligatus, R. pinguis, R. proximus, R. unguirostris, R. wiedii
* Varanus rosenbergi
Fierce snake
Bandy-bandy
Pouched lamprey
Bony bream
Flat-headed galaxias
Freshwater catfish
Two-spined blackfish

E. REQUIRING CAREFUL MONITORING

Ningaui
Little pygmy-possum
Yellow-bellied glider
Koala
Great pipistrelle
Dingo
Little penguin
Peregrine falcon
Malleefowl
Hooded plover
Latham's snipe
Long-billed corella
Regent parrot
Sooty owl
Western whipbird
Grey-crowned babbler
Rufous-crowned (Mallee) emu-wren
* Aprasis inaurita
* Aprasia striolata
* Egernia multiscutata
* Hemiergis millewae
* Morethia adelaidensis
Western blue-tongued lizard
Carpet python
Dwarf galaxias
River blackfish

F. PRESUMED EXTINCT

Kultarr
Western quoll
Eastern quoll
Red-tailed phascogale
Pig-footed bandicoot
Western barred bandicoot
Rufous bettong
Tasmanian bettong
Brush-tailed wallaby
Eastern hare-wallaby
Toolache wallaby
Bridled nailtail wallaby
Red-bellied pademelon
Rabbit-eared tree-rat
Lesser stick-nest rat
Greater stick-nest rat
Plains mouse
Desert mouse
Sandy inland mouse
Undescribed Pseudomys
Magpie goose
Night parrot

* These species have no accepted common name

* preserve remaining areas of high wilderness quality

* protect remaining areas of special value for natural heritage, as flora and fauna habitat, or for maintenance of ecological processes or life-support systems

The complex nature of ecosystems and their interaction with each other makes them difficult to define accurately and map. Therefore the best ways to ensure the conservation of ecosystems are to protect examples of vegetation associations, which in turn represent habitat types, and to protect examples of land systems. Conservation of vegetation associations is discussed in the following section, while land systems are dealt with in chapter 9.

Protection of vegetation

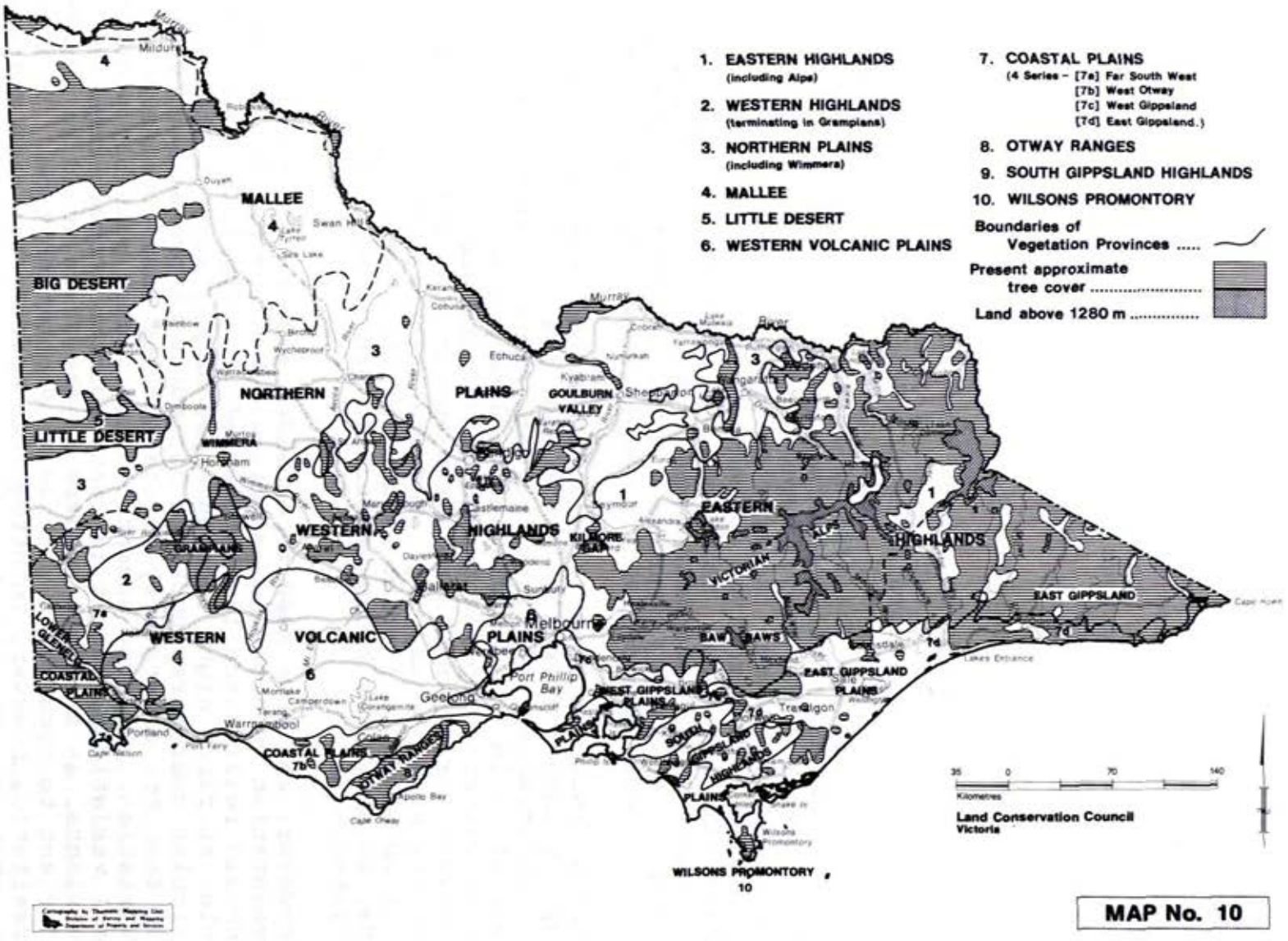
Two main approaches have been used to classify vegetation in Victoria. The first is based on structural types, which are categorized according to the dominant species in the tallest stratum (layer), usually regardless of the diversity of ground flora. The maps of forest types in various Land Conservation Council resource reports illustrate the use of this method. The second approach depends on the degree of association between the species present irrespective of plant size or perceived commercial importance - that is, a floristic approach. This leads to the identification of communities or subcommunities in which a range of species occur consistently together. Council's East Gippsland Review report (August 1985) contains such a floristic map.

Not everybody agrees as to which method reveals the most appropriate information or is most practical, particularly in relation to providing insight into ecological patterns or assisting in the formulation of land use policies. Vegetation patterns are recognized at varying scales, with species showing various modes of distribution that change depending on the scale of mapping. Different approaches to classification detect different aspects of this general pattern. Map 10 shows the broad vegetation provinces that cover Victoria.

However, while we need to consider similar groupings of vegetation in order to select examples for protection, we should realize the limitations of this approach. For example, at first sight such an approach may suggest that a particular overstorey eucalypt has adequate protection, whereas in fact the understorey vegetation may show considerable variation. We must accept that we cannot possibly protect all variations, but it is reasonable to protect regional variants, as a single reserve in the State would be insufficient to conserve a particular vegetation type. It is unrealistic, however, to attempt to specify how many reserves or what area it takes to achieve adequate protection without first documenting the scope of variation - something that is yet to be completed for the whole State.

It would also be unwise to consider that two reserves might duplicate conservation values on the basis of a small set of attributes common to both.

VEGETATION PROVINCES



MAP No. 10

Protection of fauna

While protecting static native vegetation communities may be a comparatively easy task, ensuring effective protection for native fauna is far more difficult. For the purposes of discussion here, the terms 'fauna' and 'animal' include mammals, birds, reptiles, amphibians, fish, insects, and all other invertebrate forms, including microfauna.

Although invertebrates are little appreciated, their role in nature far outweighs their size. In terms of total biological mass they far exceed vertebrates, and are to be found in large numbers in every kind of ecosystem, whether terrestrial, aquatic, or airborne. They are responsible for a large part of the pollination process, the biological control of other populations, the decomposition and removal of detritus, and the recycling of many essential nutrients (particularly in soils), and are vital in the lower food chain as both predators and prey.

Adequately protecting fauna involves several difficulties - the main problem being that animals are mobile. Some, including most bird species, are especially so. In these circumstances man-made boundaries, even those offering protection, tend to lose their significance and meaning. The amount of movement is usually determined by the location of breeding and feeding grounds, by interrelationships between different species, and frequently by the turn of the seasons, which affects climatic patterns and the availability of certain kinds of foods.

In some ways, however, this mobility perhaps makes protection less critical for animals than for plants. It results in lower dependence or fixity within individual niches, in migration - usually possible or even natural if environmental conditions change - and often in less colonial dependency for reproduction. Of course many animals are so wide-ranging that it would be impossible to attempt to reserve their entire range, given the modified land distribution pattern in Victoria.

Nevertheless, a number of problems face animal species, which do not have the same implications for plants. Animal populations generally exist in smaller numbers over more dispersed areas than plants. These patterns could easily influence population viability where breeding numbers are critically small, as in the case of the endangered orange-bellied parrot, *Neophema chrysogaster*. Even where population numbers are greater in total, individual populations may be fragmented and isolated from each other by areas of unsuitable habitat. In these cases each group may be in jeopardy, as instanced by the vulnerable mountain pygmy-possum, *Burramys parvus*, found only in restricted alpine areas of Victoria and New South Wales. A full list of species under threat in Victoria is contained in Table 18.

Other problems that may affect animal numbers more than plants include fire, drought, floods, loss of food-stocks, pollution, lake and stream eutrophication, pesticides in food chains, predation, and disease. In addition, there is

human interference through shooting and fishing for sport, trapping and netting for the pet trade, the use of poisoned baits laid against vermin but also taken by non-target species, and reduction of habitat through land use changes.

The loss of even a single animal is often a loss to that species' breeding stock, particularly where the victims are young. Where numbers are already limited, such losses can quickly become a threat especially during 'open seasons'. The rare orange-bellied parrot and black-eyed miner are cases in point. Populations may cease to mate because of forced dispersal, even though their numbers in total remain adequate. Whereas certain plants survive adverse conditions either by natural protection or long-term seed dormancy/viability, animals have no such means of outliving adversity.

Thus, while conditions with a detrimental effect on animals may not necessarily affect plants, generally anything that poses a threat to plants will almost certainly affect animals - through the loss of food sources, sheltering vegetation, and general habitat modifications or destruction. Large animals may starve as a result of land clearance; because of fire, small animals may lose their cover and become easy prey; birds may lose nesting places through logging activities; while river works may remove aquatic vegetation or gravel beds that once provided breeding grounds for fish and a host of invertebrates. It is therefore becoming increasingly important that we do more to protect the floral habitat as a positive means of preserving wildlife, in addition to enforcing negative controls that restrict or prohibit the taking of animals themselves.

Marine environments

Marine ecosystems can be classified in a variety of ways. The inter-tidal areas between high and low water marks are distinct biologically and physically from the subtidal areas. Rocky and sandy habitats also support differing flora and fauna, as do the major and minor embayments and the oceanic coasts. Finally, we can distinguish between the fully saline environments and the brackish estuarine areas of river outlets and some of the smaller embayments.

The nature of the biological communities found in any of these habitats will depend on a variety of factors. The physical nature of the habitat will play a major role; for example, the nature of the subtidal sediment will greatly affect the types of organism that can live there. Wave or current energy is also important, not only for the way in which it affects the physical habitat but also for its direct effects on organisms.

The water mass is obviously a major habitat in itself. It provides a home for many organisms, including fish that are important for both recreational and commercial fishing, and the plankton and other materials on which they live. Management of these waters, however, presents many problems because they are in constant motion, crossing jurisdictional boundaries and moving into and away from the influence of endangering processes such as contaminant discharge. For

this reason the identification of conservation values has so far been confined principally to the land body rather than the waters that surround it.

Far less is known about marine environments, or for that matter aquatic ones in general, than is known about terrestrial ecosystems. The systematic study of even a small part of the sea floor demands scarce and expensive resources, as well as highly skilled observers. In Australia, until recently, use of the marine environment has not been sufficiently intensive for its conservation and management to be seen as important. The need to obtain information about the sea has consequently been accorded a low priority. Up until the 1970s the bulk of information about marine environments was collected by amateur groups or universities and other institutions. More recently, however, large-scale government-funded studies have increased our knowledge of major areas such as Port Phillip and Westernport Bays and the Gippsland Lakes. Enormous gaps remain in detailed knowledge, and in some cases even a broad understanding of how certain habitats function is lacking.

Holmes (1986) distinguishes five major regions in Victoria's coastal environment, each containing a broadly consistent marine habitat:

* South Australian border to Warrnambool
* Warrnambool to Point Lonsdale
* Point Nepean to San Remo
* San Remo to Wilsons Promontory
* Wilsons Promontory to Cape Howe

Major inlets are separated into:

Port Phillip Bay
Westernport Bay
Corner Inlet
Gippsland Lakes

Methods of Nature Conservation

In a society with high material aspirations it is not feasible to protect all nature conservation values in every area because of the need to utilize our natural resources. Because of this constraint, opinions vary as to the best way of achieving conservation of species and dynamic natural ecosystems.

Some argue that 'multiple use' achieves this sort of conservation. It does so, however, only if the natural systems can be maintained. Unfortunately multiple use tends to introduce conflicts that upset natural stability, making conservation aims much more difficult to achieve. Other people have suggested that ecosystems can be reconstructed, but (as attempts to reconstruct on a small scale at the Organ Pipes, just to the west of Melbourne, have shown) this too is very difficult. Both propositions serve to highlight the need to securely protect examples of natural ecosystems that are under threat, of either extinction or extreme alteration. It is well known that natural processes are modified to varying

degrees when other resources in the same area are utilized, especially if the uses are incompatible. The degree of modification depends upon the compatibility and intensity of the uses.

According to Frood and Calder (1987), the preservation of ecosystems and their inherent genetic resources is best achieved in appropriately managed areas specifically set aside for their protection, and as free from human interference and other disturbances as possible. This reflects observations in the 1983 National Conservation Strategy for Australia, which states:

> 'The most effective means of preserving genetic diversity of whole communities is as natural systems in reserves.'

It also states, consequently:

> 'The national objective should be to ensure that all plant associations are protected in reserves large enough to be self-perpetuating. Most animals will then be provided with suitable habitat.'

Representation

Informed opinion seems to hold that protection in reserves is the best method of ensuring conservation of species and ecosystems. Ideally a system of conservation reserves for Victoria would contain representation of all the different vegetation types and land systems.

Assessing the representativeness of a system of reserves for conservation of vegetation types is difficult. It first requires decisions on which characteristics are selected to attribute vegetation to community types. Where community descriptions have a wide ecological or geographic range, one sample of a 'type' will be inadequate to represent clearly different segments. Vegetation types vary in their sensitivity to different types of disturbance, and therefore the appropriate size of reserves is variable. The viability of representative samples declines in smaller reserves, as a consequence of edge effects from adjacent land, limitations on the numbers of species that can be assured of survival, and restricted ecological diversity, particularly with regard to age-phases and broad pattern of vegetation types. As a long-term goal, all vegetation types should be represented in reserves. This would protect those currently common and widespread, as well as those under threat at the moment.

Selection of appropriate areas for addition to reserves raises a further group of issues. Land to be considered tends to vary in size, history of disturbance, and accepted levels of disturbance (for whatever period) after selection. Accordingly it is difficult to specify ideal areas for reservation.

However, an area is clearly a desirable addition to the reserve system if it:

* represents a major vegetation type not represented (or only poorly so) in existing conservation reserves

* has high botanical interest for features that are not replicated securely within relevant reserves, but may not be illustrated by consideration of vegetation types as above

* represents phases of a catena or continuum that are not adequately represented in existing relevant reserves

The difficulties with assessing vegetation type for reservation are mentioned above. However, a clear need for a reserve occurs in cases where the conservation status of a broad vegetation alliance is so poor that any example should be reserved.

Representative examples of vegetation types are intended to be 'typical'. However, the scale of study and mapping tend to be more important than complete consistency in drawing boundaries around vegetation types.

A reserve should contain the range of variation exhibited by the identified type, including variations in floristic composition and age-phases. Some aspects of reserve adequacy are:

* reserve type and size

* extent and quality of vegetation type in reserve

* activities permitted in reserve, and how these affect the vegetation type(s)

* proportion of pre-settlement distribution and current distribution of type

* land-use practices on other remnants of the type - that is, the extent of endangering activities

Land Conservation Council Recommendations

The Land Conservation Council has consistently taken the approach of recommending permanent reserves for nature conservation, with a limited, specified suite of compatible uses. This has been in deliberate preference to the zoning of broad areas or temporary reservations and the use of codes of practice, which can be easily amended, in contradiction of the concept of long-term protection. Reservation does not automatically mean that the values in an area are protected, but it does mean that managing authorities will need to introduce a management regime that aims at protection. Without formal reservation or other mechanisms to control uses, there is no guarantee that degrading processes will not occur.

Table 12 in the previous chapter includes the various categories of nature conservation reserves recommended by the Council and the total areas within each. The major types of reserves established to protect the most significant nature

conservation values include national, State, and coastal parks, flora reserves and flora and fauna reserves, reference areas, wildlife reserves, and marine reserves. In recommending these the Council has endeavoured to establish a State-wide system of reserves that contain adequate representations of all the major vegetation types and habitats.

Victoria's national and State parks, flora reserves and flora and fauna reserves are the most important reserves with respect to terrestrial habitats, while marine and wildlife reserves include significant aquatic ecosystems. All such areas are recommended to be permanently reserved, under either section 4 of the *Crown Land (Reserves) Act* 1978 or the *National Parks Act* 1975, and all have as one of their major aims the protection of nature conservation values.

Other areas placed in different land use categories also play a part in the protection of native flora and fauna. These include areas set aside as State forest, regional parks, natural features and scenic reserves, and lake reserves. However, while most of these land uses are usually recommended for permanent reservation, nature conservation is generally a secondary rather than primary aim of management.

In total, the Council has recommended that about 2.2 million ha or 10% of the State be permanently reserved primarily for the protection of nature conservation values. These are shown on Map 11 and on Maps 1 to 4. Other areas totalling 4.9 million ha (including State forest) or 22% of the State provide some lesser degrees of protection. In the case of State forest, nature conservation values are protected by management prescriptions, appropriate codes of practice, or temporary reservation under the *Forests Act* 1958.

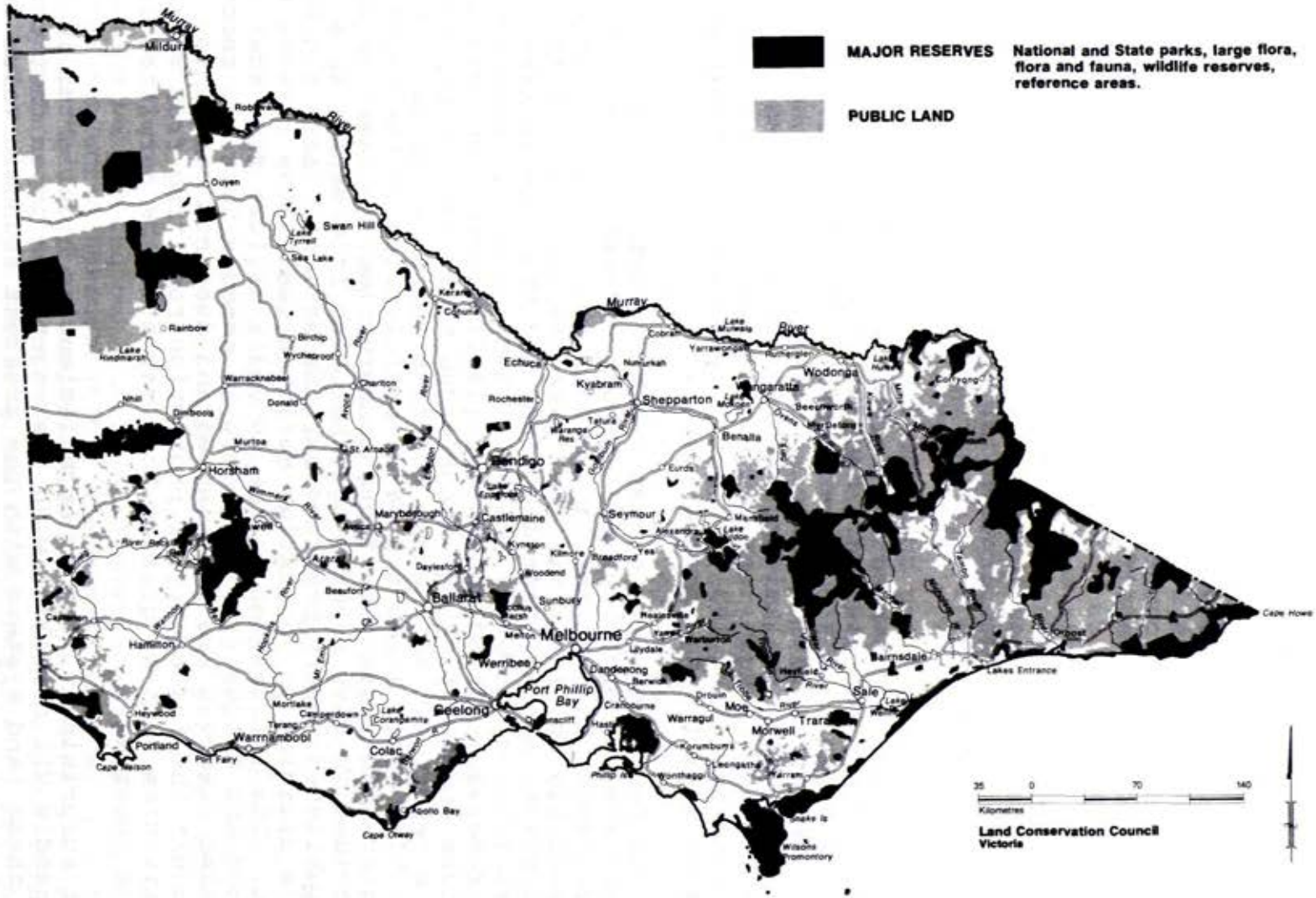
Council recommendations for marine areas

Victoria now has more than 24 areas of marine habitat that are subject to some sort of protection. Most of these are intertidal, adjoining what are basically terrestrial national parks, and park regulations provide some safeguards. Council has made recommendations for only four specifically protected marine areas. These are the Wilsons Promontory Marine Reserve and three marine and wildlife reserves around the Promontory, the Harold Holt Complex of Marine Reserves, and Point Cook and Williamstown Marine Reserves, both in Port Phillip Bay. Some estuarine ecosystems of varying size are also protected in the Croajingolong National Park in East Gippsland. The extent of safeguards for these areas varies somewhat depending upon the traditional uses taking place. In addition, ten wildlife reserves have been established to protect limited aspects of the marine environment. The marine component of these areas totals 8.61 sq.km.

Evaluation of the Council's Recommendation

Prior to the establishment of the Council in 1970, only 640 000 ha or 3% of the State was reserved for the protection of nature conservation values (see Figure 5 and Map 18). This has increased to a total of 10% of the State now

MAJOR CONSERVATION RESERVES



MAP No. 11

recommended for conservation reserves by Council - obviously a substantial increase in the area set aside for this purpose. However, some deficiencies in the representation of ecosystems in conservation reserves still remain.

Vegetation

While representation of vegetation types in conservation reserves has definitely improved as a result of Council recommendations, it is difficult to quantify the change due to the previously discussed problems of establishing a consistent vegetation classification and defining adequacy of representation.

In 1971, Frankenberg outlined 62 Victorian vegetation alliances and reviewed their conservation status. Separate geographic provinces contain 187 distinct occurrences of these alliances.

Of these, Frankenberg considered 81 (43%) to have been unrepresented in reserves and a further 42 or 22% to have been inadequately represented. Many of the poorly reserved vegetation types have since been represented in reserves through the Land Conservation Council process. However, her 62 alliances were a preliminary list, and included some arbitrary combinations. Much detailed vegetation mapping has been carried out since 1971, in particular using floristic methods of identifying associations.

The current position is that further vegetation associations are now protected as a result of reserves recently recommended through the Land Conservation Council process, especially the large national parks recommended for The Grampians, Alpine, East Gippsland and the Wimmera Area. Some associations, however, are still not adequately represented in reserves. Frood and Calder (1987) examined the status of nature conservation in Victoria and their work is published in a report titled 'Nature Conservation in Victoria'. Appendix VII, which lists the major deficiencies in the reserve system with respect to flora conservation, is based on data provided in that report, together with information in a 1988 unpublished report prepared for the National Parks and Wildlife Division on vegetation deficiencies in the reserve system. The information in the Appendix differs from that in Frood and Calder (1987) because it assumes that all recommended reserves are implemented and does not take into account the inadequacy of protection resulting from various activities such as grazing that may still be permitted in some reserves.

Not surprisingly, the major deficiencies highlighted in Appendix VII correlate with the vegetation types that occur on those land systems with the greatest economic value for exploitation, especially for agriculture. For instance, to the early settlers, a range of types of grassland and grassy woodland indicated land that could be cleared and developed with relative ease. Little public land remains, for example, in areas such as the Western Highlands, the Western Volcanic Plains, or the Northern Plains, the Western Coastal Plains, and the Gippsland Coastal Plains.

Frood and Calder consider that the general reservation status of the native grassland and grassy woodland units has not been greatly improved since the survey by Frankenberg in 1971. For many of these floristic assemblages, only small fragments remain and it is too late for any substantial reservation other than by repurchase and extensive restoration. Much of the associated fauna is already extinct, but such repurchase projects would improve the chances of survival of what remains. However, at the present time, these remnants on small areas of public land are highly significant in the State-wide context.

Appendix VII also highlights the fact that watercourses and wetlands have been subject to extensive alteration. While wetlands may be well represented in wildlife reserves, (see Appendix VI), this does not necessarily assure protection of fauna or flora. In general the best-reserved communities are those of dry stony ridges and some types of infertile sandy country.

The National Parks and Wildlife report on deficiencies identifies some 248 vegetation units of which more than 120 are adequately represented in the reserve system. A further 50 units have very limited occurrences on public land and cannot be adequately represented unless freehold land is purchased and restored. Most of these are included in category 1 of Appendix VII. Another 15 units are well-represented on public land in the Mallee but are not adequately protected in the reserve system. The remaining 60 units have sufficient representation on public land but are not currently within reserves. However, while this may seem to be a large number of units that are inadequately represented most are particular regional variants of vegetation types that are mostly adequately represented in the reserve system.

Overall, of the vegetation units that can be adequately represented by the reservation of public land, more than 60% are considered to be sufficiently protected.

There are obvious gaps in the reserve system in the Mallee and these are being considered in the Council's current review of this area. In those parts of the State where very little public land remains, small blocks and linear reserves associated with railways and roads can support highly significant vegetation and it would be appropriate to conduct detailed investigations of such areas to identify important relics.

It should be pointed out that the intensity of vegetation surveys conducted throughout the State has differed considerably and that current knowledge will be necessarily modified by future survey work. Thus, as new data becomes available, the currently identified units may require review in the future. It must also be stressed that due to the variability of the data in terms of its frequency, scale of survey, and methods of vegetation description, the identification of these broad vegetation units is at best arbitrary, Any such identification will be arbitrary because in the natural environment, vegetation is a continuum in which subtle changes occur across the landscape.

Fauna

To obtain an accurate assessment of the representation of native fauna in conservation reserves, it would be necessary to plot all the records for each species on the public land use maps of the State. This has yet to be done and is an enormous task. However, in an attempt to obtain some assessment of faunal representation in conservation reserves, it was decided to identify a number of species which, by their presence, indicate that the habitats they occupy are probably in good condition and are therefore likely to contain the full suite of native fauna found in them.

Following discussions with officers of the Arthur Rylah Institute it was determined that the mammals and birds identified as being 'threatened' in Victoria would be the best indicators of good habitat condition. However, it should be stressed that the 20 mammals and 29 birds shown in Figures 8 and 9 (and Appendix V) do not fully represent all the known habitats in Victoria. The following statements are only preliminary and should be considered in conjunction with data on the representation of vegetation communities described earlier in this chapter.

Of the 20 mammals listed, the ningaui has not been recorded from any conservation reserve. Two relevant points regarding this species are that it has only been recently identified from Victoria and very few records exist. It occupies a particular habitat in riverine environments in the Mallee and as very few conservation reserves occur in that environment at present, it is unlikely that its status in reserves will alter unless additional ones are established.

Other species such as the eastern barred bandicoot, squirrel glider and brush-tailed phascogale have a large proportion of their records from areas that have been modified. In each case, their preferred habitat has been severely depleted - the bandicoot being restricted to the area around Hamilton. Both the squirrel glider and phascogale require mature forest and woodland which provides the necessary nesting and food requirements. Such habitat in western Victoria is rare and many records for these species occur along roadsides where mature vegetation still exists.

Overall, 8 of the 20 mammals have less than 20% (an arbitrary figure for adequacy of representation) of their records in conservation reserves (see Figure 8). Several of these, the ningaui, little pygmy possum, Mitchell's hopping mouse, yellow bellied sheathtail bat and large-footed myotis occur in the Mallee area, currently under review by Council.

Of the 29 birds shown in Figure 9, 7 have less than 20% of their records from conservation reserves. It is important to note here that in each case severe habitat depletion is responsible for their designation as threatened species.

Significantly, 6 of the 7 species, namely the bush thick knee, superb parrot, regent honeyeater, plains wanderer, turquoise parrot and grey-crowned babbler all rely on mature woodlands for their survival.

FIGURE: 8

DISTRIBUTION OF THREATENED MAMMAL SPECIES

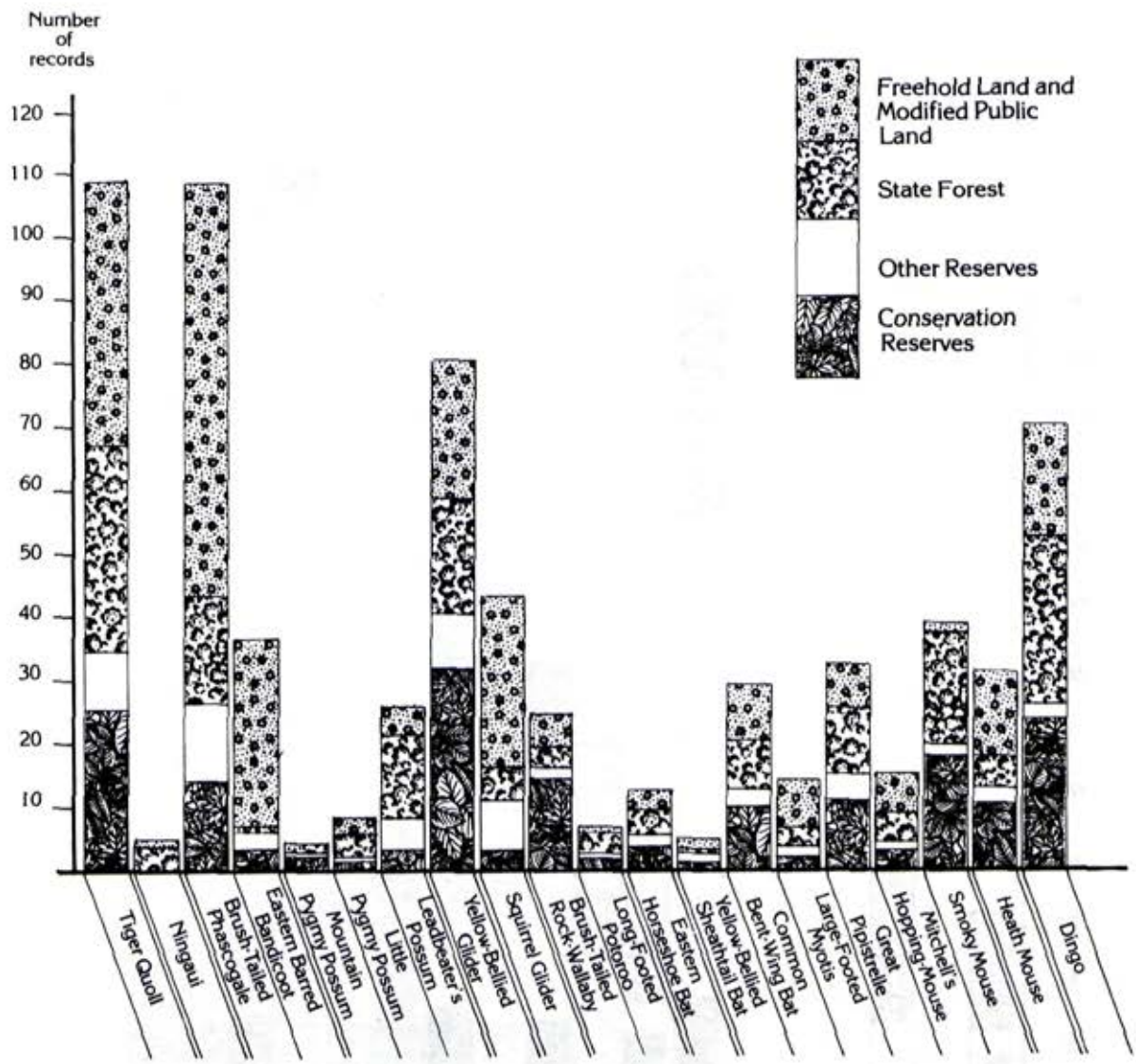


FIGURE: 9 (a)

DISTRIBUTION OF THREATENED BIRD SPECIES

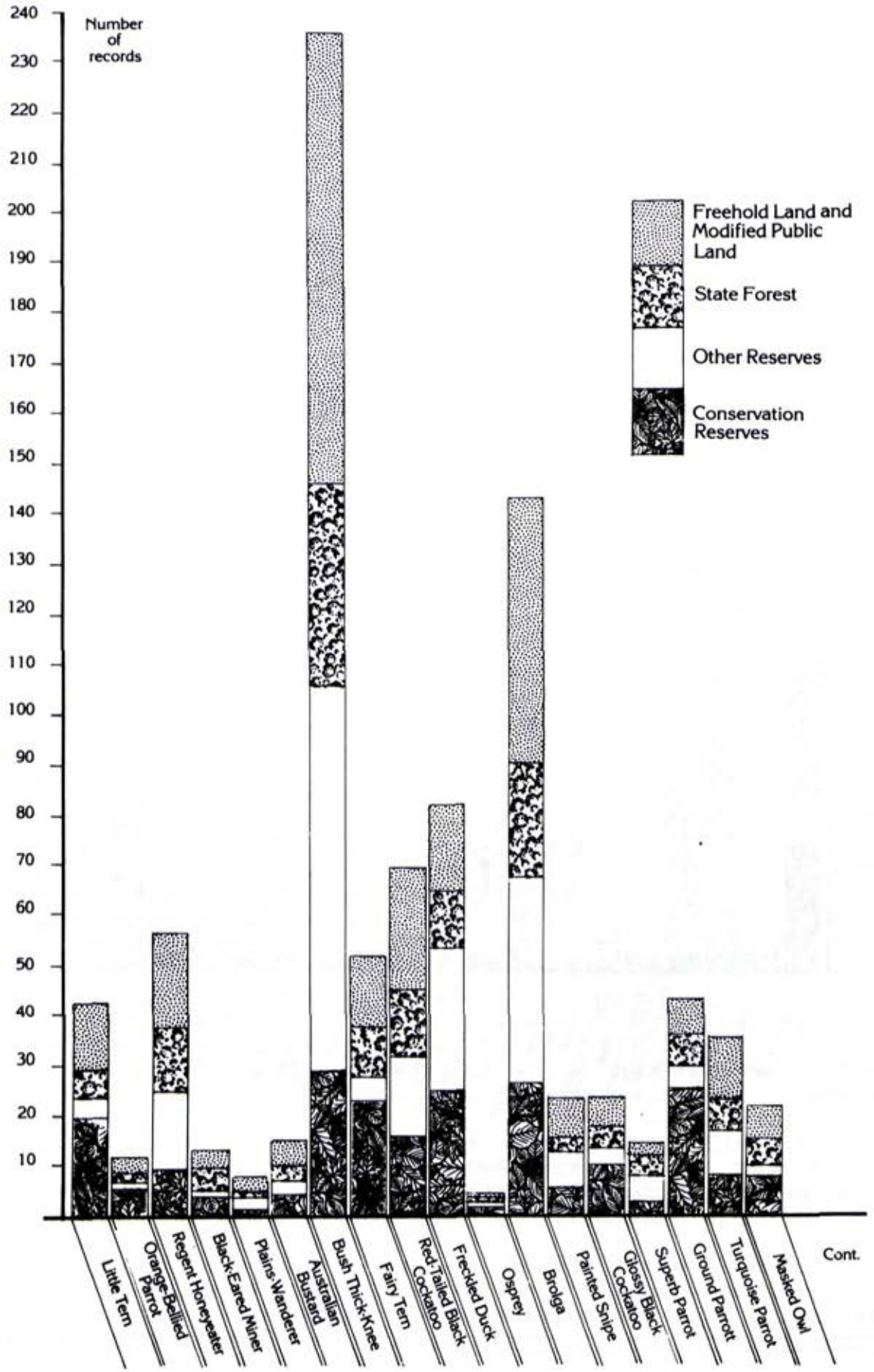
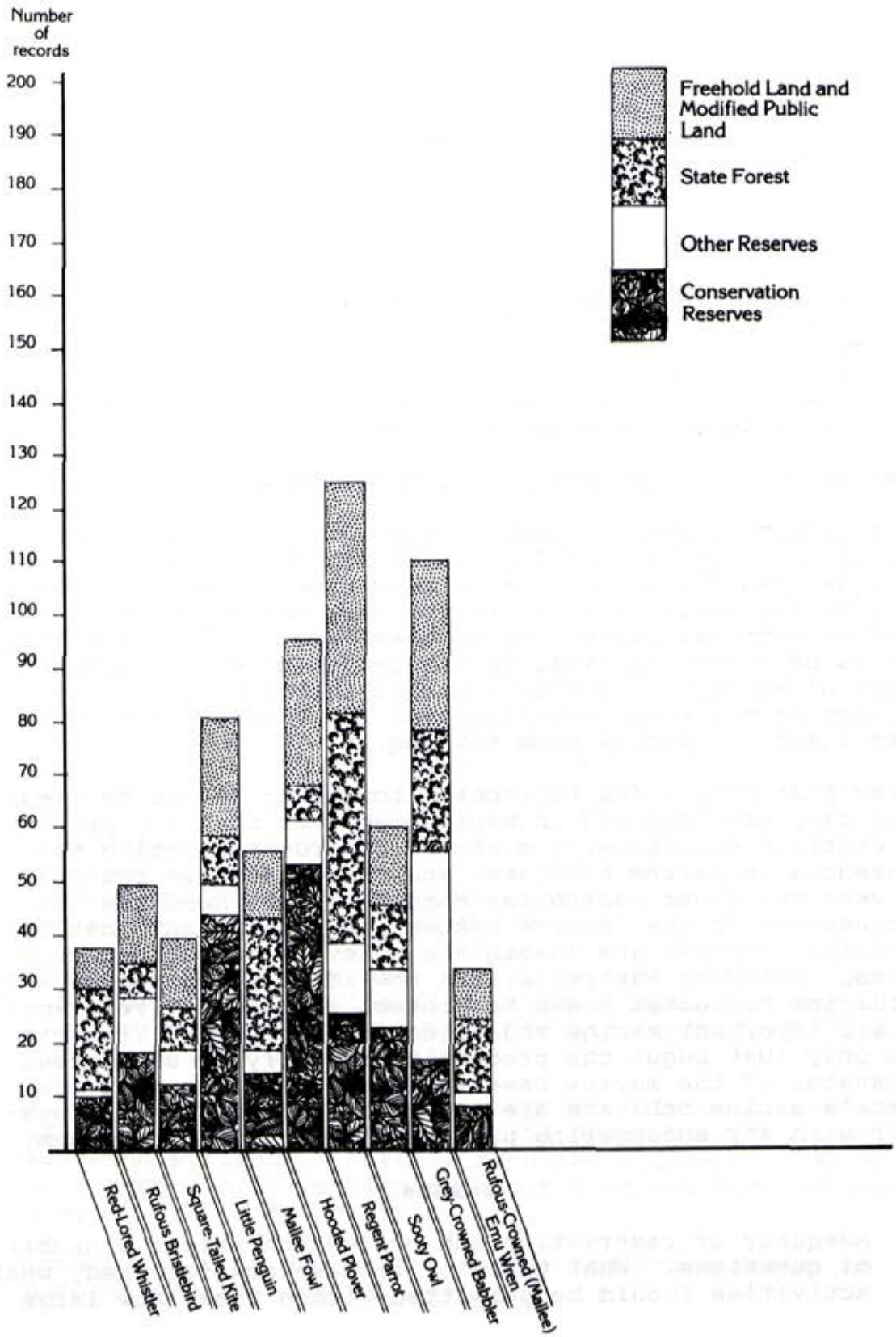


FIGURE: 9(b)

DISTRIBUTION OF THREATENED BIRD SPECIES



Not only are mature woodlands relatively uncommon, they appear to be poorly represented in conservation reserves.

Another 8 bird species have between 20% and 30% of their records in conservation reserves. All of these species namely, the rufous-crowned emu wren, red-lored whistler, malleefowl, red-tailed black cockatoo, Australian bustard, magpie goose, regent parrot, and freckled duck are either associated with habitats found in the Mallee area or the woodlands and wetlands of the Western Plains which have been severely depleted.

In summary therefore, it would appear that the habitats associated with the woodlands (including the riverine woodlands) and grasslands of the western and northern plains are inadequately represented in conservation reserves. Habitats found in the Mallee area also appear to be under-represented in the conservation reserve system.

Management issues

In addition, Frood and Calder make reference to a number of management-related issues that have a substantial bearing on the maintenance and protection of native flora and fauna. Many of these concern the continuation of various activities that are incompatible with the object of nature conservation, such as the grazing of domestic stock.

Evaluation of recommendations for marine areas

As a result of Land Conservation Council recommendations, the level of protection for Victoria's coastline has been extended significantly, but in most cases it usually extends only to low water mark, as in the sections adjacent to coastal national parks. It is therefore unlikely that this degree of protection will be effective for ecosystems anywhere off-shore. Victoria's marine territory is the area bounded by the ocean coastline and the 3 nautical mile seaward limit; it totals some 8520 sq.km.

Given that only a few stretches, totalling 320 sq.km (less than 4%), are included in marine reserves that are protected by controls specifically directed towards regulating the pressures on marine habitats, and that the three regions between the South Australian border and San Remo are not represented in the reserve system, it is apparent that the existing reserves are inadequate. Several developed countries, including Australia, are now identifying Marine and Estuarine Protected Areas to protect representative examples of all important marine and estuarine habitats. Victoria has only just begun the process of identifying such areas. Expansion of the marine reserve system requires that the State's marine habitats are identified and assessed, together with any endangering processes that may affect them.

Issues

* Adequacy of reservation and protection raises a number of questions. What types of reserve are required, what activities should be permitted within them, how large

should they be, and how should persisting detrimental uses be phased out? What quantity and quality of vegetation types should they contain, and what proportion of a vegetation type's distribution (both current and presettlement) should be reserved? How effective are prescriptions for protected areas of State forest, and can territorial fauna survive when disrupted by other uses in State forest?

* Identification of further substantial reserves to protect particular plant communities or areas with a high diversity of fauna - inadequately protected plant communities are listed in Appendix VII.

* Identification of further small reserves to protect sites carrying rare or endangered species - botanists at Latrobe University have prepared species status reports on a number of such plant species that are not yet adequately protected.

* Uses and reservation of marine areas - there is an urgent need for a thorough survey of Victoria's marine ecosystems and for further reservations based on the results of such a survey.

* Ecological, recreational, scenic, and cultural values of rivers and streams and their appropriate uses - currently the subject of a special investigation by the Land Conservation Council.

* Uses and reservation of rainforests - this formed the subject of a government policy, however, some unsolved problems remain.

* There is concern about the need for representation of a range of age forest classes and successional stages.

* Uses of wilderness - should conservation or recreation be the primary aim of management? There is a need for clear recommendations regarding uses and the type of reservation.

* Areas where particular public interest is likely in current and future reviews include the Central Highlands, the Melbourne and Metropolitan Board of Works' catchments, the Otways, and the Mallee.

* Need for further research - this is required into marine areas and on protection of endangered species (in particular conservation genetics, habitat requirements, and impact of land use activities).

* Wildlife reserves - these currently contain an imbalance of habitat types, with 134 of 152 State wildlife reserves being wetlands. Further recommendations on uses are also needed - in particular whether or not hunting and grazing should be permitted.

* Impacts of soil and water degradation and salinity on nature conservation values.

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9. LAND SYSTEMS

The land systems approach was developed to meet the need to include data on various land characteristics and processes when planning for land use and management. While originally used for soil conservation planning on freehold farmland, this approach has been adopted by the Land Conservation Council in its public land use planning process.

It is an ecological approach, which integrates environmental features often mapped singly, for example, rainfall, geology, topography, soils and indigenous vegetation. The mutual distribution of these is not random. Patterns occur, governed by the interaction of climate, geology and landform over time, to influence the distribution of soils and vegetation. In order to map land systems, these patterns are identified by air photo interpretation, field observation and other techniques.

A land system is a complex mapping unit in that it contains a pattern of land components, each of which has little variation in climate, lithology (rock type), landform, soil and indigenous vegetation. Soils and vegetation can vary widely however between different components of the same land system. The land component is regarded as a unit of management for broad-scale uses such as dryland farming or forestry.

Detailed land systems surveys involving intensive field work, laboratory analysis of soils, and map scales of 1:100 000 to 1:250 000, have previously covered about two-thirds of the State.

For the Statewide Assessment, land systems of Victoria have been completely remapped at a consistent scale of 1:250 000 by J.N. Rowan. A new system of identification has been developed, and as described below, these land systems have been grouped into a set of geomorphic units. Some 711 land systems have been mapped. For this report the land system boundaries have been simplified from the 1:250 000 maps, and are published at 1:500 000 scale in Maps 19 to 22. A brief description of each land system is tabulated in Appendix VIII and available from the Council on request, in microfiche form. The complete set of the more detailed maps is available with a separate report, 'Land Systems of Victoria', by J.N. Rowan.

Land classification systems

For systematic classification of landform patterns, and for comprehension, there is a need to divide the State into broad-scale units, which can in turn be divided into land systems. In one method, the Atlas of Victoria contained a map showing the State broken into 59 broad 'land types' at the scale 1:2 million. Each 'land type' may have contained several defined land systems, but these were not identified,

mapped or referenced. Some early studies grouped similar land systems into 'land zones', but these were mapped for only a small part of the State (Table 19).

As an improvement on these methods, a new system of 'geomorphic units' has now been used. Precedence has been given to geomorphology because of the control exerted by landform pattern and geomorphic history on the dependent features, particularly soils. The scheme begins with 6 then 9 then 29 geomorphic units (Table 20). Within each, a specified suite of land systems occurs.

The land systems are classified and labelled according to the relevant geomorphic unit, then the independent features landform (upper-case letters), lithology (lower-case letters) and climate (numbers 2 to 9), as shown in Table 21. Subscripts distinguish different land systems with the same independent features.

Table 19

LAND MAPPING UNIT TERMINOLOGY AND HIERARCHY

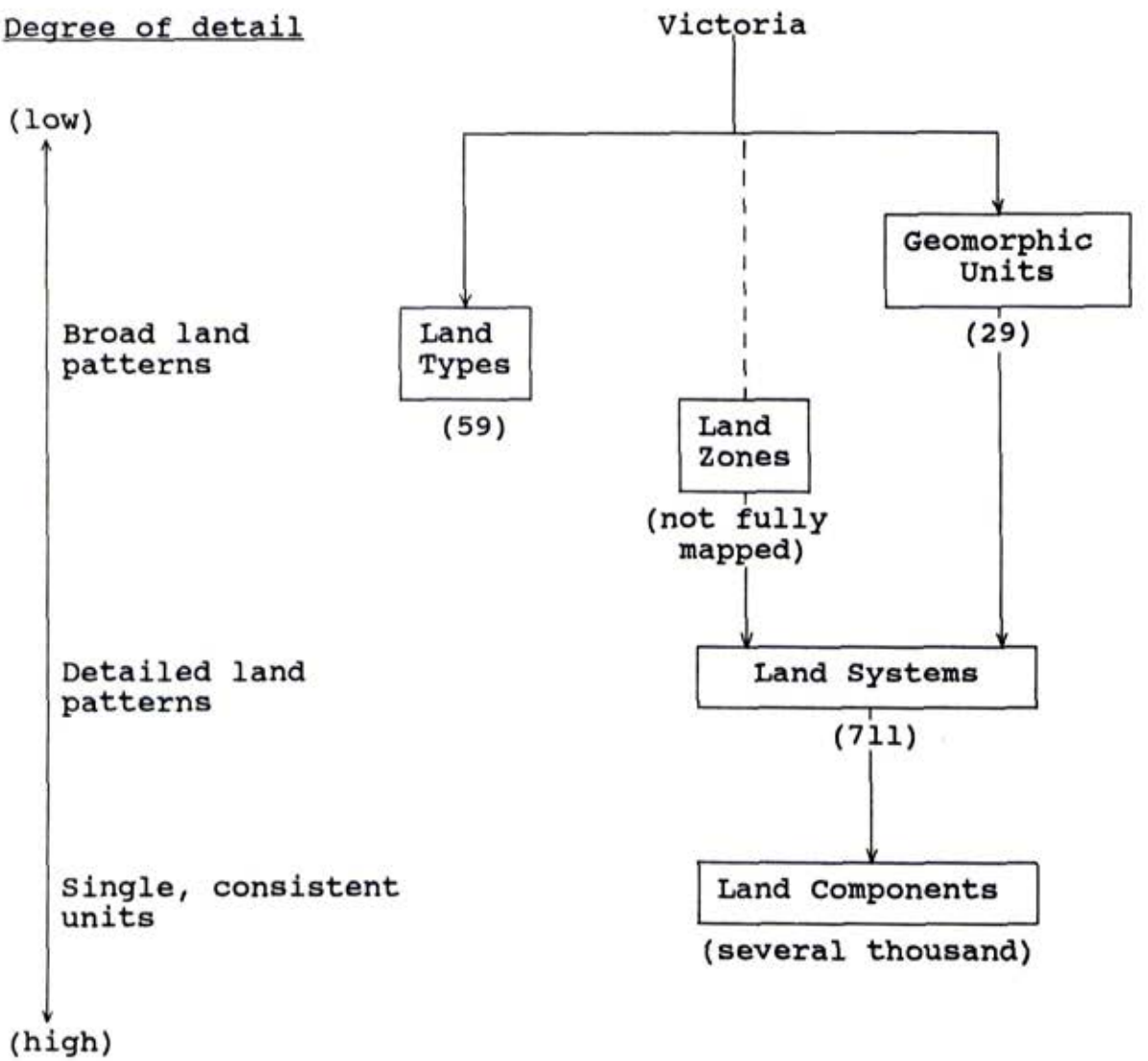


Table 20

GEOMORPHIC UNITS OF VICTORIA

Central Victorian Uplands	East Victorian Uplands	1.1	Dissected uplands
		1.2	Dissected plateau (Wellington uplands)
		1.3	High plains (Dargo, Bogong, etc)
	West Victorian Uplands	2.1	Dissected uplands (Midlands, etc)
		2.2	Prominent ridges (Grampians)
		2.3	Dissected tableland (Dundas Tableland)
		2.4	Dissected tableland (Merino Tableland)
South Victorian Uplands		3.1	Dissected fault blocks (Otway Ranges)
		3.2	Moderately dissected block (Barrabool Hills)
		3.3	Moderately dissected ridge (Mornington Peninsula)
		3.4	Dissected fault blocks (S. Gippsland Ranges)
		3.5	Dissected outlier (Wilsons Promontory)
Murray Basin Plains	Riverine Plain	4.1	Present floodplain (Murray Valley)
		4.2	Older alluvial plain (Shepparton)
	Mallee Dunefield	5.1	Low calcareous dunes (Ouyen)
		5.2	High siliceous dunes (Big Desert/Sunset)
	Wimmera Plain	6.1	Clay plains (Nhill)
		6.2	Ridges and flats (Goroke)
		6.3	Low siliceous dunes (Little Desert)
West Victorian Volcanic Plains		7.1	Undulating plain (Western District)
		7.2	Stony undulating plain (Western District)
South Victorian Coastal Plains		8.1	Ridges and flats (Follett)
		8.2	Dissected plain (Port Campbell)
		8.3	Sand and clay plain (Moorabbin)
		8.4	Fans and terraces (Western Port)
		8.5	Barrier complexes (Discovery Bay/Gippsland Lakes)
South Victorian Riverine Plains		9.1	Present floodplains (Gippsland)
		9.2	Intermediate terraces (Gippsland)
		9.3	High terraces and fans (Gippsland)

Table 21

KEY TO LAND SYSTEMS

Landform

C	Coastal dune
E	East-west dune
F	Present floodplain
G	Gentle to moderate hill
I	Irregular dune
L	Lunette
P	Plain above flood level
R	Stranded beach ridge, usually trending NNW-SSE
S	Steep Mountain and hill
W	Weakly elongated dune
Y	Gypseous dune

Lithology (rock type)

c	Coarsely-textured unconsolidated deposits
f	Finely-textured unconsolidated deposits
g	Granites and gneisses
l	Limestone
s	Sedimentary rocks
v	Volcanic rocks
z	Saline finely-textured deposits

Climate (mean annual rainfall)

2	200-300 mm
3	300-400 mm
4	400-500 mm
5	500-600 mm
6	600-700 mm
7	>700 mm; temperate
8	>700 mm; montane
9	>700 mm; sub-alpine

Subscripts

These distinguish land systems with similar landform, lithology and climate, but different soils and vegetation.

For example, occurring within geomorphic unit 2.1, the land system symbol $Pf3_1$ indicates a plain (P) above flood level, finely-textured (clayey) unconsolidated deposits such as alluvium (f), and mean annual rainfall (3) between 300 mm and 400 mm. The subscript number 1 differentiates between this land system and others with the same broad characteristics but different soils and vegetation. To specify any land system, the geomorphic unit number must first be given, as for example, $1.1/Ss7_1$, $1.2/Ss7_1$, $2.1/Ss7_1$, $3.1/Ss7_1$, and $3.4/Ss7_1$, are five distinct and different land systems. Where more than one letter is used for landform or lithology, the land system contains a mixture, with order of letters reflecting the decreasing abundance of each feature.

Brief descriptions of the dependent variables (vegetation and soils) are given in Appendix VIII, on microfiche. Where land systems have been mapped in earlier published studies, the original land system names are cited in that Appendix, and detail can be obtained through use of the references.

For each land system an assessment has been made of the soil deterioration processes to which the land is considered susceptible. Susceptibility refers to an inherent quality as distinct from terms such as hazard or risk which combine natural qualities with land management regimes.

Use of land system data in planning

As integrated surveys identify fundamental differences between types of land, their application has widened from their original uses to include various other uses such as town and regional planning, forestry, water supply catchment protection, and services such as effluent disposal.

Land system data have also been used by the Council in the process of selecting areas for certain conservation reserves, to ensure that the range of land systems in the State are represented in these reserve types.

Representation of land systems in reserves

Areas recommended for inclusion in several of the Council's major public land use categories - national and State parks, reference areas and education areas - have been selected in part on the basis of the land systems they represent. It is now possible, following completion of the State-wide land systems mapping, to review this process, and determine gaps in representation.

The concept of representation can be as difficult with land systems as with nature conservation. Boundaries between land systems are often not as precise as they shown on the maps, and a randomly selected area may not be typical of a whole land system. Areas at opposite extremes within a land system may not be identical to central areas, because of gradual changes, for example in annual rainfall. Map scale limits the size of small inliers of another land system which can be shown. Reserves may cover only one component of the five or six in a land system, leaving others unrepresented. For example, most wildlife reserves are wetlands (see Appendix

VI), and may represent only the drainage depression component, but not the alluvial terrace, lower slope, upper slope or ridge components.

Council's policy for national and State parks refers to representation of 'major land types' in such reserves. It is clear that this refers to land systems rather than the Atlas of Victoria 'land types', as:

* the various larger reserves are of a size which can represent land systems but not land types (the average area of the land types is 386 000 ha)

* the systems are mapped at the same scale as Council's recommendations, while the land types are at one-eighth that scale

* the number of Council's recommendations for conservation reserves is appropriate for land system representation.

Council did not intend that all land systems be represented in reserves, but that the more extensive ones be represented where suitable areas exist on public land, as well as smaller land systems, where these have important land or landform characteristics.

All of the larger reserves recommended by Council have been reviewed for their land systems content, using the 1:500 000 public land use and land systems maps in this report. Single-component reserves (for example, wetlands wildlife reserves) were not considered representative unless a larger percentage was covered. Adequate representation was arbitrarily assessed to be at least 10% of the estimated total area of each land system.

The following analysis is limited by its use of estimates for area, and its assumption that the appropriate figure for adequate representation is 10%.

Appendix IX identifies those conservation reserves that contain part of each land system, while Table 22 provides an overall summary of representation.

The adequacy of representation of the 711 land systems has been assessed on the basis of all occurrences in reserves. However, the appendix gives no indication of the extent or completeness of representation. For example, a land system may occur in only a small part of one or more reserves, or only a limited number of land system components may be present. In other cases, the whole land system may be represented in several reserves, but each occurrence, or the reserves themselves, may be very small. These factors have been taken into account when assessing the adequacy of representation of each land system.

Table 22 indicates that 32% of all land systems are adequately represented in reserves, and a further 23% occur on public land although poorly represented in reserves. The remaining 45% of land systems occur mainly on freehold land, and are unable to be adequately represented.

The extent of each land system was estimated using the following classes:

* Very small - less than 5000 ha (22%)
* Small - greater than 5000 ha, less than 20 000 ha (37%)
* Moderate - greater than 20 000 ha, less than 60 000 ha (29%)
* Extensive - greater than 60 000 ha, less than 225 000 ha (8%)
* Very extensive - greater than 225 000 ha (3%)

The percentage of all land systems in each class is shown in brackets. While some 420 of the 711 land systems are smaller than 20 000 ha, the larger ones lift the average area to about 32 000 ha. Removing the land systems having 'very small' extent caused only a small change in reservation status, increasing the percentage adequately reserved from 32% to 33.5%, or some 60% of land systems occurring on public land.

Of interest are the figures for representation in reserves shown in Table 22, which groups the land systems into their geomorphic units.

All land systems in some geomorphic units - 1.3 high plains, 3.5 Wilsons Promontory, 6.3 Little Desert - are adequately represented. In some others most land systems are represented - 1.2 Wellington plateau area, 2.2 Grampians, 5.2 Big Desert/Sunset, 8.5 coastal barrier complexes. These areas remained as public land largely because of their perceived unsuitability for agricultural use last century.

About half the land systems are represented in reserves in the extensive East Victorian dissected uplands unit (1.1), and in units 3.1 (Otways dissected fault blocks) and 8.4 (Western Port fans and terraces).

Among the 19 geomorphic units that are poorly represented in reserves overall, few land systems occur on other public land in the following units - 3.3 Mornington Peninsula ridge, 6.1 Nhill clay plains, 8.3 Moorabbin sand and clay plain, and 9.2 Gippsland intermediate terraces. In five units, not one land system is adequately represented, most notably on the West Victorian Volcanic Plains (7.1 and 7.2), where only 8 of 61 occur on public land. These geomorphic units are in areas which have been almost totally alienated because of their desirable characteristics, or ease of development, for agriculture.

In unit 4.2 Riverine-older alluvial plains, only 3 land systems are well represented, and another 5 of a total of 35 contain more than minor public land areas. Of these systems, $Pf3_1$ and $Pf4_1$ are both 'very extensive' and $Pf3_2$, $Pf4_2$, $Pf5_2$, $Pf6_1$, and Pfc4 are all 'extensive' (refer to land systems maps), but none of these contains sufficient public land for adequate representation.

Table 22

REPRESENTATION OF LAND SYSTEMS IN RESERVES

Geomorphic unit				Land systems			
Name			No.	No. with good representation	Number with poor representation		Total number
					Other public land exists	Less than 10% public land	
Central Victorian Uplands	East Victorian uplands	Dissected uplands	1.1	81	48	40	169
		Dissected plateau (Wellington)	1.2	16	3	2	21
		High plains	1.3	11	-	-	11
	West Victorian uplands	Dissected uplands	2.1	19	37	70	126
		Prominent ridges (Grampians)	2.2	6	1	1	8
		Dissected tableland (Dundas)	2.3	2	2	4	8
		Dissected tableland (Merino)	2.4	-	-	2	2
South Victorian Uplands		Dissected fault blocks (Otway)	3.1	4	3	-	7
		Moderately dissected block (Barrabool)	3.2	-	-	2	2
		Moderately dissected ridge (Peninsula)	3.3	1	1	7	9
		Dissected fault blocks (S. Gippsland)	3.4	1	3	8	12
		Dissected outlier (Wilsons Promontory)	3.5	6	-	-	6
Murray Basin Plains	Riverine plain	Present floodplain	4.1	2	3	3	8
		Older alluvial plain	4.2	3	5	27	35

Murray Basin plains	Mallee dunefield	Low calcareous dunes	5.1	4	11	15	30
		High siliceous dunes	5.2	9	3	-	12
	Wimmera plain	Clay plains (Nhill)	6.1	1	-	12	13
		Ridges and flats (Goroke)	6.2	3	2	9	14
		Low siliceous dunes	6.3	4	-	-	4
West Victorian volcanic plains		Undulating plain	7.1	-	5	45	50
		Stony undulating plain	7.2	-	3	8	11
South Victorian coastal plains		Ridges and flats (Follett)	8.1	4	7	3	14
		Dissected plain (Port Campbell)	8.2	9	14	11	34
		Sand and clay plain (Moorabbin)	8.3	-	1	4	5
		Fans and terraces (Western Port)	8.4	4	-	3	7
		Coastal barrier complexes	8.5	23	3	2	28
South Victorian riverine plains (Gippsland)		Present floodplains	9.1	4	1	11	16
		Intermediate terraces	9.2	1	-	11	12
		High terraces and fans	9.3	9	11	17	37
			Totals:	227	167	317	711
			Percentage:	32	23	45	100

Several geomorphic units - 1.1 and 2.1 (East and West Victorian dissected uplands), 5.1 (Mallee - low calcareous dunes), 8.2 (Port Campbell plain) and 9.3 (Gippsland high terraces and fans) - contain substantial numbers of land systems on public land but without reserves, indicating the potential for reservations in future studies.

In unit 2.1 (West Victorian dissected uplands), public land occurs mainly as small, fragmented parcels. The low proportion of land systems adequately represented in reserves for this unit, some 15%, reflects the difficulties of identifying areas suitable for reservation in such land.

While the above analysis is sufficiently accurate to identify major gaps in the reserve network, it should not be concluded that major increases in reserves are necessary to represent other land systems. A more detailed investigation may show that many are at present adequately reserved in less than 10% of their area; in other locations carefully targetted reserves of moderate size would achieve representation.

Representation of land systems in reference and education areas is separately reviewed in chapters 10 and 11.

Issues

* meeting the gaps in the representation of certain land systems in parks, reference areas, and education areas

* use of land systems information, and more detailed land component and land capability studies to assist in public land management planning and programs

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10. ECOLOGICAL REFERENCE

As a general principle the concept of setting aside relatively undisturbed areas for scientific reference is now widely accepted (Fenner, 1975; Helman *et.al.* 1977; Fatchen and Lustig 1986).

Acceptance of the concept is based on the observations that:

* knowledge of land including land capability and processes is very imperfect
* suitable land for reference is generally becoming scarce
* a demand does exist for scientific reference areas within the scientific community
* there is a need to preserve genetic diversity

A number of approaches can be taken in allocating land for reference and maintaining its values for such use. They range from zoning to specific legislation to designate and protect such areas, with reason for their creation ranging from achieving representation of land systems to the preservation of special or unique ecological values suitable for scientific reference.

Victoria's Reference Areas

After 150 years of European influence, it was realized during the 1970s that many types of land found in the State had been so extensively developed that no undisturbed samples, suitable for scientific reference, remained. In addition, it was believed that, given the State's rate of development, viable undisturbed samples of the remaining undeveloped land types would soon vanish unless a conscious effort was made to permanently protect them for use as reference both now and into the future.

As many of these undeveloped land types are found on public land, the task of finding suitable samples for reference became part of the Land Conservation Council's task of recommending balanced public land use. Furthermore, because it was developing an ecological approach to land appraisal (which stresses integration of several environmental features), in allocating land for reference the Council pursued a policy based on securing representation of the major land systems found in the State, particularly if these systems had been or were about to be modified elsewhere for productive uses. Land systems are fully explained in chapter 9.

Protecting the Environment - A Conservation Strategy for Victoria

The Government's Conservation Strategy, published in 1987, recognizes the importance of maintaining undisturbed

examples of Victoria's natural environment and seeks as one of its primary objects to 'protect representative and ecologically viable samples of all Victoria's natural ecological systems, including land systems, native vegetation types and native animal communities'. The established system of reference areas has a major role in fulfilling this object.

Definition and description

Reference areas are tracts of public land containing viable samples of lone or more land systems that are relatively undisturbed. These are to be reserved in perpetuity since the *Reference Areas Act* 1978 contains no provision for revocation.

They are used to maintain natural ecosystems as a reference to which those concerned with studying land for particular comparative purposes may be permitted to refer, especially when attempting to solve problems arising from the use of land.

The use of land can, and does, give rise to problems and effects that change ecological systems, many of which are irreversible. Finding a solution to such problems or gauging the effects of use can be assisted by reference to an undisturbed sample of land where capability and natural processes have been maintained intact. Here the soils, vegetation and fauna, and water, nutrient, and energy cycles can be studied under natural conditions and the knowledge gained can be compared with the land in use.

Reference areas include typical examples of lands that have been modified for 'productive' use elsewhere. They allow the measurement of human impacts due to land alteration and utilization.

So that the natural processes can continue undisturbed, a reference area must not be tampered with. Access to it is restricted, and experimental manipulation is not permitted. Activities such as grazing, exploration for minerals and gold, mining, logging, beekeeping, recreation and any others that conflict with its purposes are not permitted.

Each reference area is chosen so as to be sufficiently large for viability and is surrounded by a buffer, the width of which would vary according to the activity occurring on the adjacent land. The buffer will protect the area from damaging or potentially damaging activities nearby. It will also protect important values in the surrounding land from potentially damaging natural processes occurring within the reference area.

Reference Areas Act **1978**

From its earliest recommendations, Council identified a need for areas for scientific reference, and foresaw the need for both new legislation to specify the status of these areas, and for the establishment of an advisory committee to determine broad policy for their management. Consequently the *Reference Areas Act* was passed in 1978, to meet these needs.

Under this Act, after the government has considered a recommendation by the Land Conservation Council, the Minister may recommend to the Governor-in-Council that certain land be proclaimed a reference area. Following acceptance of the Minister's recommendation the Governor-in-Council proclaims it under section 3 of the Act. Notice of proclamation is published in the *Government Gazette*.

The Act provides for the appointment of a Reference Areas Advisory Committee to advise the Minister about the way each one should be protected, controlled, and managed so as to preserve it in perpetuity as a reference.

The committee consists of up to 6 members, all of whom are appointed by the Minister for Conservation, Forests and Lands. Three members come from the Department while the other three are persons having qualifications in one or other scientific discipline concerned with matters relating to the preservation or management of land and ecological communities.

Under section 6 of the Act the Minister may publish in the *Government Gazette* from time to time directives for the protection, control, and management of all or any particular reference areas and the relevant land manager should comply with those directives.

It is now proposed that the provisions of the *Reference Areas Act* be incorporated into the new 'lands' legislation being prepared by the Department. In the draft legislation, land may be designated as a reference area as well as being classified or categorized for other uses such as a national park, State park or State forest in much the same way as it is now.

Uses

The use of reference areas may be undertaken in accordance with the guidelines provided by the Reference Areas Advisory Committee. Types of use permitted are:

* surveys to complete inventories within the reference area

* surveys for comparison with land of the same type outside the reference area, especially by people attempting to solve problems arising from the use of the land

* studies to determine correct management procedures

* other studies (not involving manipulation or experimentation) to analyse relations between the biota and the environment to any level of complexity

In all of the above uses, permanent recording equipment may be set up provided its establishment and presence do not significantly affect the environment.

A number of authorities and individuals have used reference areas for scientific research.

The Latrobe University Department of Botany uses them in research on threatened Victorian plants. It is often desirable to search first for threatened plants in land that is relatively undisturbed in comparison with similar land. Spring Creek, Livingston Creek, and Yan Yean Reference Areas have been used for this purpose.

Botanical survey work has been carried out in Gelantipy Plateau, Zig Zag Creek, Benedore River, Seal Creek, Gattamurh Creek and Concordia Gully reference areas in East Gippsland while, long-term monitoring of vegetation changes followed the 1983 wildfire in Jones Creek Reference Area.

Fatchen and Lustig (1986) conducted a survey of potential users of reference areas and/or reference catchments, which established that there is a significant demand for such areas. However, they pointed out that many researchers do not make use of reference areas because they are unaware that these exist, while managers of the areas sometimes appear to be unaware of the variety of research uses that may be applied.

Other areas of the public land estate are also available for scientific reference. These generally take the form of an experimental control, such as a control catchment, or allow the user to manipulate the ecosystem and measure the effects of the modification. Chapter 22 discusses this and other types of use of public land for research.

Reference areas elsewhere

It appears that no other State in Australia has developed a reference area system comparable to Victoria's. The New South Wales National Parks and Wildlife Service has examined the need for establishing representative reference catchments for scientific studies of water and land resources in eastern New South Wales. The report prepared by Fatchen and Lustig addressed this need and suggested that a system of reference areas similar to Victoria's be created, for which the Victorian areas should be used as a model.

Various Provinces of Canada have formally proclaimed areas for use for scientific reference. These differ from the Victorian system, as they can include areas representative of natural ecosystems, ecosystems that have been modified and that are to be used in measuring recovery from such modification, areas in which rare or endangered plants or animals may be preserved in natural habitat, and areas containing unique or rare examples of botanical, zoological, or geological phenomena.

Evaluation of Victoria's Reference Areas

To date the Council has recommended that 127 reference areas be established and all of those considered by government have been accepted, except for the Framlingham Reference Area which was not accepted as the government resolved that this land should be controlled by the Aboriginal community.

The 127 reference areas are dispersed throughout the public land estate, mainly located within the larger blocks of public land. They contain examples of the land systems found within the State.

Appendix X gives a listing of the recommended reference areas in chronological order of area investigation, reference area recommendation number, land systems, and proclamation status.

In addition to the 54 reference areas proclaimed under section 3 of the *Reference Areas Act* 1978, three are at various stages of the detailed management planning process that occurs prior to proclamation.

Reference areas are managed by the authority managing the surrounding public land as the management of buffers is critical to their protection. The Geelong Water Board, with assistance from the Department of Conservation, Forests and Lands, manages two proclaimed reference areas; of eight are managed by the Melbourne and Metropolitan Board of Works, six have been proclaimed; while the Rural Water Commission manages one unproclaimed reference area. The 116 remaining, of which 46 have been proclaimed, are managed by the Department of Conservation, Forests and Lands.

The reference areas recommended range in size from 70 ha to 8400 ha, averaging 669 ha. The total - some 85 000 ha - represents about 1% of the State's public land estate or 0.4% of Victoria's land area. These 85 000 ha include some 11 areas, totalling 24 000 ha, found in the western 'deserts'.

Representation in reference areas

Of the 711 land systems in the State, 141 (20%) are represented in reference areas. Their distribution is broadly similar to the representation of land systems in conservation reserves, discussed in chapter 9. Appendix X lists the land systems occurring in each reference area.

Representation of land systems in reference areas (20%) is well below that of land systems adequately represented in conservation reserves - 32% (see Table 22, chapter 9), but this is expected as reference areas are only one of the eight categories of such reserves.

Forty-three reference areas occur on land systems which are not adequately represented in reserves. In part, this reflects the Council's policy of where possible, retaining for future reference examples of public land which has been largely alienated. Where other public land exists in these areas, little if any of it is in other conservation reserves.

Rarely can a reference area alone adequately represent a land system. While a carefully chosen site may include all components of the land system, it cannot represent the range of soil and vegetation trends within the system. To demonstrate, the average area of land systems is 32 000 ha and that of reference areas is 660 ha, about 2%.

Table 23

REFERENCE AREAS

Occurrence in Land Systems by Geomorphic Unit

Geomorphic unit	No of land systems with reference areas	Total no of land systems	Percentage (%)
1.1	61	169	36
1.2	7	21	33
1.3	5	11	45
2.1	13	126	10
2.2	3	8	38
2.3	1	8	13
2.4	-	2	-
3.1	3	7	43
3.2	-	2	-
3.3	-	9	-
3.4	1	12	8
3.5	2	6	33
4.1	3	8	38
4.2	1	35	3
5.1	5	30	17
5.2	7	12	58
6.1	-	13	-
6.2	2	14	14
6.3	3	4	75
7.1	1	50	2
7.2	1	11	9
8.1	5	14	36
8.2	7	34	21
8.3	-	5	-
8.4	2	7	29
8.5	4	28	14
9.1	-	16	-
9.2	-	12	-
9.3	3	37	8
	141	711	20

As shown in Table 23, few reference areas occur in the geomorphic units corresponding with the Dundas and Merino Tablelands in the south-west, the Barrabool Hills, Mornington Peninsula and South Gippsland Ranges, the older alluvial plains of the Murray and Goulburn valleys, the Wimmera clay plains around Nhill, the Western District Volcanic plains, the Moorabbin coastal plain, and in Gippsland, present floodplains and intermediate terraces. In these units, reference areas occur on only 5 of the 175 land systems.

These areas have been very largely alienated and substantially cleared for agriculture or other freehold land use.

This identifies a need for scientific reference, in accordance with Council's policy. However, the remaining public land in these areas is too fragmented to enable land to be selected and managed for reference. Table 22 (in chapter 9) shows that 45% (317) of all land systems contain less than 10% of their area as public land.

Land system size class	Land systems containing reference areas (%)
Very small	4
Small	14
Moderate	28
Extensive	47
Very extensive	67

Council did not intend that examples of all land systems be reserved for scientific reference, but its policy implies that major land systems should contain such reserves. About 60% of all land systems are in the 'small' or 'very small' size classes. The following percentages illustrate that reference areas have been recommended more frequently in land systems of greater extent.

It is, of course, harder to find suitable areas for reference in the 'very small' and 'small' land systems, and correspondingly easier in the more extensive ones.

Excluding the 'small' and 'very small' land systems, and those which have less than 10% of their area as public land, 103 reference areas occur in the remaining 190 land systems. Given the difficulties in identifying areas suitable for reference, this is a considerable achievement by the Council, particularly since a complete land systems map of the State has only recently been available.

Issues

* The Council's approach to the selection of reference areas is based on land systems representation. However, authorities elsewhere use different criteria for selecting areas for scientific reference and these need to be considered.

* It has been suggested that the land systems approach may result in a lack of representation of important natural features, particularly fresh-water and marine environments.

* The new lands legislation, if enacted, provides for the *Reference Areas Act* 1978 to be repealed. However, the provisions of that Act are incorporated in the new legislation, thus ensuring that reference areas are specifically identified and adequately protected. There was some concern that reference areas might simply be identified as zones within other land-use designations rather than identified areas with a permanent status.

* It may be necessary to enlarge some reference areas in order to achieve and maintain viable ecosystems.

* The Council's object is to protect viable samples of major land systems of the State in reference areas. As indicated earlier, about 87 of the larger land systems do not occur in reference areas. Representation of other major land systems in appropriate areas requires investigation.

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11. EDUCATION

Environmental education is concerned with people's interrelations with the natural and cultural environments. It aims at encouraging in people:

> 'a sense of awareness, concern, and responsibility about the total environment and its associated problems, and helps to provide them with the knowledge, attitudes, motivations, commitment, and skills to work individually and collectively towards solutions of current problems and the prevention of new ones' (1977 World Intergovernmental Conference on Environmental Education).

In this context, education about the environment would encompass a broad spectrum of concepts. They range from studies of the built environment, or of interrelations between people and between people and their environments, to studies of the natural environment where human intervention is not evident.

To place theoretical studies in a practical context, to relate learning to action, and to develop an awareness of the concepts, values, and skills necessary to conserve natural resources require access to land. To this end the Land Conservation Council has sought to encourage the use of public land for educational activities and to ensure that its management makes provision for them. The range of environments it includes and its relatively unaltered condition compared with most freehold land make public land a particularly important educational resource. Its natural systems may be contrasted with modified ones on other land nearby.

Provisions for environmental education

Almost all public land is available for education, a fact reinforced by the Council in its recommendations. For each of the major forms of land use proposed by the Council, such as parks and State forest, indicated in Table 24 education (with recreation) has been an identified primary or secondary use.

Educational opportunities generally available on public land outside specifically designated education areas, however, usually take a passive form, relying on observation rather than manipulation. Examples include 'forest tours' organized in State forests or 'nature walks' in national or other parks.

A number of schools also regularly use of public land for geography or biology studies, as is the case with Ballarat East High School at Union Jack, or Geelong Grammar at Delatite, or use private land as does Victoria College at 'Yarralock'.

In a less formal sense, education about the natural environment may be achieved through interaction with it during recreational activities such as orienteering, rock-climbing, bush-walking, or nature photography, which utilize features of that environment. In these situations learning can usually take place without conflicts arising between the educational use and the primary land use.

Table 24

REFERENCES TO EDUCATION IN RECOMMENDATIONS

	Land use
DIRECT REFERENCES	
Areas set aside specifically for environmental education	Education areas
'... to provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments'	National and State parks Coastal parks Marine and wildlife reserves Gippsland Lakes reserve
'... to provide opportunities for recreation and education in natural environments'	Multi-purpose parks
'... for public recreation and education where this does not conflict with ...' (*conservation of habitat*)	Wildlife reserves
'... to provide opportunities for recreation and education'	Natural features and scenic reserves
'... to provide opportunities for open-space recreation and education'	State forest (hardwood production, eucalyptus oil production, etc.)
[Further to the more general recommendations for State forest, the Council recommended that two areas, totalling 22 500 ha, should be '... used for education and research, associated with forestry management practices'. East Gippsland Area Review - 1986]	
'... to protect and conserve natural landscapes and ecosystems (and geomorphological, archaeological, and historical features) for public enjoyment and inspiration, and for education and scientific study'	Coastal reserve
'... to provide opportunities for recreation and education, and scientific study where appropriate'	Cave reserve
'... to provide opportunities for recreation and education associated with (their history)'	Historic area and reserve

Table 24 (continued)

	Land use
INDIRECT REFERENCES	
'... to maintain natural ecosystems as a reference to which those concerned with studying land for particular comparative purposes may be permitted to refer ...'	Reference areas
'... passive recreation such as nature study ... be permitted'	Flora reserves, and flora and fauna reserves

Long-term studies that monitor changes in ecosystems, require manipulation of the environment, or involve collection of samples, however, may conflict with the primary use of conservation reserves such as national parks - or may be compromised by other activities such as timber-harvesting from State forest.

To ensure that educational activities can take place without conflict, the Council has delineated specific areas exclusively for education, and these are listed in Table 25. These small relatively natural areas represent a wide diversity of environments across the State, in which education is the long-term primary land use. They provide representation of vegetation types ranging from sub-alpine woodlands to mallee scrub, and from tall mountain forests to coastal heath, and offer opportunities for a spectrum of educational experiences reflecting this range of environments. Some 20 of the 29 geomorphic units in the State are represented in education areas. Another 7 units occur in areas where there is very little public land, while the remaining two comprise Wilsons Promontory and the Little Desert, both of which are national parks.

By providing areas specifically for education, Council has ensured that all students have access to a range of natural areas for comparison, and that these areas remain available for experiments or observations that span long periods of time without threat of interference from other land uses. This feature is particularly attractive for senior secondary- and tertiary-level studies, where the work of successive years can be combined and compared. Primary-school teachers on the other hand, would tend to be satisfied with an attractive bushland setting that children could explore without themselves or the environment sustaining damage; the ability to undertake experimental work is not a prime object. For primary-school groups, accessibility, site safety, simple interpretative facilities, shelter, and toilet facilities would be the main features determining their use.

In its recommendations for education areas, the Council specifies that they should be permanently (and separately) reserved. In this way the Council seeks to ensure that they remain available in the long term and are not relocated or

Table 25

EDUCATION AREAS

Investigation Areas and Land Systems

Investigation Area	Education area details			
	Recommendation number	and name	Area (ha)	Land systems
North-eastern 1 (1973)	D1	Mountain Creek	770	$1.1/Sg8_5$ $1.1/Sgs7_2$
North-eastern 2 (1974)	D2	Lima South	380	$1.1/Sg7_1$ $1.1/Gg7_2$
Melbourne (1977)	M1	Eumeralla	313	$8.2/Gf6_1$ $8.2/Pf5_1$
	M2	Ocean Grove	143	$8.3/Pfc6$
	M3	Meredith	236	$2.1/Ss5_6$
	M5	Tylden South	115	$2.1/Gs8$
	M6	Mount Piper	45	$1.1/Gs7_4$ $7.1/Pvf7_8$
	M7	Kinglake West	280	$1.1/Gs8_1$ $1.1/Ss7_2$
	M8	Kinglake	60	$1.1/Ss7_3$
	M9	Andrews Hill	210	$1.1/Ss8_5$
	M10	Castella	50	$1.1/Ss8_5$ $1.1/Sg8_1$
	M11	Tonimbuk	250	$1.1/Sg8_3$ $1.1/Gg7_1$
	M12	Crossover	60	$1.1/Gs7_8$
	M13	Fumina South	170	$1.1/Ss8_{11}$ $1.1/Gv7_4$
	M15	Boggy Creek	160	$9.3/Gfc7_3$
East Gippsland (1977)	K1	Bidwell	300	$1.1/Gsg8_1$ $1.1/Ss8_{12}$ $1.1/Gsg6$
	K2	Sardine Creek	200	$1.1/Ss7_{13}$ $1.1/Sg7_{12}$
	K4	Serpentine Creek	500	$9.3/Pf7_6$
Mallee (1977)	H1	Outlet Creek	710	5.2/IPRc3 5.2/EPRc3 5.2/Ffc3
	H2	Timberoo	320	5.1/EPRfc3
	H3	Wemen	490	5.1/EPRfc2 4.1/FWcf2
	H4	Koorlong	680	5.1/PEfc2 5.1/RPEfc2
North-eastern 3,4,& 5 (1978)	L1	Carboor Upper	450	$1.1/Ss7_6$ $1.1/Gs7_6$
	L2	Mt Barambogie	700	$1.1/Sg6_4$
	L3	Lockhart Creek	500	$1.1/Sg7_1$

Table 25 (continued)

Investigation Area	Education area details			
	Recommendation number	and name	Area (ha)	Land systems
North-eastern 3,4,& 5 (1978) (continued)	L4	Wandiligong	180	1.1/Ss8$_5$ 1.1/Pf8
Corangamite (1978)	M2	Sherbrook River	395	8.2/Pf7$_4$
	M3	Barramunga Creek	135	3.1/Ss7$_1$
	M4	Bambra	217	8.2/Gf6$_2$ 8.2/Pf6$_2$
Alpine (1979, 1983)	H1	Delatite	421	1.2/Ss8$_1$ 1.3/Sg8$_4$ 1.3/Ss8$_4$
	H2	Mt Russell	220	1.3/Sg8$_4$
	H3	Mt Tamboritha	300	1.2/Ss8$_2$ 1.2/Ss9$_1$ 1.3/Gsg9$_1$
	H4	Sunnyside	535	1.1/Ss8$_4$
North Central (1981)	M1	Faraday	100	2.1/Ss5$_3$ 2.1/Ss5$_4$
	M2	Eppalock	1200	2.1/Ss5$_5$
	M3	Deep Lead	260	6.1/Pf5$_4$
	M4	Waranga	230	2.1/Gs5$_1$
	M5	Mt Egbert	90	2.1/Gs3
South-western 2 (1982)	M1	Black Waterhole	250	6.2/RPc5 6.2/PRf5$_3$
	M2	Potter Creek	400	2.2/Pc7 2.3/Pf7
	M3	Wannon Divide	275	2.2/Ss7 2.2/Pc7
	M4	Mount Napier	350	7.2/Pv6$_1$
South Gippsland 2 (1982)	M1	Jeeralong North	160	9.3/Gc6 3.4/Sf8
Ballarat (1982)	L1	Jenny Clayton	200	2.1/Sg7$_1$
	L2	Union Jack	70	2.1/Ss7$_4$
Gippsland Lakes Hinterland (1983)	M1	Seaton	110	9.3/Gfc7$_1$
	M2	Melwood	200	1.2/Gs7$_2$ 1.2/Ss7$_2$
	M3	Cutfinger	300	1.1/Svs7$_2$ 9.3/Gs7$_{11}$
South-western 1 Review (1983)	L1	Tarragal	150	8.1/PCc7$_1$ 8.5/PClc7$_1$
Murray Valley (1985)	M1	Spence Bridge	230	4/1/Ffc3 4.2/Pf3$_1$
	M2	Wallaby Hill	310	1.1/Gs5$_1$

Table 25 (continued)

Investigation Area	Education area details			
	Recommendation number	and name	Area (ha)	Land systems
Benalla--Upper Murray Review (1986)	L5	Little Snowy Creek	3	$1.1/Ffc7_2$
East Gippsland Review (1986)	K3	Cape Conran	780	$8.5/PCc7_7$
	K5	Mallacoota	49	$9.3/Pf7_6$
Wimmera (1986)	M1	Catiabrim	1350	6.2/EPRc4
Melbourne 1 Review (1987)	M7	Spargo Creek	290	$2.1/Gs7_2$ $7.1/Pvf7_3$

revoked at the discretion of the land manager. Separate reservation also ensures that the full range of activities applicable to an area could be carried out free of such restrictions as may be imposed by its inclusion in, say, a national park, and free of conflict occasioned by such activities as logging.

The provision of areas representing the general range of environments of a region specifically for educational purposes may also help to protect conservation areas from overuse. In the North Central area, the Mount Egbert education area is used for environmental studies and has reduced the pressure of use on the nearby Wychitella flora and fauna reserve.

Although a basic philosophy behind education areas supports the ability to conduct manipulative programs on aspects of the environment, it is not suggested that this is appropriate in all areas or in all parts of each one. It may be potentially damaging to even the larger ones to allow indiscriminate experimentation by individual groups.

Co-ordination by the land manager is essential. The development of management plans, however, should take place through the combined efforts of those knowing syllabus requirements, those with environmental knowledge, and those responsible for land management, to ensure that the area is developed in sympathy with both the particular education aims and the land capability.

Policy

The Council's policy is that education areas should be used to:

* illustrate related aspects of natural ecosystems including the geology, soils, hydrology, vegetation, fauna, and ecology of an area, and the processes of change in them

* provide a comparison with other natural and artificially altered systems nearby

* demonstrate and practice methods of environmental analysis and field techniques of the natural sciences

* conduct simple long-term experiments aimed at understanding the changes that occur with time

* provide facilities for day visits or extended stays

* provide adventure and recreational opportunities during vacation periods or when there is no specific requirement for their use as indicated above

Council also envisaged that no one group would have the exclusive use of an area, that any existing camps would continue to be used, where appropriate, for both education and adventure activities, and that new facilities, on-site accommodation, and even field laboratories could be constructed on or near the areas as required.

The Council's recommendations, accepted by the government, are for all education areas to be reserved under section 4 of the *Crown Land (Reserves) Act* 1978.

Selection criteria

The Council has based its selection of education areas in each of its study areas on the following criteria:

* provision of examples of major land systems within the study area

* inclusion of a maximum diversity of environments, preferably with natural boundaries

* a size large enough to sustain continued usage while rotating activities among a number of sites to permit their recovery

* reasonable vehicular access

* close proximity to other land types and land uses

* a wide distribution of areas throughout the study area situated so that fire, erosion, and pollution hazards are minimized

A recent paper prepared for the Graduate School of Environmental Science, Monash University, investigated criteria for the identification of education reserves, drawing on information from people involved in environmental education.

In addition to the above criteria, the team found that potential users seek areas that are internally accessible and in which limited facilities such as toilets and water supply are available. They indicated that some provision for physically handicapped people should be made within an education reserve. Some teachers require areas relatively close to

emergency communications, first aid, and shelter. As many teachers are uncertain of how these areas could be used, and lack confidence in dealing with the unfamiliar environments, the team suggested that the land manager should be clearly identifiable and supportive of the area's use for educational purposes and should also monitor, if not actually conduct, manipulative and interactive programs for students.

Current status

To date, the Council has recommended a total of 60 areas to be set aside for environmental education purposes (as shown on Maps 1 to 4). Subsequent government decisions providing land for Aboriginal purposes and a reservoir rendered two of these unavailable. Two others were owned, at the time of the Council's recommendation, by the Victoria Conservation Trust (one - Haining Farm - is now included in a schedule to the *National Parks Act* 1975) and are farmlands; while they do offer a number of educational opportunities, they are extensively modified and are not considered further here.

The remaining 56 education areas, including two recommended for relocation in reviews, have been accepted by the government. These occur in over 60 of the major land systems across the State, as listed in Table 25.

Only one area (Mount Piper) has been temporarily reserved, however, and none has yet been permanently reserved under section 4 of the *Crown Land (Reserves) Act* 1978, the government-approved form of reservation. Seven have been incorporated into adjacent national or State parks, where the management policies of the parks may conflict with the approved uses of the education areas.

By contrast, of 127 reference areas recommended by the Council, 54 have been proclaimed, despite each requiring a detailed management plan and review by the Reference Areas Advisory Committee. This difference may be because the *Reference Areas Act* 1978 was specifically passed to implement Council recommendations for such areas and provides a clear framework for implementation, and the Reference Areas Advisory Committee, set up by that Act, has actively worked towards establishing the reference-area system.

To guide the development of the education-area system, an interdepartmental standing committee on education areas was established in 1979 by the former Ministry for Conservation. Meetings of this committee lapsed in 1981, and during its operation it concentrated on the need for and expense of facilities for areas rather than the development of educational activities, supporting information, and promotional material.

Probably because of the need for interdepartmental co-ordination, the land managers have in general made very little progress in establishing and developing education areas for use. A prevalent attitude has been that 'all public land is available for educational purposes', a view that ignores the Council's reasons for recommending special areas for that use.

As a consequence, the management of education areas is minimal, and so is the public's awareness of them.

Use of education areas

In 1985, the Council conducted a telephone survey of some schools and other groups known to be interested in education areas, and the results, along with information from the Department of Conservation, Forests and Lands, indicated that about half of the areas were being used. Not all schools with potential interest in the areas were surveyed nor were the land managers or regional education officers fully aware of who was using them. The degree of usage may, in fact, have been greater. Nonetheless the areas were generally under-utilized, the main reason most probably being the widespread ignorance of their existence.

Poor access to some education areas has been proposed as one reason for their limited use. On investigation it was found that two (Kinglake and Fumina South) are quite difficult to reach due to narrow roads or fences and do not have adequate room to park vehicles. Four others have similarly difficult access but to a lesser degree, and most problems can be overcome by road repairs and parking areas. The balance present no difficulties.

Most schools surveyed by the Council were enthusiastic about the concept and would use education areas more frequently if curriculum material was available. To date, however, limited resource information has been printed for only three of the areas.

To assist in overcoming this paucity of available information, students from the Rusden Campus of Victoria College in 1986 developed a computer-based system whereby information about each education area could be systematically recorded, retrieved, and assessed. The system, programed to be available through 'Viatel' - Telecom's public-access videotex system - can be interrogated to provide information to potential users of the areas and allows for feedback into the data bank.

The framework for recording and classifying the information in the data bank is sufficiently flexible to accommodate the variable quality and quantity of information about each education area, and to allow modification of the data.

The students also investigated the availability of information about education areas and recommended the establishment of a management committee for the areas, a program of public information (including the production of an illustrated brochure about them), the extension and implementation of the Viatel-based information-access system, and the development and promotion of two representative education areas on a trial basis.

Most teachers indicated that they have neither the time nor resources to develop their own excursion materials and, because many lack confidence in using unfamiliar environments, they tend to use well-known areas where activities

and background data are already developed. As a corollary, once curriculum and/or interpretative information is prepared and disseminated, usage of areas is likely to increase. Teachers expressed particular interest in the chance to monitor variations in or to conduct experiments in land management, but - again because of unfamiliarity - it was felt that these programs should be set up and run by the land manager. In this way, too, damage to the environment could be avoided. Support and participation by the regional land manager would provide a reference point for potential users to deposit acquired resource information and the results of studies; it would also facilitate a booking system if necessary to prevent overlapping of users, and establish a regional contact to provide information on local weather, fire, or access conditions.

Suggested activities for senior students include: the long-term monitoring of some imposed management regime; collection of botanical samples; trapping and release of fauna; soil, geological, and water sampling; measurement of progressive change such as erosion, rehabilitation, or plant growth; and more recreation-based activities such as bushcraft or simply bush-walking. Comprehensive curriculum material based on each education area would be an important adjunct to its use.

The Rusden students also suggested the following long-term studies as being most suitable in education areas. (It should be noted, however, that the nature of these experiments would require the close involvement of the land manager in their implementation.)

* the invasion/recolonization of disturbed sites (quàrries, tracks, or eroded gullies) by introduced and native plants; possible emphasis on native 'weeds'

* effect of altered nutrient status on vegetation, such as heath, adapted to very low nutrient levels

* effects of grazing on sensitive vegetation types such as alpine flora

* effects of harvesting of forest products like mallee-broombush, eucalypt leaves for oils, and timber

* impacts of various fuel-reduction methods on plant communities (slashing, raking, burning, etc)

* effects of burning frequency on vegetation

* flowering cycles of plant species and the effects that pollen- and nectar-harvesting by commercial apiaries exert on the animal species that use them as food sources

* effects of management practices on populations of plants like endangered orchids or *Themeda* grassland

* revegetation of sites by various methods such as seed trees, seedlings, direct seeding, establishment of nurse crops, and mulching

* the effect of some of the above practices on water budgets and quality in selected stream catchments

An objective of the State government in its conservation strategy ('Protecting the Environment') is to 'promote and strengthen interdisciplinary environmental education programs in schools and tertiary institutions'. In this document the government noted that it has been examining ways to encourage the use of the Land Conservation Council education areas.

Three of the government's specific intentions with respect to environmental education are to:

* continue to assist the preparation of resource materials and guidelines for environmental education and to assist schools to develop their own programs

* increase awareness of sites designated by the Land Conservation Council as education areas and develop appropriate education programs for their use

* produce an updated Environmental Education Resources Directory, which will include information on available materials, contacts, and suitable sites for education activities

Other provisions for environmental education

Publications commissioned and produced by the Council during an investigation of an area contain valuable environmental data. Some submissions to the Council are also useful sources of information.

The descriptive report published as the first phase of the Council's investigation brings together in the one document contemporary information about the natural resources, uses, and potential of the land. It is an important resource document for anyone requiring general descriptions of a region of the State, and all the reports are in wide demand in the educational community.

The subsequent publications of the Council - proposed and final recommendations for each of the study areas investigated - are usually in less demand by educational groups unless some aspect of the recommendations becomes publicly controversial.

For many of its study areas, the Council has supplemented information provided by the member government departments, universities, and other organizations or individuals by commissioned studies or investigations by its research staff. That approach has increased the resource base available for Council consideration, and subsequently for public information.

Appendix XVII provides a categorized list of the various reports prepared for the Council, usually by consultants. Many of them have also been requested for educational purposes.

Issues

* A concerted and sustained program throughout the education community is required - to advertise the existence and utility of education areas, to achieve a stated object of the government's conservation strategy.

* A concerted and sustained effort by the land manager is required, to promote the use of education areas and to assist in their use.

* There is a need to develop curricula materials based on the use of education areas in general, and for the use of each area specifically, through co-operation between the land manager, user group, and other interested people.

* The Council's education areas should be reviewed in terms of the range of land types that should be represented and new or alternative areas sought if considered necessary. Those areas to which access will be a continuing problem, even with some roadworks, should also be reviewed with the view to possible relocation.

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12. HISTORIC SITES

This discussion deals with post-European settlement, with emphasis on historic sites located on public land and those that have been addressed in Council's various recommendations.

Any review of the identification of such sites on public land should consider the material below.

Activities conducted by Europeans on public land over the last 150 years can be grouped into six broad categories that have varying degrees of impact and visibility.

Pastoral use

Most land in Victoria has been used for grazing of sheep and cattle at some time. The original squatting occupation (see Map 6 in chapter 3) was followed by agricultural selection that saw most of the productive lands progressively alienated. Where the climatic conditions or soils are not favourable for agriculture, land remained in public ownership but grazing largely continued. Some of these areas are still being used by pastoralists in much the same way as they were in the squatting days. Examples include the high plains of the Alpine area, and parts of the Mallee.

While pastoral use has been widespread, it has produced comparatively few lasting physical structures. Bush huts, sheds, yards, fences, and tracks are the main examples, although the structures are vulnerable to damage by fire, or have been replaced or progressively updated as management techniques or requirements changed, and tracks quickly become overgrown if not used.

Mining

Gold-bearing lands, and other areas believed to have mineral deposits, were withheld from the land selection process so that mining would not be hindered by land-owners. In numerous instances, gold was found on poorer-quality land that had not been taken up for agriculture or grazing. Many of these areas have remained public land and frequently contain relics of the mining days - such as old machinery, shafts, mullock or tailings dumps, water races, poppet heads, and other surface soil disturbances. Unlike many other forms of public land usage, mining tends to cease abruptly and leave durable remains on the site.

Timber extraction

Victoria originally had a plentiful supply of timber for fuel and construction purposes. However, clearing of vast areas of forest - associated with the rapid spread of agricultural settlement after 1869 - emphasized the need for

public timber reserves. From the mid 1870s, deliberate measures were taken to retain some large areas of Crown land as production forest, particularly around the main mining areas.

Except for the few logs that were salvaged during the original clearing of farms, most of Victoria's timber supplies have come from these State forests. Many mills were set up close to the resource, and consequently relics of the early industry - particularly of mills, tramways, sites of residences, and sawdust heaps - occur on public land. As with pastoral artefacts, the few relics that remain become lost in overgrowth and are susceptible to damage by fire.

Public purpose facilities

From the beginning of European settlement, Crown lands were reserved or set apart for public purposes; these can be categorized as either sites for government services and utilities (for example, schools, railways, lighthouses, drainage channels, and government offices) or sites for public facilities (like roads, parks and gardens, water reserves, timber reserves, commons, and churches). Some of these are well represented on public land.

Temporary uses

Small areas of Crown land have traditionally been made available for a multiplicity of 'temporary' uses - those not involving alienation of the land. Examples include residences, business sites, charcoal pits, and beehive sites. Such activities did not specifically require a Crown land site, but made use of conveniently located Crown lands. Generally, little remains of their presence, although concrete blocks or fireplaces may still be found.

Transient uses

Other uses or events did not necessarily relate to land status nor did they leave artefacts - for example, explorers' routes and sites of prominent historical events, accidents, and decisions.

Factors for consideration

A review of the identification of historic sites on public land should consider the following factors.

* History and the awareness of history are ongoing processes, hence the identification of historic sites and the recognition of past values are also ongoing. It follows that a list of historic sites cannot be exhaustive, but indicates what is considered important by a particular assessor at a particular time.

* History is inherent in all lands, structures, and activities, and virtually all public lands have been used by European settlers to some extent for pastoral, agricultural, commercial, industrial, residential, or recreational purposes at some time. Whether past or ongoing

uses are understood and considered to be historically significant can vary with the time of evaluation and the perceptions of the assessor, who uses objective methods to assess the significance of sites in the context of the present.

* The perceived historical heritage will continue to grow with the passing of time; in contrast, however, the extent of the natural heritage is diminishing.

* Because of the concept of property rights observed by European settlers in Australia, many of the land-use activities of Europeans have occurred primarily on areas that are now privately owned. Consequently, historic sites on public land cannot be fully representative of the history of the State of Victoria.

Council's Provision for Historic Sites

As with most of its land use categories, the Council's approach to historic sites has evolved over time.

Many historic sites on public land are located in broad areas that have been recommended by Council for such other purposes as national, State, and regional parks and hardwood production areas. Where the historical features are prominent, as in the Beechworth, Chiltern, Brisbane Ranges, Steiglitz, Hepburn, and Mount Samaria Parks, the recommendations may specifically refer to them. In most cases, however, the historical values are not brought out in the recommendations, as the Council focussed primarily on the natural values of the land.

The earliest of the Council's recommendations did not give consideration to sites of historical interest relating to the post-settlement period, and none was identified for special reservation. In 1977 and 1979, two sites and five sites respectively, were set aside by the Melbourne and Alpine final recommendations as historic areas. Each is of substantial size and contains a number of obvious relics of the mining era.

Recommendations for the North Central area (1981) introduced a new land use classification - the historic reserve. These are small sites, often containing single relics rather than a range of them, and most are located on small blocks of public land that were originally withheld from sale because of the public importance attributed to the various activities (usually mining) occurring on them. In these circumstances the historical values are often obvious because other values are insignificant. The reverse is often true in larger areas of public land, where apparently isolated or individual relics have not been afforded a special designation, but are nevertheless protected within the broader land classification.

Also for the North Central area, the Council contracted a consultant to investigate and make an inventory of the historic sites on public land. This was a departure from previous studies, which used information from departmental

sources and submissions only. This and subsequent studies were assisted through the use of a checklist of historical themes (see Table 26).

Consultant studies to provide an inventory of historic sites have now been undertaken in the following areas: North Central (1979), Ballarat (1980), North-eastern (Benalla--Upper Murray Review 1984), Melbourne (District 1 Review 1985), East Gippsland (Review 1985), and the Mallee (Review 1986). Full references for these are listed in Appendix XVII.

In all cases, time and resource limitations restricted the studies to little more than inventories of sites and broad rankings based on the consultants' expertise and on the established list of themes in the table. Placement of sites into a broader regional historical framework, with associated analysis of historical significance, was not undertaken. Individual sites have, however, been given a significance rating as perceived by the consultant.

The results from the consultants' surveys are far from definitive, but they do indicate the extent and diversity of historical relics on public land within a study area. A number of problems, however, are inherent in the reports, principally because of the Council's limited resources and restriction to public lands.

* Considerable emphasis is placed on physical structures, whereas sites with significance that transcends structure or relics have not been sufficiently considered.

* Some consultants' reports do not indicate the methods by which the sites were selected initially and, consequently, the depth and extent of the investigation can only be inferred.

* Ranking of significance given to sites appears in some cases to derive from an arbitrary process without the descriptive, conceptual, or statistical foundations being explained.

* Inventories are inconsistent and incomplete in their treatment of urban or township Crown lands, becaus in most cases such land is not 'public land'.

The Council's recommendations for historic sites tend to emphasize those with physical relics commemorating the mechanical transformation of Victoria's countryside, and the historic areas and reserves are set aside not only as sites where relics are protected but as areas that can be used for education and the interpretation of historical features. As a result, sites with important but subtly expressed historical values might not have been identified by a specific recommendation.

Although the very small areas of public land are omitted, the inventory of historic sites still achieves the primary aim of identification of historical themes on public land. However, the exclusion of land in cities, boroughs, and towns and of land vested in municipalities is, in part, the

Table 26

CHECKLIST FOR AN INVENTORY OF HISTORIC SITES*

Theme	Sub-theme
Contact, exploration tion, possession	Early contact Maritime exploration Terrestrial exploration: early pastoral mining (i.e., discoveries) Sites of acts of possession
Events, persons, activities	Landing sites of first settlers Proclamation sites Riots, disturbances Monuments Later civic Artists, writers, etc. Other
Settlements	Proposed but unoccupied Unsurveyed - briefly occupied Surveyed - occupied - but now abandoned: partially abandoned completely abandoned Early settlements with many original characteristics Aboriginal missions and settlements Settlements of specific ethnic groups (Chinese, etc.) Unidentified ruins Special sites associated with settlement: cemeteries, burial grounds rifle ranges water reserves, etc. recreation reserves gardens
Primary productive industry	Grazing Cereal Orchard Vineyard Market garden: Chinese European Other, including beekeeping
Primary extractive industry	Timber-getting Quarrying: building stone gravel limestone

Table 26 (continued)

Theme	Sub-theme
Primary extractive industry (continued)	Mining - gold: alluvial - hand workings alluvial - major sluicing (hydraulic) alluvial - dredging alluvial - deep lead quartz - tunnelling and shafts quartz - open-cut other (specify) Mining - other minerals Guano and other phosphate deposits Saltworks
Secondary industry	Processing of primary productive products Processing of primary extractive products Manufacturing
Tertiary industry	Trade and exchange (market, shops) Transport (roads and bridges) Services (water, sewerage) Public administration (municipal, State, federal) Police, judicial, penal Health services Communication Education: schools mechanics institutes, libraries Scientific sites and installations Religion Recreation Other, including buildings and houses
Defence (Army, Navy, Air Force)	Forts and gun emplacements Internment camps War memorials

* Modified from 'Report of the Project Co-ordination Committee on Historic Archaeology' (1978).

reason for the heavy emphasis on mining, because themes such as 'public utility' and 'government offices' are often concentrated and well-represented in urban areas.

Table 27 lists the specific recommendations for historic areas or reserves by study area, while Table 28 summarizes this list by area and major type.

Table 27

RECOMMENDED HISTORIC AREAS AND RESERVES

Study area	Area or reserve[1]	Type
South-west 1 (1973)	-	-
South Gippsland 1 (1973)	-	-
North-east 1 (1973)	-	-
North-east 2 (1974)		
Toombullup	A	Timber, Kellys Archaeological
Melbourne (1977)		
Walhalla	A	Mining
Bungal	A	Mining
East Gippsland (1977)	-	-
Mallee (1977)	-	-
North-east - 3,4 & 5 (1977)	-	-
Corangamite (1978)	-	-
Alpine (1979)		
Howqua Hills	A	Mining; settlement
Grant	A	Mining; settlement
Victoria Falls	A	Power station
Oriental Claims	A	Mining
Cassilis	A	Mining
North Central (1981)		
Castlemaine-Chewton	A	Mining
Percydale	A	Mining; town
Stuart Mill	A	Mining; timber
Maldon	A	Mining
Moliagul	A	Mining
Diamond Hill	A	Mining
Landsborough	R	Mining
Glendhu	R	Mining
Majorca	R	Mining; town
Kong Meng	R	Mining
Timor	R	Mining
Tipperary Hill	R	Mining
McIntyre	R	Mining
Rheola Hill	R	Mining
Nine Mile	A	Mining
New Bendigo	R	Mining
Wild Dog Diggings	R	Mining
Baileston	R	Mining
Fosterville	R	Mining
Wehla	R	Mining
Lower Homebush	R	School
Graytown	R	Mining
Kinyapaniel Creek Weir	R	Water supply
North Central (1981)		
Wanalta Weir	R	Water supply

North Central (1981) (continued)		
Murchison Water Works Trust Water supply	R	Water supply
Goldsborough	R	Mining
Serpentine Creek Weir	R	Water supply
Gooseberry Hill Tunnel	R	Mining
(Tarnagulla Township)	-	Mining
South-West 2 (1982)		
Hand in Hand Co. Mine	R	Mining
Deep Lead	R	Mining
Ballarat (1982)		
Nerrina	A	Mining
Jubilee	A	Mining
Lal Lal-Bungal	A	Mining
Australasian No. 2 Deep Lead Mine	R	Mining
Golden Stream	R	Mining
Happy Valley	R	School
Piggoreet	R	School
Berringa	R	Mining
Bulldog	R	Mining; school
South Gippsland 2 (1982)	-	-
South-west 1 - Review (1983)	-	-
Gippsland Lakes (1983) Hinterland	-	-
Alpine Review (1983)		
Mount Wills	A	Mining
Mount Murphy	A	Mining

Murray Valley (1985)		
Woolshed Swamp Sheepwash	A	Pastoral
Boxwood, Lime and Wood Reserve	R	Mining
Chiltern Valley Extended Mine	R	Mining
North-east (Benalla-Upper (1986) Murray) Review		
Tallangallook Dry Creek	A	Mining; township
Nine Mile Creek	A	Mining
Bethanga	A	Mining
Mansfield Railway Station	R	Railway
Cocks Eldorado NL Gold Dredge Site	R	Mining
Cocks Pioneer Open Cut Mine	R	Mining
Cunningham Gully Mine	R	Mining
Reform Quartz Gold Mine	R	Mining
Magpie Creek Reserve	R	Mining
Pioneer Hydraulic Sluicing Co.	R	Mining
Timber Trestle Bridges Cudgewa-Wodonga	R	Railway (6 sites)
East Gippsland - Review (1986)		
Bonanza Gully	R	Mining
Victoria Star Mining	R	Mining
Golden Gully Mach. Site	R	Mining
Wimmera (1986)		
Serviceton Railway Station	R	Railway
Mooree	R	Archaeological

Table 28

SUMMARY OF RECOMMENDATIONS BY COUNCIL

A. Recommendations by area

Study area	Historic areas		Historic reserves		Total area (ha)
	Number	Area (ha)	Number	Area (ha)	
North East 2	1	265			265
Melbourne	2	2 520			2 520
Alpine	5	13 373			13 273*
North Central	7	12 590	22	655	13 245
Ballarat	3	620	6	51	671
South West 2			2	12	12
Alpine (Review)	2	9 850			9 850
Murray Valley			3	75	75
North East (Review)	3	930	13	105	1 035
East Gippsland (Review)			3	100	100
Wimmera			2	58	58
Total	23	40 148	51	1 056	41 104*

* Adjusted for a reduction by 100 ha in the 1983 review.

B. Recommendations by major type

Study area	Pastoral	Mining	Timber	Water supply	Govern-ment	Other public
North East 2			1			1
Melbourne		2				
Alpine		5				
North Central		24	1*	4	1	
Ballarat		7			2	
South West 2		2				
Alpine (Review)		2				
Murray Valley	1	2				
North East (Review)		9			7	
East Gippsland (Review)		3				
Wimmera					1	1
Total	1	56	2	4	11	2

* Is also a mining site

The recommended historic sites show variability in both distribution and theme and Tables 27 and 28 reveal a process of evolving awareness of historical values, particularly after 1979, when the Alpine Area Final Recommendations were published. This is emphasized in the North-eastern Area (Benalla--Upper Murray) Review, published in 1986, which recommended three historic areas and eight historic reserves; the

recommendations for the same area between 1973 and 1977 proposed only one historic area. Therefore in parts of the State - particularly those areas examined prior to 1979 - historical values may be unrecognized.

Important as mining has been to the State's history, the Council's recommendations do not properly represent post-settlement history as it relates to all public land; also, the large number of sites relating to the State's mining past, particularly in the North Central area, suggests an imbalanced representation of post-settlement historic sites.

Several factors have contributed to the prominent recognition given to mining sites. Mining was widespread and known auriferous lands were not sold but were reserved; or they were less attractive for pastoral or agricultural uses. More-over mining artefacts are durable and, on their abandonment *in situ* at the cessation of operations, became the property of the Crown. The relics remain widely distributed on public land - perhaps more than for any other single theme.

In contrast, pastoral sites on public land are under-represented for the following reasons. Most squatting runs and homesteads were converted to freehold during the 19th century and are outside the Council's charter. Those areas remaining as public land through the squatting influences are not recognized as having historical importance, as squatting history is not well publicized. In any case, pastoral occupation of unalienated public land, although widespread, did not produce dramatic landscape changes other than deforestation, and few associated structures persist, particularly since pastoralists replaced or modified structures (such as new fences, yards, or sheds) as needs and methods changed. Finally, continuous pastoral use of public land - for example, grazing on the high plains - has not been highlighted as a 'historical' land use.

Timber-industry-related sites are also poorly represented. The relics occupy only small sites, often isolated from each other, in areas that are still used for timber production and are thus likely to be used and modified or replaced as needs arise. The relatively few structures associated with the industry were both susceptible to fire and located in fire-prone areas. As well, overgrowth conceals some, and often makes access difficult. And again, continuous use of broad areas for production forestry has not been recognized as a 'historical' land use.

Public-purpose, private-occupation, and other sites are also under-represented. These are small and, if recognized at all, are frequently not considered sufficiently important to be identified for special recommendations. In open country, they often occur on small blocks of public land that have not been specifically identified by public land mapping. (Mapping is usually down to 1-ha blocks, whereas many, such as school sites, are smaller than this.) However, they commonly occur in cities, towns, and boroughs and, although many are historically very important, are outside the terms of reference of the Council.

Aboriginal Archaeological Sites

Despite a tendency in the past to concentrate on post-settlement history, awareness of the history of the Aborigines is growing. Evidence of Aboriginal occupation and usage of areas occurs throughout the State, but it has only been in the last 15 years or so that the cultural value and significance of this non-renewable and diminishing resource have been widely appreciated by the non-Aboriginal Australians. Changes in land use over the last 150 years have resulted in substantial destruction of Aboriginal archaeological heritage.

The Victoria Archaeological Survey facilitates public access to this heritage through research, documentation, and education, and Aboriginal communities play a vital role in its management. Thus far, the Survey has recorded about 9700 Aboriginal archaeological sites, of various types, of which about 3000 (or 30%) are located on public land. As only a very small proportion of the State has been systematically surveyed, thousands of sites probably remain to be located. Hence, the total number and type of identified sites, and their distribution across the State, only reflect the limited extent and nature of the surveys. However, there is an urgent need to resource systematic surveys of the State before this heritage is lost for all time.

Aboriginal archaeological sites are grouped into a number of categories. These are given in Table 29, together with the percentage of sites in each category.

All archaeological sites, regardless of their situation or category, are protected under the *Archaeological and Aboriginal Relics Preservation Act* 1972 and amendments. This Act does not distinguish between sites on public or freehold land. In addition, the *Aboriginal and Torres Strait Islands Heritage Protection Amendment Act* 1987 will also afford protection to Aboriginal archaeological sites. However, because of each individual site's circumstances, some are vulnerable to natural and human-induced deterioration. Such problems as rabbits, weed infestation, erosion, and accessibility to visitors and vehicles place many sites at risk. Fortunately, many are located within permanent reserves such as national parks, State parks and smaller reserves. Such sites should be afforded additional protection by their inclusion in a management plan, where likely causes of deterioration can be identified and controlled. In many other areas of public land, however, this level of potential active protection is unavailable and the inadvertent destruction of sites through such things as forestry, mining, or public usage is a very real possibility and does occur.

In the course of its investigations of public land across the State, the Council has not applied a systematic approach to the protection of Aboriginal archaeological sites. However, as Table 30 shows, about 52% of those on public land have been included in a conservation reserve of some kind. This does not necessarily imply that these sites are actually better protected than those in other categories of public

Table 29

ABORIGINAL ARCHAEOLOGICAL SITES IN VICTORIA, BY TYPE
(current at May 1988)

site type	Frequency (number rounded)	Percentage (% rounded)
Isolated artefact	700	6.0
Rock shelter/cave	170	2.0
Exposure in bank	190	2.0
Grinding grooves	20	<1.0
Stone house	290	3.0
Mound	1 510	14.0
Art site	120	1.0
Rock arrangement	40	<1.0
Scarred tree	2 930	26.0
Artefact collection	60	<1.0
Burial	220	2.0
Other type	180	2.0
Fish trap	60	<1.0
Isolated hearth	340	3.0
Shell midden	1 880	17.0
Aboriginal place	30	<1.0
Quarry	50	<1.0
Surface scatter	2 170	20.0
Rock well	40	<1.0
	11 137 *	100.0

* Weighted total: the weighted total is the summation of all site types. Where one site carries different types - e.g., burial area, with surface scatter - it is counted as '1' under each site type class, and thus counts as more than one site.

land, nor that the remaining sites are inadequately protected, but the management goals for the conservation reserves should certainly assist in avoiding inadvertent damage. Management strategies to protect sites in the long term need to be based on a detailed understanding of the context of the sites and experience in the application of various management strategies in particular situations.

As with many other resources on public land, the questions of site significance and representation, for example, in social and scientific terms, are very difficult to establish. It is a complex process to determine the significance of a particular site, especially when such a small area of the State has been investigated and because of the difficulty in making comparisons between various types. However, under existing legislation all sites have equal significance.

In relation to representativeness, Vinnicombe (1974) argues that:

> '... it is urged that the total picture be taken into consideration, and that a representative selection of

> associated sites, even if insignificant on their own account, be included in management proposals. Preservation of a transect through a range of habitats, and of sites reflecting a range of activities, will ensure a more complete reconstruction of the living patterns of the people who produced the sites.'

This approach is similar to that adopted by the Council in ensuring representation of other resources on public land, but a serious problem arises when knowledge about the total resource is incomplete. As this is the Victorian situation it would seem appropriate to develop a means of preserving a broad range of the archaeological resource. If preservation is focused on units of space rather than specific resources, the survival of a representative sample of resources in that area will be easier to achieve (Dunnell 1984). This approach also preserves the relations between the archaeological resources and their environment, so aiding both research and public education views of the past.

The protection of representative samples also relies heavily on the identification of broad cultural areas or regions, as Aboriginal resources in the archaeological record are the product of a cultural relationship with the landscape. It should therefore be possible to define broad environmental boundaries that have important cultural implications (Witter 1984). In addition, major landscape features or specific landscape resources are often associated with discrete components of archaeological record. Thus, the protection of representative areas on a regional basis must take into account both cultural and physiographic factors.

On the basis of the current understanding of the distribution of sites, it is possible to provide qualitative comments on this in relation to landscape features, distribution of resources, and cultural boundaries. Unless an area has been specifically surveyed in detail it is not possible to make categoric statements on the presence or absence of a site in that area. Consequently, the supply of maps showing the distribution of currently known sites may, through the assumption that an absence of points on a map means an absence of sites or particular site types on the ground, can in fact put sites at risk. In some instances it has caused damage to or destruction of sites. The translation of the Victoria Archaeological Survey's current understanding of site distribution into a predictive model at a map scale of 1:500 000 is currently under investigation. It is expected that these predictive models in association with appropriate management guidelines will enhance the long-term survival of Aboriginal archaeological sites.

There is obviously a need for a great deal more survey work and identification of the Aboriginal cultural resource and a more systematic approach to the identification of significant and representative sites. The Council, in the past, has given some attention to the protection of certain sites, but its approach has been inconsistent. However, despite this, a large number of sites do occur on public land and the agencies responsible for management should be made aware of these cultural values and how they may be best protected.

Table 30

DISTRIBUTION OF KNOWN ABORIGINAL ARCHAEOLOGICAL SITES ON PUBLIC LAND AS AT JANUARY 1988

Study area	Conservation reserves	Other reserves	State forest	Modified areas
South Gippsland 1	1S, 1A	90M+S, 1T		6M+S
Melbourne	25M+S, 1S 2M	62M, 10S		
Mallee	28T, 7S 2A, 1B, 5H, 2M+S	1A, 1H	1B, 1A 37T, 4S 7N, 7H 2M+S	1C
North-eastern 3, 4, & 5	18S, 9A		18S, 18P, 18T, 9C	9P
Corangamite	1N, 3B, 30M 17S	27M, 3S 17M+S	1N	1N
North Central	11W, 34N 31T, 30	11N, 2T 2S	6T	
South-western 2	15S, 18C, 19P, 14T, 3N, 1Q	21T, 2P 2C, 2M		2T, 1N
Ballarat	33O, 33P	33S		
South Gippsland 2	1A, 1B 45M, 3S, 13M+S	19M+S		7S, 4T 6A
South-western 1 Review	1M, 34S 13J, 6F 2E, 1D 1H, 41M+S			
Gippsland Lakes Hinterland	13S, 6C 8A, 3T	47T, 3M	6S, 8T, 2G	5T
Alpine Special Investigation	3P, 31T 21A, 3B 3S, 3D 3F	3A, 3T 7S	3S, 14A	
Murray Valley	1C, 1B, 3T 3N, 1M+S	1C, 14B, 32N, 1T, 12S	11T, 20N	
North-eastern (Benalla-Upper Murray)	28P, 4S 4C, 20T	20T	4A, 4B 8T, 8S	
Wimmera	3T, 4S	6S, 82T 5A	1S	1S
Melbourne 1 Review	17A, 33S	17O, 17W	17Q	
East Gippsland Review	1Q, 3A, 1E 8S, 72M 15M+S			
Total	52	18	27	3

Note:

Figures are expressed as a percentage of total number of sites in each study area.

KEY TO TABLE 30:

Recommendation categories

Conservation reserves
National or State parks, wilderness, reference areas, wildlife reserves, flora and flora and fauna reserves, coastal parks, marine and wildlife reserves

Other reserves
Regional or multi-purpose parks, bushland reserves, streamside reserves, education and historic areas, water production

State forests
State forest, hardwood production, uncommitted land, forest area, recreation reserve

Modified areas
Agriculture, softwood production, eucalyptus harvesting, minerals and stone, utilities

V.A.S. site type

A - Artefact
B - Burial
C - Cave/rock shelter
D - Other
E - Exposure
F - Fish trap
G - Groove
H - Hearth
J - Stone house
M - Midden
N - Mound
O - Rock arrangement
P - Painting
Q - Quarry
S - Surface scatter
T - Scarred tree
W - Rock well
M+S - Midden and surface scatter

Council recommendations

The Council has, in a number of its final recommendations for various study areas, recommended that Aboriginal archaeological sites or relics be protected, for example, in the Grampians National Park, and the Black Range State Park. In other cases the existence of particular sites has been noted. However, Council has not specifically set aside any area primarily for the protection of Aboriginal archaeological sites, partly because of the concern that once an area is identified, it could be threatened by over-use or vandalism.

Issues

Several aspects of Council's recommendations for historic sites require further investigation.

* Most historic sites identified in Council recommendations relate to mining history. Other themes have not received the same level of investigation due to the paucity of relics on land within Council's charter.

* Gaps occur in the information base - both in consultants' reports and in cases where consultants were not

employed. No information on historic sites exists for Council's early studies.

* It may be appropriate in future to consider the historical significance of a study area as a whole rather than concentrating on what is essentially an inventory of sites, without further analysis.

* There is also a need to conduct historical studies on public land in cities, towns, and boroughs, which is outside Council's jurisdiction.

* Activities on public land including mining, forestry and tourism pose an ongoing threat to the survival of Victoria's remaining Aboriginal archaeological heritage.

* To ensure the protection of archaeological sites as a public resource there is a need for detailed site surveys to be carried out.

* 'Archaeological significance' needs to be defined in a manner that can be used to rank sites for the purposes of making recommendations.

* Council recommendations, based on a systematic assessment of the Victoria's archaeological heritage could lead to the systematic protection of significant and representative sites on public land. The effectiveness with which the Council's recommendation leads to the protection of sites requires assessment.

* The Council could recommend significant archaeological sites or groups of sites, which are not contained within reserves such as national parks, as historic areas and reserves.

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13. LANDSCAPE

This discussion deals with the concept of landscape and landscape evaluation. Although implicit in many of Council's recommendations, landscape has not generally been separated as a concept or treated in its own right in a specific recommendations chapter. Instead it has been an integral part of many recommendations. When making recommendations for its preservation and protection, Council has not followed a particular methodology. Accordingly applications of landscape assessment have not been consistent between study areas.

The landscape is our total visual environment. It encompasses all visible landform, water-form, vegetation, and cultural components. It is a visual resource just as soil, water, and vegetation are other important land resources. All should therefore be taken into account in determining the use and management of public land.

Landscape management is important because all land uses and land management activities occur within the context of a landscape setting, and have visual components to a greater or lesser degree (for example, mining, hardwood and softwood, forestry, power-line construction, and roading).

Sensitive land management should ensure that marked land use changes and management actions are integrated into the landscape with the least possible disruption to visual and physical resources. Thorough planning and careful management of operations can often minimize the need to go to extensive and expensive lengths in subsequently reducing any unexpected landscape impacts. Landscape assessment is therefore best used early in the planning stage of major projects or operations.

Assessment

Awareness of the importance of visual resources in Victoria is growing. These have long formed the basis of much of the State's tourism and associated recreation. With this awareness, though, comes a diversity of opinions regarding methods of assessing the landscape in a systematic, uniformly applicable way. One method that has been applied in the Victorian context is the Department of Conservation, Forests and Lands' Visual Management System, although its refinement is still continuing.

This system describes and tabulates the physical landscape in terms of landform, water-form, vegetation, and land use, and assesses visual resources for scenic quality, public appreciation, and general visibility. It is only applicable to non-urban environments, especially forest landscapes.

In addition to the Visual Management System, a systematic inventory and assessment of the features is important. A

'landscape feature analysis' describes and records the characteristic major forms, lines, colours, and textures. Human-induced change can be better integrated by borrowing from or reflecting these landscape characteristics.

The scenic assessment procedure developed by the consultants 'Scenic Spectrums' (1986) adopts a similar methodology and applies it to rivers. The procedure seeks to identify systematically rivers or river sections with the best scenic features or general scenic quality.

This serves to illustrate that variations in assessment procedures can be used to assess and emphasize specific components, and to determine how these fit into the general landscape context.

Since 1972, the National Trust has been identifying significant landscapes in Victoria. It has two levels of significance: 'classified landscapes' are those parts of the physical environment, both natural and constructed, that contribute to the heritage of Australia and must be preserved. 'Recorded landscapes' are those parts that contribute to our heritage and should be recorded, whose preservation is encouraged.

In order to be either classified or recorded, a landscape must have outstanding scientific, cultural, and aesthetic values and quality. Frequently, such values and quality are interrelated, although one may predominate. Any person may propose that a landscape be classified, which ensures that in due course it will be evaluated by the Trust. To date, the National Trust has classified 120 landscapes and 70 have been recorded.

Council's provision for landscape

While there has been no formal study of landscapes, provision for their protection has been implicit in most of the Council's recommendations. Any recommendation for a major conservation reserve has necessarily included consideration of its landscape. Many of the national and State parks are located in areas of high landscape appeal. In fact, among the areas identified by the Visual Management System as having high scenic quality, many remaining on public land have also been identified by Council for recreation - for their landscape features as well as their other values. Appendix XI summarizes this position, and associates the recommendations with the principal landscape character types identified by Leonard and Hammond (1974).

In addition, landscape is the primary factor in other recommendations such as natural features and scenic, bushland and scenic reserves, roadside conservation, and natural features zones.

These have provided the main mechanisms for protecting significant scenic features within Victorian landscapes. Comments in the Council's reports and recommendations have also identified the need to maintain natural landscapes, features, or scenic character in many specific cases.

Landscape protection can be built into management planning for operations within State forest areas. For example, one recommendation of the Alpine Area Special Investigation was use of the Visual Management System in relation to timber-harvesting and recreation, and particularly the scenic quality of the Alpine Walking Track.

Small blocks of public land, road reserves, river and stream frontages, etc. all contribute to landscape diversity, scenic interest and variety, and focal points in panoramic views. Preferences for 'natural' areas and the presence of wildlife have been catered for in the majority of Council's recommendations, as have preferences for water bodies, since Council has recommended the retention and conservation of many lakes and wetlands.

Scenic quality is enhanced if constructed features are absent or blend in with the surrounding environment. Council has so provided in utilities and survey categories, recommending that new power lines, pipelines, etc. be planned to minimize disturbance to public land, follow existing easements if possible, and not be located along streams or lakes. Their planning and construction must be sensitive to landscape.

Some perception testing indicates a public preference for eucalypt forest cover rather than pine forests. Where Council has recommended softwood plantations, it commonly proposed these in conjunction with a 'forest area'. This is designed to protect the adjacent softwoods area, conserve fauna and flora, and preserve scenic values.

Hardwood-timber harvest proposals in Council hardwood-production zones and areas adjacent to the Alpine Walking Track have been subject to detailed landscape studies, which focussed on demonstrating how timber can be satisfactorily extracted and visual resource values maintained. Methods of achieving this include selective harvesting, logging from coupes of reduced size or irregular shape, carefully planning the sequence of logging operations over time and space, and planning roading, snig tracks, and landings. The Wheelers Creek Landscape Study within the Council's Alpine Area offers one example of this amalgamation of timber, visual, and other land-resource values.

The identification of landscape values by the Council in other recommendations for hardwood production is important. For example, the landscape values of Turton Track and the Wild Dog Spur in the Otway Ranges were recognized in the Corangamite Study, 1978. To reconcile these values and timber-harvest demands, the Department of Conservation, Forests and Lands has conducted a landscape study to provide visual guidelines designed to minimize visual impacts and to integrate timber-harvesting operations sensitively into the landscape.

Summary of Council's recommendations

Council has made various recommendations that have a direct effect on protecting landscape values. A park is defined in

general terms by Council as 'an area of land in a natural or semi-natural condition, reserved because of its scenery, floral and faunal content, historical interest, or other features, which is used by the public primarily for open-space recreation and education'.

The various types of parks have different and precise definitions in Council's recommendations. National parks have 'outstanding natural features and diverse land types, set aside primarily to provide public enjoyment, education, and inspiration in natural environments'. State parks are generally smaller, and have a less diverse range of land types, but still have the purpose of providing the public with enjoyment, education, and inspiration in natural environments.

Recommendations for State forests have directly addressed the need to conserve landscape values. In the final recommendations of the East Gippsland Area Review, for example, the following specific provisions were made for State forest:

* conservation of landscape values listed as a particular land use goal

* visual management zones identified by the application of the Visual Management System to be incorporated in regional plans and managed accordingly

* certain recreation and landscape values, as listed, to be protected by the implementation of management prescriptions

Council's recommendations for bushland reserves and scenic reserves in all study areas specifically state that these reserves be used to maintain the local character and quality of the landscape.

In their sections on coasts, various final recommendations reports proposed a category called 'Scenic Coast'. This is defined as a coastline of outstanding appeal that remains in a relatively unspoilt state. Recommendations for 'roadside conservation' recognize that vegetation along roads is often a major component of the landscape, and 'public land water frontages' are recommended to be used for the maintenance of the character and quality of the local landscape, as well as offering protection from erosion, flora and fauna conservation, and low-intensity recreation. Similar recommendations apply to 'streamside reserves'.

'Natural features and scenic reserves' set aside land 'containing outstanding landscapes... or other natural features that warrant special protection'. The principal recommendation for these areas is directed towards the maintenance of natural landscapes and features.

The National Trust has made a number of submissions to the Council identifying the significant landscapes occurring in particular study areas and this information has been used in the development of many recommendations.

Issues

The community expects to be able to enjoy pleasant views and scenic surroundings as a complement to many recreational activities, and it is within Council's responsibilities to recommend preservation or other protection of those landscape values.

* Landscape values, although addressed in the body of many of Council's recommendations, have not received particular prominence or recognition and their assessment has not followed a consistent and uniform path.

* Separate chapters on landscape issues could be written for both resources reports and the Council's recommendations in future studies, drawing together elements of other recommendations, and pursuing the development of appropriate prescriptions and guidelines for landscape protection.

* The State Conservation Strategy nominates protection of the visual environment as a broad conservation issue, and identifies various actions for landscape protection, including protection, restoration, and enhancement of scenic values of rivers, wetlands, and the coast, reversal of rural tree decline, and a requirement for detailed landscape and rehabilitation plans for mining and extractive industries sites.

* Landscape assessment is a relatively new concept and appropriate assessment methodologies are still being developed and refined.

* Council could consider conducting some public-perception testing, which is one tool for identifying landscape preferences in the community. It is essentially a method of polling the public to determine the key landscape features and is widely applicable to local areas and issues.

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14. RECREATION

Council recognizes that recreation is an important use of public land, and in general has set aside areas somewhere on public land in which virtually all recreational activities may be undertaken. It has pointed out that outdoor recreation in general is an acceptable primary or secondary use of much public land, but has left the details of planning such use to the land manager.

Two important factors must be considered in any discussion of recreation:

* the wide range in intensity of recreational use

* various activities are to some degree incompatible with each other or with other uses of public land

The State Situation

Although recreation and tourism are sometimes taken to be synonymous, there is a distinction between them.

A 'tourist' is considered by major tourism authorities to be a person who travels at least 50 km from home and stays overnight. These two elements distinguish tourism from recreation; tourists are involved in recreation, but recreation does not necessarily involve tourism.

Both tourism and recreation have a strong economic element as money is spent on transportation, accommodation, food and beverages, entertainment, equipment, sightseeing, photographic supplies, souvenirs, and a variety of personal services. This expenditure is passed on through the community and has a considerable effect on the State's economy. In 1986, total visitor expenditure in Victoria by both domestic and international visitors is estimated at nearly $4000 million. An unknown proportion of this would have been spent on activities associated with public land.

Table 31 indicates levels of tourist expenditure for some regions of the State with large areas of public land. Although only a partial picture, it illustrates the contribution that public land makes to the State econ-omy. The actual use of parks, for instance is shown in Table 32.

Every year tourists in Victoria make 9.2 million overnight trips and 20.6 million day trips, indicating the breadth of, and demand for, tourist venues throughout the State. That is, an average of some 107 000 people travel to or from Victorian tourist destinations each day.

In its report 'Access to Victoria's Parks', the Parliamentary Natural Resources and Environment Committee in 1987 made several recommendations in terms of recreational use and

diversity of opportunities in parks, which included the following.

* The Victorian park system should be further developed to provide access to a diverse range of educational and recreational opportunities.

* Work by the Land Conservation Council should now be followed through, with the development of detailed management plans for each area covered by the Council and adopted by government.

* The availability, diversity, and quality of opportunities and experiences in parks should be improved.

Table 31

ESTIMATED GROSS TRIP EXPENDITURE IN VICTORIA FOR SELECTED REGIONS, 1986

Region	(a) Domestic overnight trips ($M)	(b) Day trips ($M)	(c) International visitors (projection) ($M)	Total (a)+ (b)+ (c) ($M)
East Gippsland	80	7	5	92
Wimmera/Grampians	48	2	5	35
Otway/Geelong	134	45	7	186
South Gippsland (including Gippsland Lakes)	63	34	10	107

Source: Victorian Tourism Commission.

Council's Provision for Recreation

The Council's standard introduction to the chapter on recreation in its published recommendations briefly defines passive, active, formal, informal, open-space, and intensive recreation. Some of these terms overlap in definition and the real meaning may be obscure.

The recommendations assume recreational activities can be arranged into a spectrum, from the active spectator sports in constructed arenas to the passive and non-intrusive observation of shy wildlife in natural environments. In formulating its recommendations, the Council has aligned this recreation spectrum to parallel other spectra of public land use, such as the conservation of flora and fauna and resource exploitation.

'Multiple-use' management attempts to provide for many types of land use on a limited area of land. It may only achieve provision for a few such uses, while diminishing the values of the area for others. In recognizing this, Council has consistently recommended the reservation of separate areas, each of which provides for a limited range of compatible

activities. In this way, Council's recommendations make adequate provision for all uses.

Table 32

VISITOR USE OF NATIONAL PARKS LISTED IN THE NATIONAL PARKS ACT (1977/78 TO 1986/87)

Financial year	Day visitors	Camper nights	Total visitor days	Number of parks assessed
1977/78	2 957 000	442 300	3 400 000	39
1978/79	3 695 000	464 800	4 160 000	41
1979/80	3 825 000	541 000	4 366 000	46
1980/81	4 489 000	567 000	5 056 000	55
1981/82	5 878 000	613 000	6 491 000	58
1982/83	6 407 000	589 400	7 000 000	60
1983/84	5 735 000	613 500	6 349 000	61
1984/85	6 896 000	835 100	7 731 000	64
1985/86	7 060 000	870 000	7 930 000	65
1986/87	7 130 000	900 000	8 030 000	66

Note: figures are rounded

Source: Department of Conservation, Forests and Lands (1987)

Using examples from opposite ends of the spectrum, areas primarily suited for organized intensive sports are not suited to the conservation of wildlife or to the protection of wilderness values and, because of the wilderness areas' remoteness and limited access, the converse is also true. Accordingly, Council recommendations for each category of land use provide for recreation activities appropriate to those areas. Two tables in Appendix XII describe recreation types and their intensity, and show which of Council's land use categories accommodate each recreation type.

To assist planning and management of public land, the Department of Conservation, Forests and Lands has identified five classes of recreation settings within the total spectrum based on access, facilities, the level of use and management criteria (see Appendix XIII):

* remote (distant from vehicle access, low level of use)
* semi-remote (low intensity of tracks, few basic developments)
* roaded-natural (some roads, many tracks, small campgrounds)

* semi-developed (well-developed access, facilities for large numbers, semi-natural)
* developed (intensive developments - accommodation, ski resorts, marinas etc. in modified surrounds)

The relative proportion of these across the State are shown in Figure 10.

Demand for recreation settings

It is not possible to quantify at this stage the community 'demand' for different recreation settings. Such a study of demand would need to involve a large sample of the Victorian (and possibly Australian) population to ensure adequate representation of users of all sections of the spectrum. A demand study of this type would be further complicated by the fact that many people undertaking outdoor activities require different settings at different times in their life and leisure-time (for example remote bush-camping when fit and young, and car-based camping in semi-developed areas with young children).

It is instructive to examine the availability of different recreation settings in each Conservation, Forests and Lands region (Table 2 of Appendix XIII). It could be assumed that a mix of recreation settings providing for all parts of the leisure spectrum in each region would be desirable to provide reasonable access to the full variety of settings for pursuit of desired recreation activities. Unfortunately, the distribution of public land makes this impossible, particularly with regard to 'remote' settings.

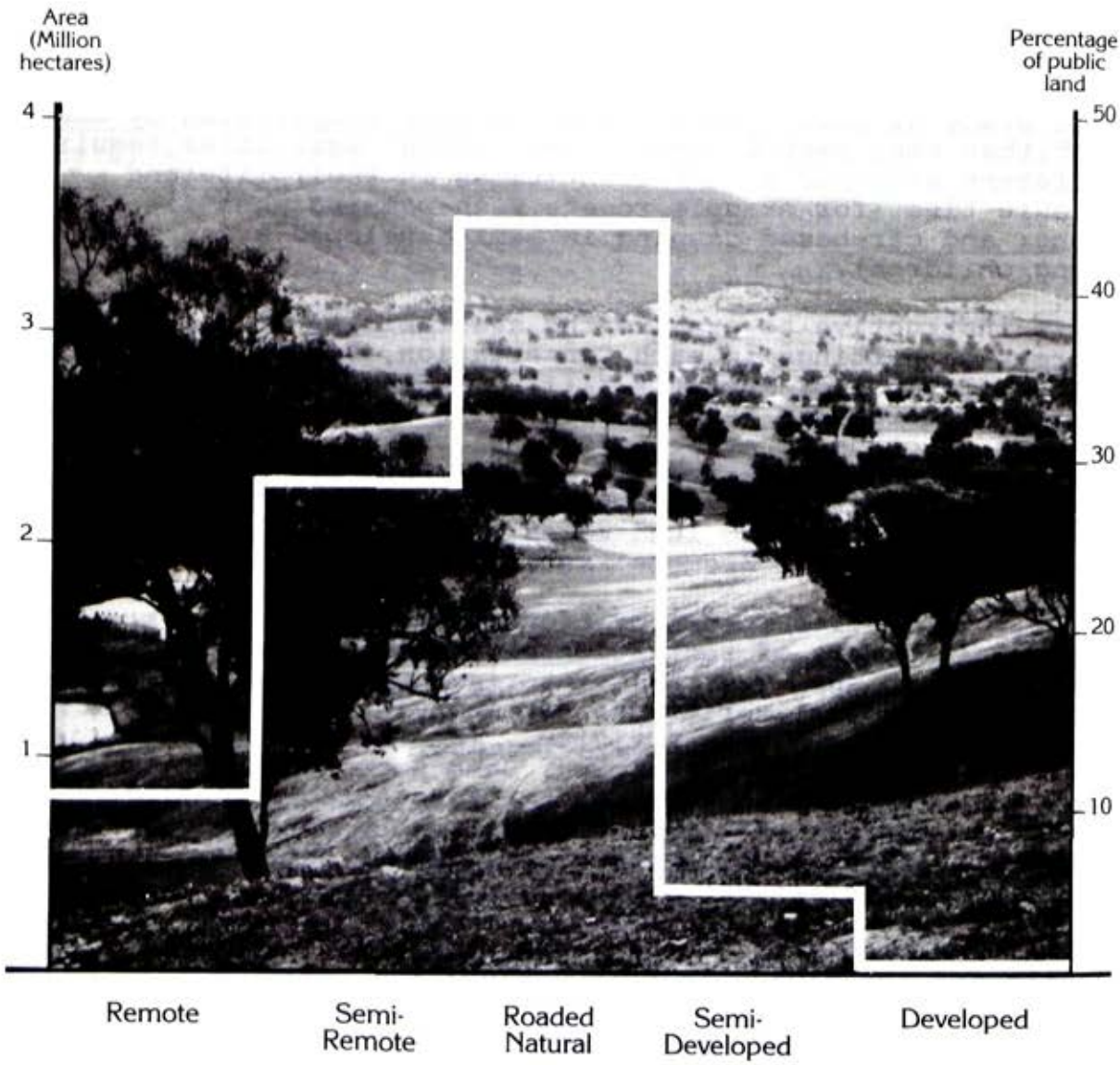
Ideally, Council's recommendations would result in a proportional mixture of recreation settings distributed across Victoria. In this way, all Victorians would have reasonable access to the full variety of settings in which to pursue their chosen recreation activity. The reality, however, is that the distribution is uneven. Some parts of Victoria possess few if any areas that contain remote-recreation opportunities, for instance. East Gippsland by contrast has a large proportion of remote and semi-remote settings, but a relatively small proportion of developed sites.

Small developed settings can accommodate large numbers of people and are always in high demand; remote-recreation opportunities, however, involve few people and require much larger areas. Nevertheless, each portion of the spectrum is important because of the opportunity it provides for a particular recreational pursuit.

In various submissions to Council some groups have implied that the area of public land suitable for their sport or recreation should be allocated exclusively to them. The Council has generally rejected this view. Given the relatively limited amount of public land available, most recreation activities are provided for specifically or broadly in Council recommendations and can be carried out harmoniously in most areas. Where limitations apply, it is because certain activities would conflict with other recreation uses or would have an impact on other values.

FIGURE: 10

RECREATION SETTINGS ON PUBLIC LAND



Provisions for Specific Recreation Activities

Various recreation activities differ in their requirements for types of land, size of area, and site location. In recognizing this, Council's recommendations have singled out those activities that have the highest public profile and have greatest potential for environmental disturbance, because of either the activity itself or the large numbers of people engaged in it. In all these recreational activities, the issue is not so much the activity, but the level of disturbance that it causes - both to the environment and to other land-users wishing to pursue different recreation activities.

The availability of some reserves (such as flora, bushland, and streamside reserves) for passive and low-intensity recreation activities like picnicking and walking is often expressed in the recommendations, although such areas are not intended to be developed for recreation. Others (such as scenic reserves) have clearly defined recreation significance for particular activities, and recommendations for streamside reserves [post *Land (Amendment) Act* 1983] seek the provision of stiles in any fences to improve access to licensed frontages.

Usually, where a particular activity requires it, special consideration has been provided for in notes to the relevant recommendation. A number of recreational pursuits, however, have occasionally received special consideration in Council's proposals and often specific provisions are made where an incompatibility between an activity and the land use category either exists or is perceived. Sometimes the Council proposes zoning and management provisions to reduce impacts. Some of these activities are described further below.

Skiing

Provisions for both alpine (or downhill) and cross-country skiing have received specific attention in recommendations for the Alpine, Melbourne, and North-eastern areas, which contain the vast majority of locations for this type of recreation.

Hunting

Although the Council recognizes that vermin pose problems in the management of public land, the recreational hunting of vermin has received only general reference in its final recommendations. However, provision for hunting on nearly all public land currently popular for the sport has generally been recommended.

Hunting is not normally permitted in national or State parks, flora and fauna reserves, reference areas, and education areas or along licensed water frontages. In some parks, however, seasonal hunting of deer is permitted but restricted to stalking using bows or rifles. The government also modified the Council's recommendation for the Barmah State Park to permit hunting of feral animals at the manager's discretion.

Deer-hunting received considerable attention in the Alpine, North-eastern, South Gippsland, Gippsland Lakes Hinterland, and South-western study areas. Alpine recommendations, for instance, supported the continuation of hunting on more than 1 million hectares of parks, forest, and other reserves, representing some 77% of the total study area.

Duck-hunting was particularly mentioned in the Murray Valley, South Gippsland, and Gippsland Lakes Hinterland recommendations. Other study areas, like the South-western and North-eastern, also make provisions for this sport.

Duck-hunting takes place on a large number of water bodies although it is excluded from some particularly important breeding areas. Of the 151 declared State Wildlife Reserves, for instance, covering more than 120 000 ha, more than 60% are available for hunting. Many freehold wetlands are also used, although indiscriminate shooting is causing conflicts.

Simulated field-shooting ranges, such as that in the Dundas Ranges (South-western Area, District 2) may also be provided for in the Council's recommendations.

Fossicking and prospecting

Although Council's recommendations have closely connected fossicking and prospecting, these similar pursuits seek different objects - as explained in chapter 16. Fossicking is recognized by Council as a legitimate recreational use of public land, and is permitted subject to the Council's guidelines on most public land categories with the exceptions of reference and water-production areas, flora reserves, and some specific public-purpose reserves like community halls and cemeteries. Under section 32(d) of the *National Parks Act* 1975, fossicking is allowed in parts of some State and national parks, where it is defined as the recreational search for gold and other materials like gem-stones and bottles, using hand tools only.

Recreational prospecting under a Miner's Right is permitted subject to guidelines on many types of public land, exceptions being parks under the *National Parks Act* 1975, reference, wilderness, and some water-production areas, and certain public purpose reserves. Other areas may be excluded from time to time at the mutual discretion of the land manager and the Department of Industry, Technology and Resources. More than 6000 Miners Rights were issued during 1985 and 1986. Eductor dredging, a form of prospecting that requires a specific licence, is allowed in watercourses as determined from year to year. Council has made specific reference to eductor dredging, in the final recommendations for the East Gippsland Review, but is aware of its emerging importance as a recreational pursuit.

Both fossicking and prospecting are potentially damaging to the environment and consideration needs to be given to the level of use of these recreational activities which is appropriate in areas with other values. This also applies to eductor dredging, where studies into its effects on streams have been somewhat inconclusive.

Bushwalking

Bushwalking ranges from short walks along well-established trails and paths in semi-natural surroundings to hiking with backpacks through remote areas for long periods. Many people engage in some form of bushwalking, and the extensive system of parks and reserves established throughout the State provides an ideal range of environments in which to enjoy this pastime.

Virtually all public land is available for bushwalking activities, with the exception of reference and some water-production areas, although in places the complete enjoyment of the activity may be compromised by the presence of other uses such as intensive timber-harvesting and mining, and to a lesser extent by motor vehicles, trail-bikes, etc. The importance of the Alpine Walking Track as a focus for long-distance walking in Victoria was highlighted in the recommendations for the Alpine Area.

Solitude is an important recreational experience related to bushwalking and is available in wilderness areas and similar zones within large parks. Perceptions of wilderness range from the concept of a primeval wilderness - completely unaltered, unroaded, and remote even from aeroplane flight paths - to that perceived by some in small patches of suburban bush.

In Victoria, discussion centres on whether wilderness is primarily for use for the recreation experience, or primarily an undisturbed area for wildlife conservation. The wilderness areas identified by the Council - Avon (40 000 ha) and Big Desert (113 500 ha) - were recommended primarily to provide opportunities for solitude and unconfined forms of recreation in large, substantially unmodified, natural environments.

Feller *et al*, on the other hand, prepared in 1979 an inventory of wilderness in Victoria, and used selection criteria with a strong ecological element and a size threshold:

* a core diameter of at least an average day's walk
* a total area large enough to sustain ecological processes without loss of species and genetic variability

In 1987 a study by Preece and Lesslie measured four continua in 1-kilometre-square grids to identify wilderness:

* remoteness from settlement
* remoteness from access
* aesthetic naturalness
* biophysical naturalness

Scores for each were combined by computer to produce a map of variations in wilderness quality and extent in Victoria.

Vehicle-based recreation

By its nature, motorized recreation using trail-bikes and four-wheeled vehicles can be annoying to other users of an

area and in some cases environmentally damaging through the destruction of vegetation and erosion.

Although most of the State's public land is open to motorized touring on tracks and trails, there are few areas specifically devoted to off-road use. Major difficulties in the establishment of suitable areas include public liability insurance, annoyance to other public-land users principally through noise, access by under-age riders (unlicensed riders, unregistered trail-bikes), and the short time it takes for users to become bored and over-familiar with a designated zone and to seek new challenges beyond its boundaries.

The issue of providing areas for use by off-road vehicles has received repeated consideration by the Council which generally suggested that land managers should investigate areas that could be made available and managed for off-road vehicle use, particularly trail-bikes. Specific recommendations for off-road vehicle use were made for Mt Doran Forest (Ballarat area), near Newmerella (East Gippsland), and in locations used for coal production in the Stradbroke and Melbourne areas.

Use by dune-buggies of sand dunes near Portland was suggested in the 1973 final recommendations for the South-western Area, District 1.

Opposition to the use of over-snow vehicles outside resorts was strong due to their conflict with cross-country skiing and other winter-wilderness activities, the potential damage to vegetation in areas of shallow snow cover, and the danger to other snow-users.

In the Alpine final recommendations (reiterated in the Alpine Area Special Investigation) the Council proposed that the only use for over-snow vehicles outside resorts should be for search and rescue and management activities. Despite the government's acceptance of the recommendations, a 4-year licence for the operation of an over-snow vehicle in the Bluff--Mount Lovick area was issued by the Road Traffic Authority in October 1983.

The Council has also provided for a number of highway parks adjacent to major roads and highways for travellers to rest and relax, isolated from the road environment:

Campaspe River	(Northern Highway)
Broken River	(Northern Highway)
Ravenswood	(Calder Highway)
Runnymede	(Northern Highway)
Bates Lake	(Wimmera Highway)
Cherrypool	(Henty Highway)
McKenzie River	(Princes Highway)
Stratford	(Princes Highway)
Hopkins River (Dobie)	(Western Highway)
Merton	(Goulburn Valley Highway)

To date only the last three have been extensively developed, but all provide attractive wayside stops along tourist

routes. The developments at Dobie have been abandoned because of vandalism.

Fishing

As an informal, low-intensity form of recreation, fishing is generally an acceptable use of much public land, except reference areas, some water storages and their buffers, some streams in national parks, for instance, which contain significant native fish species and breeding areas, and marine reserves where it is inconsistent with protecting important marine ecosystems.

In common with other activities, fishing may pose little threat to the environment if pursued at a low level of intensity, but conflicts and problems can arise with increasing activity and some regulation may be required if the primary aim of management of an area is threatened.

Formal Recreation Reserves

A large number of parcels of public land are reserved for such purposes as golf courses, race-courses, rifle ranges, show-grounds, and cricket/football ovals. Throughout, Council has provided for the continuation of these uses and the establishment of additional reserves where necessary.

Issues

* Given the great diversity in demands for recreational opportunities, Council considers it has achieved a reasonable balance between most activities, with almost every form of recreation allowed somewhere on public land.

* Higher-profile activities with greater potential for environmental impact - such as use of off-road and over-snow vehicles, deer-hunting, and prospecting and fossicking - have been the subject of specific Council recommendations and guidelines to minimize any impacts. In certain cases there is a need to provide appropriate locations where high-impact activities can be pursued exclusively, although consideration should be given to conducting some of these on freehold land.

* The Council has been careful to ensure that public land allocated for various recreational activities is available to the whole community, rather than particular user groups that require exclusive use of areas.

* Recreational use of public land is a major aim of many of the Council's recommendations. This is in line with the Government's Conservation Strategy, which has as one of its objectives 'the protection of natural systems for the non-material needs of society', including outdoor recreation and tourism.

* The recently released report prepared by the Natural Resources and Environment Committee of Parliament titled 'Access to Victoria's Parks' also recommended that the

State's parks be further developed to provide access to a diverse range of educational and recreational opportunities for all Victorians.

* The link between the State's tourism growth and potential and the contribution that public land assets make is poorly understood and probably seriously under-valued. This issue requires detailed investigation and analysis.

References

Feller *et al* (1979). 'Wilderness in Victoria: an Inventory.' (Monash University, Department of Geography: Melbourne.)

Natural Resources and Environment Committee (1987). 'Access to Victoria's Parks.' (NREC: Melbourne.)

Preece, K., and Lesslie, R. (1987). 'A Survey of Wilderness Quality in Victoria.' Report to the Ministry for Planning and Environment (Victoria) and the Australian Heritage Commission.

15. CATCHMENTS, GROUNDWATER AND SALINITY

Water Supply Catchments

Domestic water supplies in Victoria are mostly obtained from surface run-off water harvested from catchments.

Water-storage size, and hence time of detention , varies immensely - from the ponds on Mt Macedon holding a few days' supply, to massive reservoirs such as Lakes Hume and Eildon that provide domestic water as well as farm stock and industrial supplies and several years' irrigation water.

Water supply catchments contain land of varying tenure and uses. The Melbourne and Metropolitan Board of Works' Upper Yarra Reservoir catchment, for example, is all public land, as shown on Map 12. Water production and nature conservation are the only uses: the forest covering the catchment is not subject to timber-harvesting, no public roads traverse the area, and public access is restricted by locked gates.

On the other hand, the Moorabool River catchment, which contributes to the water supplies for Geelong and Ballarat, has a range of uses. It is mostly freehold land (Map 13) used for various pursuits including cropping, grazing, and intensive animal production. Several townships lie in this catchment, and the busy Western Highway and many other roads cross it. Water released from Lal Lal Reservoir to a lower offtake, for use in Geelong, flows down the main Moorabool River course and is accessible to farm stock and recreators.

These two large catchments contrast in size with the many very small ones supplying water to more than 100 townships throughout the State. Most of these have a range of land use and tenure, while parts of some are effectively closed to active use and public access.

Water treatment

Victorian water-consumers are commonly supplied with substantially untreated water. In many rural systems raw water from a catchment is piped directly into the supply. Most systems allow detention time in reservoirs or service basins for bacteria to die off, and many supplies are subjected to preliminary treatment such as chlorination for disinfection when required. Few systems have complete water treatment, which usually involves coagulation, filtration, and disinfection, although provision of treatment is increasing.

Some important aspects of water treatment are that:

* it is very expensive - it has been estimated that full treatment for all Melbourne's water supply would cost some $500 million, for example

MOORABOOL RIVER CATCHMENT

LEGEND

Catchment area

Public land

Study area boundary

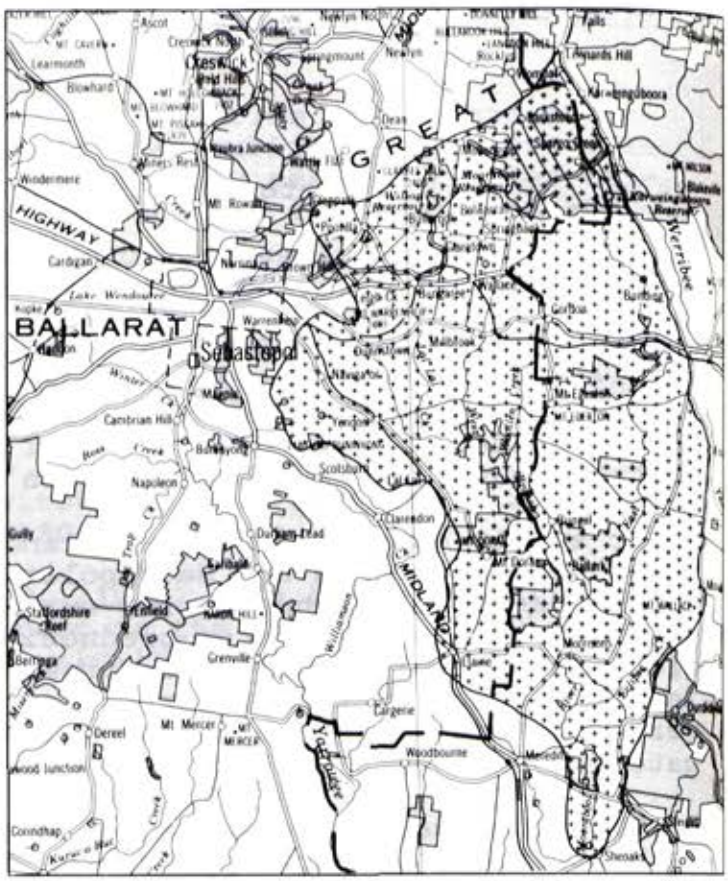
1 : 500 000

0 10 20 30

Kilometres

Land Conservation Council Victoria

MAP No. 12



UPPER YARRA RES. CATCHMENT

LEGEND

Catchment area

Public land

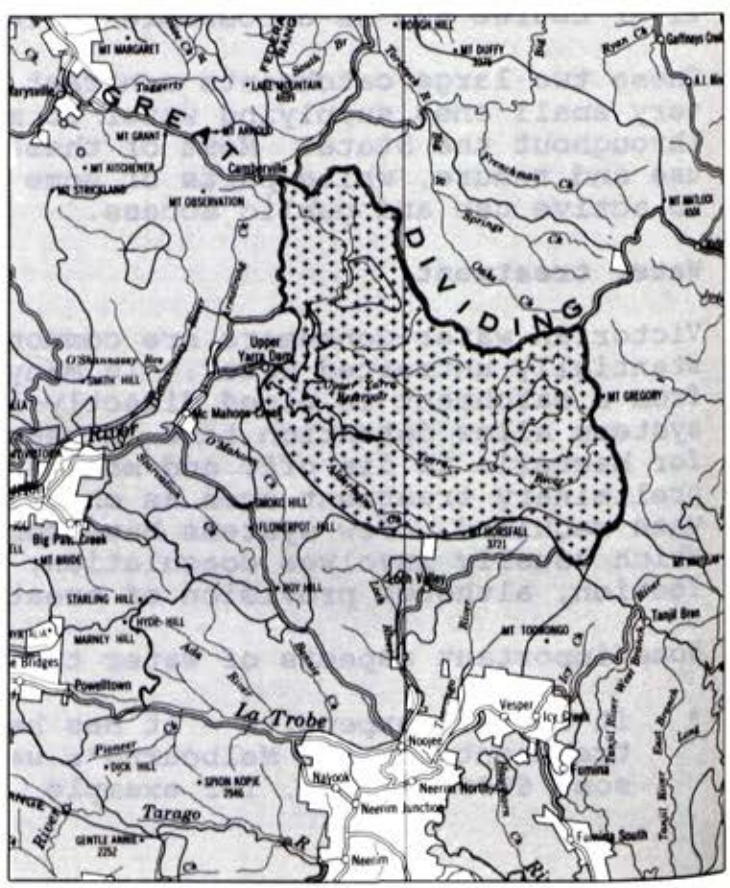
Study area boundary

0 10 20 30

Kilometres

Land Conservation Council Victoria

MAP No. 13



* cost per litre increases as raw water quality decreases because it is more difficult to achieve acceptable quality levels

* conventional methods of treatment do not efficiently remove some viruses and water-borne disease agents such as the protozoan *Giardia lamblia*

Accordingly, protection of water catchments by catchment management strategies is a priority, to minimize treatment costs, to improve treatment efficiency, or to reduce the need for treatment in the first place by improving land-use practices.

Water supply authorities

Water supply for Victoria's largest population centre is the responsibility of the Melbourne and Metropolitan Board of Works. Away from Melbourne, many water supply authorities are each responsible for constructing, maintaining, and administering a supply system to one or more townships. In 1986 these were restructured into 105 Water Boards, following the parliamentary Public Bodies Review Committee's reports.

In addition several water supply authorities - for Bellarine Peninsula, Geelong, and the Latrobe Valley - are separately constituted under their own Acts. The Rural Water Commission is a major supply authority, responsible for providing water for domestic supply in the Otway and Bendigo systems, and for stock and domestic supply to many townships and large farm areas in the Wimmera and Mallee, as well as providing irrigation and industrial supplies.

Land Use Constraints in Catchments

Water supply catchments may be proclaimed under section 22(1) of the *Soil Conservation and Land Utilization Act* 1958, following a recommendation of the Land Conservation Council under section 5(1)(b) of the *Land Conservation Act* 1970. Proclamation defines the boundaries, publicizes the existence of the catchment and its use for water supply, and allows further investigation for a land use determination (as shown in Table 33).

Preparation of land use determinations involves an assessment of the impact of each land use activity, the capabilities of various lands to support these activities, and the sensitivity of the water supply system. The intention is to minimize adverse effects on water yield, and on water quality caused by pollution of the water supply from diffuse sources.

The process parallels the Council's in formulating recommendations for public land use. Broadly suitable uses are specified in both - the land use determination categories or the public land use categories. Within each of these, detailed conditions of use may be required so that particular land use activities are regulated, as far as is required to protect specified values.

Table 33

STATUTORY PROTECTION FOR WATER SUPPLY CATCHMENTS TERMINOLOGY AND EFFECTS

Soil Conservation and Land Utilization Act 1958	Effects	Land Protection Bill 1987
S.22(1) Proclamation	Defines boundaries catchment; initiates referral procedures	S.12(1) Declaration
S.22(2) Land use notice	Specifies changes in land use that require approval of the Director-General of Conservation, Forests and Lands	
S.23(1) Land use determination	Specifies most suitable uses of parts or all of catchments, and conditions (provisions) of binding on government departments and public authorities	S.14(3),17(1) Catchment protection plan
S.23(4) Land use conditions	Land use conditions - Specify detailed conditions of use for public or freehold land Land protection orders - Specify prohibitions, requirements, or prescriptions of use for public or freehold land	S.24(1) Land protection orders

The provisions of the land use categories specified in land use determinations may be imposed as conditions on freehold land, but are mandatory for public land managers. The categories may severely limit land use where necessary in sensitive parts of catchments.

Because of the potential extent of these powers, such statutory controls must be soundly and objectively based. Accordingly, preparation of the catchment land use determinations is carried out or overseen by officers of the Land Protection Division of the Department of Conservation, Forests and Lands. The Division has the leading expertise in the application of techniques for controlling soil erosion and non-point-source pollution. Soil erosion control is a key factor in catchment protection for water quality, because: soil particles are themselves pollutants in water supplies, as suspended sediment and turbidity; soil particles can carry other non-point-source pollutants adsorbed to their surface; and the presence of soil particles renders water treatment less effective and more expensive.

Planning schemes can control the type, location, siting, and design of new developments, and activities such as vegetation removal, earthworks, and so on. Such controls are usually complementary to land use determinations, and avoid dual control. The mechanisms contained in the *Town and Country Planning Act* 1975 for public exhibition of planning controls, enforcement, and appeals make planning schemes an important method of controlling development of freehold land in a catchment or aquifer intake area.

Land Conservation Council's Role

The water supply catchment definition and advisory roles of the Land Conservation Council developed from the responsibilities of the Land Utilization Advisory Council and are now embodied in the *Land Conservation Act* 1970 (see the last section of chapter 3).

The statutory roles of the Council are put into effect in water supply catchments in a number of procedural ways:

* Council has made various recommendations for the use of each parcel of public land in all water supply catchments, under section 5(1)(a) of the *Land Conservation Act* 1970.

* Under section 2(1)(a) of the Act, land vested in any public authority, including water boards and the Melbourne & Metropolitan Board of Works, is public land (provided it is not in a city, town, or borough) for which Council can also make recommendations.

* Council's policy for water production in each of its published recommendations gives the Council's general views on land use and management in catchments.

* Council recommendations for proclamation of water supply catchments are transmitted to the Governor in Council under section 5(1)(b) of the Act.

* Under the auspices of the Act, officers from Council's member departments and Land Conservation Council staff provide detailed information for each catchment to Conservation, Forests and Lands officers carrying out catchment investigations.

* Draft reports on proposals for land use determination are presented to and discussed by Land Conservation Council members at a formal meeting, and under section 5(1)(c) of the Act any subsequent Council resolutions are transmitted to the Director-General, Department of Conservation, Forest and Lands for consideration.

* Council has been formally consulted from time to time over policy issues in catchments, also under section 5(1)(c) of the Act.

* Implementation of Council's water production recommendations, for water authority management of reservoir and offtake surrounds, depends on completion of land use determinations.

Land use constraints in catchments can have far-reaching implications. Exclusion of certain uses from sensitive areas, or imposition of strict conditions of use, can reduce the anticipated output of non-water products from a catchment. Recognizing this, a previous government established the Land Utilization Advisory Council to identify a balanced level of land use constraints. The Land Conservation Council continues that statutory role, and has wider representation. The

statutes make this an advisory and consultative role. In practice, the contents of reports on catchments and of draft land use determinations are reviewed by Council members and discussed at Council meetings.

Council considers that: the continued operation of the consultative role is important; its current operation is effective; and its statutory basis necessary. These matters are discussed below.

The Council's consultative role is important, as it provides for:

* views of land use policy in catchments, external to the Department of Conservation, Forests and Lands (which manages most of the public land in the State and in catchments, and which includes the Land Protection Division)

* the nominees from the Departments of Water Resources, Industry, Technology and Resources, and Agriculture and Rural Affairs to express opinions in Council on water, mining and agricultural land use issues, respectively, and to discuss these

* those Council members with experience in industry and commerce, with experience in the use of conservation techniques for primary production, and from the Conservation Council of Victoria to express opinions on issues of interest to them

Some of the Department of Conservation, Forests and Lands' various statutory responsibilities have the potential to conflict in catchments. The Council's consultative process provides a forum for discussion of all aspects of proposed constraints.

The Council's consultative function is also effective, because under present arrangements the draft land use determinations are prepared in the knowledge that they are to be considered by Council, and will be discussed in the light of Council's water production and public land use policies.

The statutory basis for consultation is necessary, because the fact of statutory support reinforces the consultative role and encourages the reaching of agreement on land use policy. Informal consultation without statutory support can tend towards external views being given less weight.

Current Status of Catchments

Table 34 summarizes the present position with regard to proclaimed catchments. The area proclaimed totals some 46 700 sq.km (21% of the State) and includes 30 200 sq.km of public land, representing 34% of the State's public land. Map 14 shows the proclaimed catchments, and those with land use determinations or notices.

These figures illustrate several points. Firstly, a substantial part of the State's surface is used to harvest water.

Table 34

A. NUMBERS AND STATUS OF WATER SUPPLY CATCHMENTS

		Number
Water catchments in Victoria (including MMBW)		248
Proclaimed water supply catchments		
LUAC recommendations	37	
LCC recommendations	61	
Sub-total		98
Land use determinations for proclaimed catchments		
LUAC advice	19	
LCC advice	21	
Sub-total		40
Land use notices for proclaimed catchments		3
Water supply catchments yet to be proclaimed		150

B. LAND TENURE SUMMARY

	Total area (sq.km)	
Proclaimed catchments	46 700	21% of State
Public land in proclaimed catchments	30 200	34% of total public land
Freehold land in proclaimed catchments	16 500	12% of total freehold land

C. PRIMARY USE OF WATER IN PROCLAIMED CATCHMENTS

Use	Number of catchments
Town water supply	78
Irrigation	17
Stock and domestic	8
Hydroelectric	1

Secondly, the large proportion of freehold land indicates that the range of land uses is wide, and that improving the use and management of this land has special difficulties. Thirdly, a substantial number of areas used for water supply are not yet protected by the statutes designed for that purpose.

Catchment protection needs

The current condition of water supply systems across the State is not ideal. The Department of Water Resources' 'Strategy Plan to Upgrade Drinking Water Quality in Victoria' provided an evaluation, concentrating on microbiological quality. It concluded that the 'water provided by authorities outside Melbourne falls far short of acceptable public health standards with only 7% of towns complying with 1971 World Health Organization criteria'. The standards apply to reticulated water - that is, water in the pipes - rather than to raw water from catchments.

While occurrences of water-borne diseases are now believed to be rare, there have been instances. For example, a news report on 14 October 1987 suggested that human faecal contamination in the Bolinda Creek catchment might have been responsible for a sudden outbreak of viral gastroenteritis, affecting some 1200 people at Sunbury. More common sources of pollution are parts of reticulation systems - for example, algal growth in pipes or fouling of unroofed service basins by birds - and high bacterial levels from various sources. Most water supply authorities have chlorination facilities for disinfection of water when necessary. Various physical and chemical agents can have adverse effects on aspects of public health, palatability, or aesthetic values. Raw-water quality needs to be as good as possible, to maximize effectiveness of disinfection or other treatment and minimize cost.

Recognizing a direct link between the management of water supply catchments and the quality of water harvested, the Urban Drinking Water Quality Task Force considered that 'the quality of run-off from catchment lands should at least be maintained at present levels, and where possible, be improved, in order that the risks of contamination can be minimized'. The Task Force recommended a review of planning controls to investigate their adequacy for protecting water quality, and preparation of a specific policy statement on the management of water supply catchments.

The review should also apply to the requirements for protection of intake areas to groundwater, currently used to supply or augment some 60 town water systems.

Proclamation needs

Many catchments used for water supply, and supporting a multiplicity of land uses, still have not been investigated for proclamation. In its published recommendations for each area, Council has identified most points of water storage, offtake, or groundwater bore for all supply systems; and for each one with a definable catchment area the Council has the following views:

* that each catchment should be investigated

* where a catchment supplying water for domestic, industrial, power generation, or irrigation purposes has a multiplicity of uses, it should be proclaimed

proclamation is also considered to be an important step, as it provides enhanced levels of catchment protection under certain other statutes, such as the *Mines Act* 1958, the *Extractive Industries Act* 1958, and the *Local Government (Subdivision of Land) Act* 1976.

Appendix XIV lists all Council's recommendations for water production for offtakes and storages, and their status - whether proclaimed, land-use determined, or not investigated. It also includes additional sites not shown in Council's recommendations.

Those catchments shown in Appendix XIV as 'not investigated' have been given a further rating as to whether they are likely to be proclaimed. This assessment shows that some 150 catchments require investigation.

Some of the supply systems in this group are modest, supplying small populations (for example, Dumbalk, Whitfield and Stuart Mill). Others include most of the Melbourne and Metropolitan Board of Works system, small catchments providing parts of Bendigo and Hamilton supplies, and river offtakes supplying Seymour and Wodonga.

Given that 37 catchments were proclaimed to 1970 and a further 61 to date following Land Utilization Advisory Council and Land Conservation Council recommendations respectively, there is a need to expedite the process of catchment investigation, for proclamation of priority catchments within a reasonable time. A working group - with representatives from the Department of Conservation, Forests and Lands, the Department of Water Resources, the Rural Water Commission, and the Land Conservation Council - recently prepared a priority list for catchment proclamations and this is contained in Appendix XV.

The following factors were considered in deciding necessity and priority of investigation for proclamation:

* use of the water
* degree of treatment of domestic supplies
* perceived threats to water quality or quantity
* present catchment land uses and associated hazards
* nature of catchment land
* reliability of the supply in terms of quality, quantity, and perenniality

The working group identified 35 high-priority catchments that would be considered by the Council by mid 1990 under a streamlined proclamation procedure. It identified some 103 as having medium priority and a further 12 with low priority. Two classes of catchment - offtakes from large rivers that serve small settlements and irrigation-water diversion weirs - are generally given low priority in investigations. In the first case, the implementation of protective measures necessary to provide good-quality raw water would be prohibitive in both degree and extent, and in the second the end use of the water does not justify stringent catchment controls.

Land use determination needs

Appendix XVI shows those catchments for which a land use determination or land use notice has been made. These number 43 and cover a total area of 11 160 sq.km - some 5% of the State. However, the currently proclaimed catchments without determinations or notices cover 35 560 sq.km (16% of the State) and about 150 additional catchments have not been investigated for proclamation.

Many catchments to major water supply systems are proclaimed but do not have land use determinations - for example, much of Geelong's system and those for Ballarat, Bendigo, and Maryborough. These and parts or all of many other catchments with the same status have a multiplicity of land uses, and comprise both public and freehold land.

The following land uses and activities may cause or increase the risk of detriment to water quality or quantity arising from such catchments:

* intensive agriculture - involving for example row crops, field crops, orchards, piggeries, poultry farms, and dairies, which necessitate repeated cultivation, fertilizer or pesticide application, animal access to watercourses or manure disposal

* extensive farming that may involve land clearing, traffic of stock over erodible areas, stock access to streambanks, poor grazing management, exposure of the soil surface, and increased groundwater recharge leading to salinity problems

* townships with areas under intensive development, a high population density, stormwater drains, and septic tanks or sewage treatment and disposal

* road construction, earthworks or other construction activities, and timber-harvesting operations, where any of these leave substantial areas on erodible soil types exposed to storm rainfall or where appropriate conditions are not applied

* afforestation with ash species, and forest management practices, where water yield is limiting

Examples of the above occur in many of the surface and groundwater catchments that do not have land use determinations, illustrating a need for investigation of these areas and for imposition of constraints where appropriate.

Factors in deciding priorities for land use determination investigations would include those listed above for proclamation, and in addition:

* government decisions
* matters arising from Council recommendations
* requests by water boards, Department of Water Resources, Rural Water Commission, or other public authorities
* anticipated major land use changes or developments

To illustrate the breadth of land use issues that have occurred in water supply catchments, Table 35 lists examples of land uses which have been regulated on specific sites by land use constraints in catchments. These examples illustrate the range of activities in water supply catchments which may cause problems. However they should not be interpreted as land use activities which should in general be excluded from catchment areas. Instead they are site- and time-specific cases, where poor practices by a land manager led to the need for constraints. Most of the land uses listed in Table 35 are taking place safely in other catchments.

Table 35

EXAMPLES OF USES EXCLUDED OR REGULATED BY LAND USE CONSTRAINTS IN WATER SUPPLY CATCHMENTS

Land use	Catchment
Public land use	
Land settlement	Rocklands Reservoir
State park	Stony Creek
Public access	Thomson River
Recreation use of water bodies and surrounds	Various
Timber-harvesting	Various
Softwood plantation	Various
Mining	Thomson River
Gravel extraction	Various
Grazing	Alpine catchments
Freehold land use	
House-building	Rosslynne Reservoir
Land subdivision	Malakoff Creek, Eppalock, others
Potato-cropping	Tyers River, Micks Creek, Healesville, Riddells Creek
Intensive animal industries	Rosslynne Reservoir, Tanjil River, Gellibrand River
Horse stud	Lake Eildon
Grazing	Various
Clearing for agriculture	Various
Timber-harvesting	Various
Softwood plantation	Various
Tree-fern removal	Tarra River
Tourist development	Lake Eildon

The catchment protection process often identifies certain areas where only very restricted uses may be carried out, that is, they should effectively be closed to productive uses other than water harvesting, because of the land's sensitivity or the proximity of the site to part of the water offtake system. The remainder of the catchments may be able to be used for various land uses, with conditions prepared where appropriate.

This contrasts with the 'closed catchment' policy, where all catchment land is used primarily for water production, and secondarily for nature conservation.

Revision of land use determinations

The land use determination approved in 1959 for part of the Rocklands Reservoir catchment addressed one perceived land use problem (land settlement), sought to prevent two water-supply hazards (soil erosion and salting), and contained only two land use categories.

For several reasons, such a lack of sophistication may no longer be appropriate in catchment land use determinations:

* the range of land use pressures has widened
* land use methods have changed
* better information on land and soil types is available, both to the land manager and to catchment investigation officers
* legal challenge to constraints that may flow from determinations is more likely

Some other early land use determinations have short-comings, and accordingly require revision; for example, the determination for the northern part of Eppalock catchment has recently been revised, and that for Kilmore is under investigation along with Sunday Creek. This group - some 20 catchments - is in addition to both those proclaimed but not determined and those not yet proclaimed. Once the backlog of land use determinations is reduced, it may be appropriate to institute regular reviews of earlier determinations.

Philosophy of Catchment Controls

A continuum of catchment land use stretches from fully protected catchments subject to policies of strict control, commonly known as 'closed' catchments, to those with a multiplicity of uses, where land users are advised how their land can be managed compatibly with water production. The appropriate level of catchment control varies according to the water supply system - whether treated, what lines of defence exist against pollution, the end use of the water, the sensitivity of land in the catchment, and so on.

Catchments provide a necessity - water for drinking, cooking, and washing - and it is reasonable for communities to expect land management in their catchments to be at a standard that minimizes water degradation. The means for implementing land use constraints may vary from catchment to catchment. Necessary constraints may be developed through consultation at the planning stage of proposed land use activities. For established uses, an extension program may be implemented, to gradually improve the standard of land management.

Constraints on public land use

Water is one of the harvestable products of public land, and as such is a community resource. Accordingly, where a local

community requires water supply from public land, other public-land users and managers should adapt their methods to make these compatible with water production.

Constraints on freehold land use

Some owners of freehold land in catchments may consider that water supply authorities should purchase all such land if they wish its use constrained in any way. This, however, is not the Council's view, not is it the community's view if that can be taken as being expressed in the current legislation. Various Acts impose controls over freehold land use - for example, the *Planning & Environment Act* 1987 and preceding legislation, the *Environment Protection Act* 1970, the *Vermin and Noxious Weeds Act* 1958, the *Mines Act* 1958, and so on. These impose community requirements over the unfettered use of freehold land, in the same way that the *Soil Conservation and Land Utilization Act* 1958 provides for catchment land use controls, a process that involves public consultation, appeal rights, and access to compensation in certain circumstances.

The Department of Conservation, Forests and Lands considers that, to implement land use determinations, an extension approach usually achieves a satisfactory result in influencing land management activities, and enforcement by imposition of land use conditions is rarely used. A decision to improve water quality, however, may require a different strategy.

Constraints on changes in land use

The community accepts that, in sensitive areas of catchments, land use determinations will regulate more intensive land uses to limit any harmful effects. For example, changes from grazing to annual cropping may have the potential to seriously reduce water quality, and a land use determination may be used to limit these. Other changes such as subdivision of land titles can lead to greatly intensified use, and accordingly some rural planning schemes provide for greater constraints on such development in appropriate parts of catchment areas.

Constraints on existing land uses

Where land use controls are considered necessary to improve the present water quality by limiting existing freehold-land uses, the position is less clear. Moreover, a land use plan is relatively ineffective unless linked with proper land management provisions. An approach used in several multi-use catchments is for the water supply authority to buy the most sensitive land in the catchment, generally the environs of the reservoir or offtake, and for land use conditions to be specified to ensure, at the minimum, that a reasonable level of land management is exercised on the remainder. Where poor land management has resulted in deterioration of catchment values, enforcement has been successfully pursued (see Table 36). Where a better-than-average level of management is required to protect water quality, or where specified works or other protective measures are to be undertaken, then a form of compensation has been paid.

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Water supply authority control of catchments

Some water supply authorities may seek to control part or all of the land in their catchments, by purchasing freehold land or by requesting that control of public land be vested in them. This can lead to two issues. First, it may be an unreasonably restrictive method of protection for water where other resources contained in the catchment are in limited supply - for example, land, timber, or recreation sites. Second, in sensitive catchments where this approach may be appropriate, water-authority control of part or all of a catchment only remains an effective method of protecting this where the authority manages its land for catchment

Table 36

COURT ACTIONS FOR FAILURE TO COMPLY WITH CATCHMENT PROTECTION CONDITIONS

Catchment	Land use	Date	Basis
Tarra River	Tree-fern extraction from drainage lines using bull-dozer	1982	Breach of land use conditions section 23(4)(b)*
Riddells Creek	Cultivation of streamside buffer strip	1980	Breach of land use conditions section 23(4)(b)*
Gellibrand River	Excessive clearing of erodible soils for (private) pine plantation	1981	Breach of directions section 17(2)*
Gellibrand River	Spillage of highly turbid washing water from gravel plant	1976	Environment Protection Act
Lake Eildon	Proposed intensive recreational development on lake shore	1979	Supreme Court order under Act*

protection, and not for some more intensive use that may compromise the primary use. Water supply authorities would be expected to set a good example of catchment protection, especially when other such authorities are calling for controls over similar uses in the multi-use catchments to their own supply systems.

Restricted access in catchments

The Melbourne and Metropolitan Board of Works' policy of strict catchment control applies to areas designated for the purpose of water-harvesting (closed catchments) in which public access is strictly controlled and in which economic, commercial, urban, and recreational uses or developments are prohibited.

The Board holds the following views.

* Closed catchments produce a high-quality untreated water supply. Contaminated water requires treatment to ensure it reaches designated standards, and this is expensive.

* The protection of water yield from closed catchments containing ash forests is very important, as stream flow from the 29 000 ha of ash regrowth in Melbourne's catchments is expected to double as the forest ages.

* Fire risk tends to be lower where public access is restricted, which benefits catchment hydrology. Water-yield reduction following fires or timber-harvesting in ash forests is economically significant.

* Closed catchments avoid problems associated with many activities in multiple-use catchments, which can degrade water quality (biologically, chemically, and physically) and water yield and flow.

* Closed catchments can have high scientific, environmental, and landscape values, and educational values when access is permitted.

The Board has been operating the Sugarloaf scheme, which fully treats raw water, for a number of years, and it now provides some 10% of Melbourne's water. The relative costs of treatment according to the middle-Yarra source of this raw water should be well illustrated by that experience.

The State Environment Protection Policy for the Waters of the Yarra River and Tributaries recognizes the high quality of water produced from the Board's Upper Yarra system of catchments. In studies prepared for the Upper Yarra Valley and Dandenong Ranges Authority, the O'Shannassy catchment in particular is identified as having national significance, both zoologically and botanically. The Authority's Strategy Plan endorsed the Board's policies.

With regard to the Board's Upper Yarra--Maroondah catchments, the Council's 1977 recommendation for a multi-purpose park was not accepted by the government, although recommendations for four reference areas in these catchments were.

Since 1977 the results of various catchment hydrology research projects have been analysed, including several studying timber-harvesting effects in the Board's catchments. In addition, the adjoining Thomson River catchments, with restricted recreation, logging and mining, have been supplying water to Melbourne for some 12 years. These matters are important and should be taken into account in any further consideration of this area.

Options for Catchment Protection

Strategies under the present statutes

The present statutes may be used to control land uses, such as those listed earlier, where these are of concern in water

catchments. They include the *Soil Conservation and Land Utilization Act* 1958, the *Water Act* 1958, the *Environment Protection Act* 1970, the *Health Act* 1958, the *Groundwater Act* 1969, the *Planning and Environment Act* 1987, and various others.

Land use activities that can cause deterioration of water catchment values, examples of which were outlined earlier in this chapter can be regulated by various agencies under these Acts. For example, quality and volume limits may be imposed on point-source discharges by Environment Protection Authority licence.

Most legislation relating to water protection identifies offences and allows prosecution in individual, site-specific cases where clear evidence has been collected. However the only Acts which provide mechanisms for planning whole catchments to avoid degradation are the *Soil Conservation and Land Utilization* Act 1958 and the *Planning and Environment Act* 1987. The former legislation is more specific to protective measures in catchments, although planning schemes administered by planning or responsible authorities may make provisions relating to the use, development, or protection of any land, giving an important means of land-use control in catchments.

The *Soil Conservation and Land Utilization Act* 1958 has preeminence in this matter because its provisions are the most useful for controlling non-point-source pollution, for two reasons: it makes detailed provision by land use determinations for protection of both extensive areas and the most sensitive areas of freehold and public land in catchments; and its soil conservation orientation is designed to control the mobilization of soil particles, which are both pollutants and carriers of other pollutants. Land use determinations are not limited to addressing soil erosion, however. Instead they are required to determine the most suitable uses in the public interest.

The *Groundwater Act* 1969 is the main legislation controlling use of groundwater. Exploration and investigation of the State's groundwater resources are the responsibility of the Department of Water Resources, as well as the construction and maintenance of bores and the licensing of drilling. The Rural Water Commission licenses groundwater extraction for purposes other than stock or domestic. Aspects of pollution of groundwater are covered by the provisions of the *Health Act* 1958 and the *Environment Protection Act* 1975, as well as the *Groundwater Act* 1969. Proclamation under the *Soil Conservation and Land Utilization Act* 1958 has been used to help protect a groundwater recharge area at Merino.

Proclamations

A common view holds that those water supply catchments not yet proclaimed should be investigated in whatever is the most expeditious manner. With this in mind, recent proclamation investigations have involved group proclamations of several catchments in a locality, and investigations being carried out by Land Conservation Council research officers.

In addition, a recent proposal for draft proclamations to be accompanied by only a brief outline, rather than a full report, has been accepted by Council.

Land use determinations

A range of alternative approaches to preparation of land use determinations under the *Soil Conservation and Land Utilization Act* 1958, or similar procedures under subsequent legislation, have been proposed by the Land Protection Division, including the following.

* Standardized land use determination categories and wording could be developed to cover the range of usual catchment management problems. These would have to be used only in appropriate circumstances, and would need to be linked with standardized criteria for delineating land use determination categories on the ground. The use of the land capability method means that this approach may now be possible.

* Land use determinations for parts of catchments, derived from field survey, could be detailed in the sensitive areas of catchments but generalized in the less-sensitive areas. This would reduce the extent of time-consuming detailed field mapping required.

* Partial determinations could cover, perhaps descriptively, the control of particular land uses of concern to catchment managers, while not attempting to control all possible land uses. This would reduce the degree of detail, and accordingly the time required in preparation.

* Descriptive land use determinations could be tied to recognizable characteristics of soils and site, but not mapped until required from time to time in response to land-holders' requests or proposals for land use change. At present, many proposed land use changes do require individual assessment, so this method extends that approach.

Land Protection Bill

Other changes currently under consideration are contained in the Land Protection Bill, which was introduced into Parliament on 8 August 1987. This has similar provisions to the existing legislation with regard to 'declared catchment areas', which are effectively equivalent to and would replace 'proclaimed catchments', and 'catchment protection plans' which replace 'land use determinations'.

The bill extends the process of consultation. Before declaring a catchment or approving a plan, the Minister for Conservation, Forests and Lands must consult with the Land Protection Council which includes landholder representation, and with the Minister for Water Resources, and any other affected Ministers, as well as with the Land Conservation Council as in the current legislation.

The Land Protection Bill as drafted does not include simple, interim controls such as the current Land Use Notice, requiring catchment protection plans to specify the most suitable uses and conditions. These may be applied to only part of a catchment, however. The new provisions would allow the four alternative or complementary approaches described above.

Water Act

The *Water Act* 1958 is currently under review, and consideration is being given to additional means by which water catchments may be protected from inappropriate land use. Water supply is one product from a catchment; however, as previously described, most catchments contain both freehold and public land with a multiplicity of uses. In the past, legislation has provided for controls to be overseen by bodies that have a broader scope and are administered independently of the main land- or water-user groups, in order to provide for balanced land use. In future, catchment protection may also be encouraged by new water legislation.

State Environment Protection Policies

On the recommendation of the Environment Protection Authority, the Governor-in-Council may declare a State Environment Protection Policy, which establishes a comprehensive framework for protecting elements of the environment. Such a Policy identifies beneficial uses of, for example, water resources, determines environmental quality goals to protect these uses, establishes guidelines and standards for potentially detrimental operations, and obliges planning bodies to abide by these rules in their decision-making.

A State Environment Protection Policy would commonly contain standards for waste discharges, codes of practice, requirements for the application of pollution-control technology, and guidelines and rules for land use planning and catchment management activities.

To be implemented, Policies need the support of other government agencies and municipal councils and include this as a requirement.

River Management Boards

River Improvement Trusts are being progressively replaced by River Management Boards, which aim at arresting the loss, damage, or disruption of public and freehold land, assets, and activities due to erosion, flooding, and siltation. These functions are to be carried out with due consideration of environmental and recreational values. Because of the possibility of conflict between agencies where responsibilities for land and waterway management overlap, the Boards will be advised by Catchment Co-ordinating Groups. These Groups have members representing government agencies and local interests. They have no formal powers, but will provide an important forum for expression of needs for water supply protection, and will be able to develop strategies for wide implementation by member agencies.

Groundwater

Significance

Groundwater is used as a water supply for public utility, irrigation, industrial, fire-fighting, stock-watering, and private domestic purposes. Sixty towns depend on it, partly or wholly, for their reticulated supplies. About 70 000 bores have been drilled for stock and domestic purposes throughout the State, of which more than 3000 are used for irrigation (see Table 37).

Table 37

LICENSED GROUNDWATER BORES (as at 18 June 1987)

Category of use	No of bores	Annual volume used (ML)
Irrigation	3 820	448 100
Dairy	1 062	10 900
Urban	98	32 500
Industrial	127	17 350
Commercial	55	760
Miscellaneous	95	3 490
Total	6 057	513 160

Note: An additional estimated 22 000 bores provide water for stock and domestic purposes, for which no licence is required. There is no estimate of the annual volume of water obtained from these.

Groundwater can be contaminated by pollutants from waste-disposal sites (tips) and septic tank systems, and it is therefore important that aquifer intake areas be protected from pollution as far as possible. This is a particular problem with groundwater because of the lack of aeration and flow.

Salinity

Salinity has been described as the single greatest threat facing Victoria's environment. It is already widespread throughout northern and western parts of the State, including both plains and highland areas as shown in Maps 15 and 16. Its extent and severity continue to increase. The report 'Salt Action' provides a comprehensive summary of the situation and current programs to combat it.

Although rising water tables are the cause of the problem, the effects vary from place to place. Causes and effects can occur within a single farm or may be separated by hundreds of kilometres. Symptoms may appear within a matter of months, or within decades. Salinity can affect agricultural land, vegetated public land, rivers, supplies of water to farms and towns, and wildlife habitat.

DRYLAND SALINITY – Occurrence in 1:25,000 map series grid rectangles.

KEY

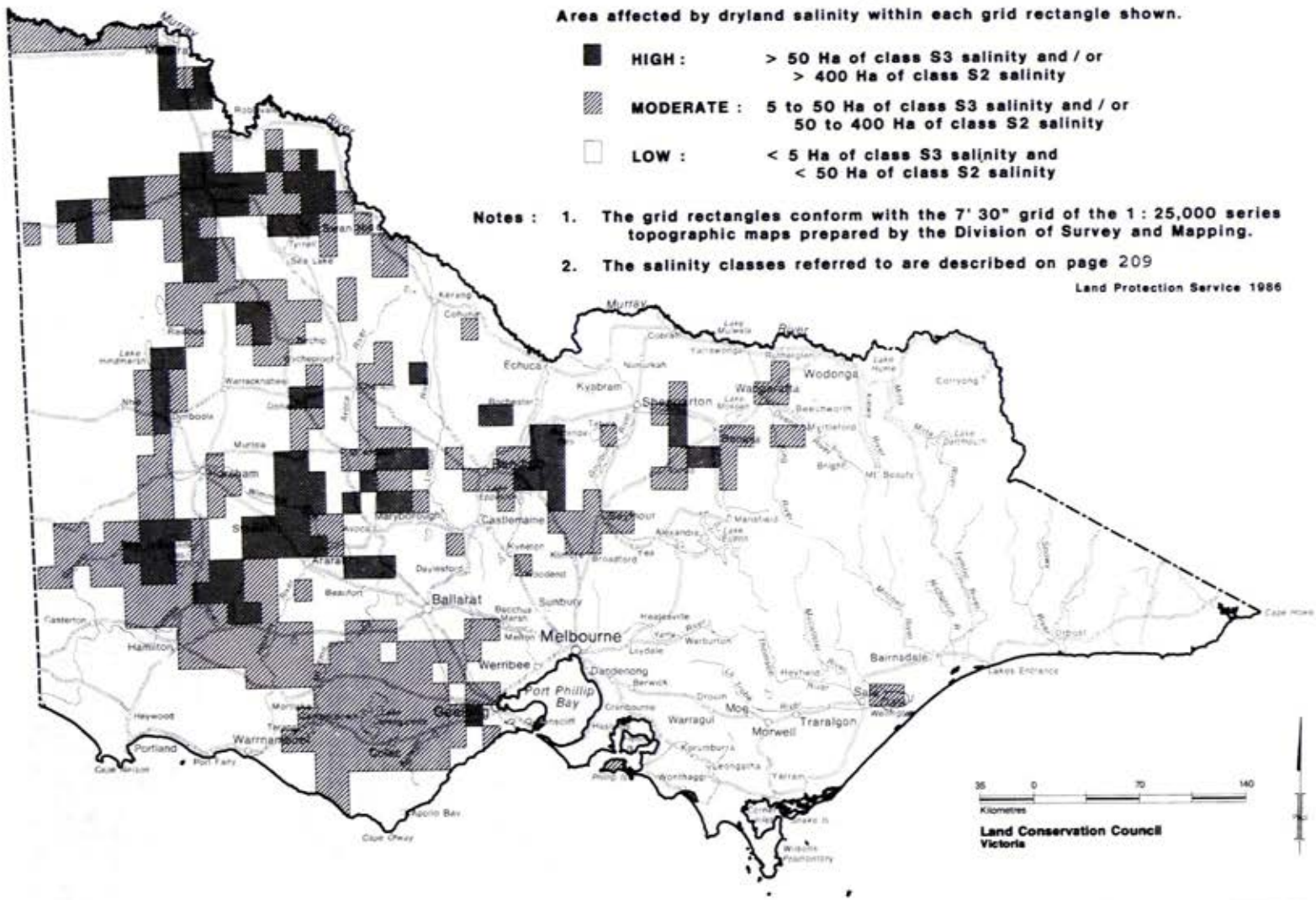
Area affected by dryland salinity within each grid rectangle shown.

■	**HIGH :**	**> 50 Ha of class S3 salinity and / or > 400 Ha of class S2 salinity**
▨	**MODERATE :**	**5 to 50 Ha of class S3 salinity and / or 50 to 400 Ha of class S2 salinity**
□	**LOW :**	**< 5 Ha of class S3 salinity and < 50 Ha of class S2 salinity**

Notes :

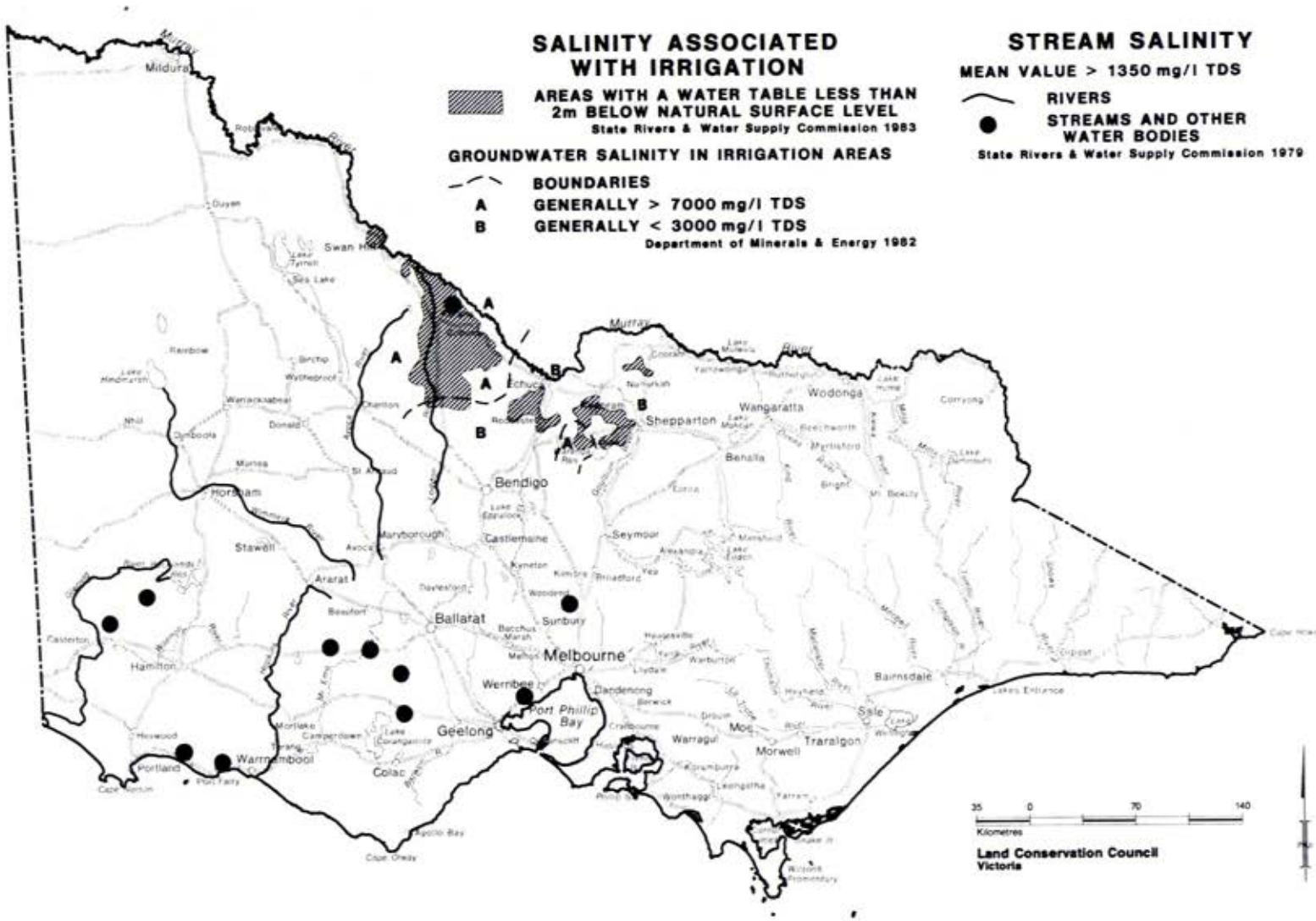
1. **The grid rectangles conform with the 7' 30" grid of the 1 : 25,000 series topographic maps prepared by the Division of Survey and Mapping.**
2. **The salinity classes referred to are described on page** 209

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MAP No. 15

SALINITY ASSOCIATED WITH IRRIGATION and STREAM SALINITY



MAP No. 16

The cause - rising water tables

The balance existing between groundwaters and surface waters is finely tuned. A small increase in infiltration of water from the surface - due to rainfall or irrigation - can cause a significant rise in groundwater pressures and in the level of the water table. This shifts the equilibrium between the surface and groundwater systems.

Rising groundwaters dissolve naturally occurring salts in the soil and bring them towards the surface, where they are concentrated by evaporation. Increased salt levels can damage vegetation and soils, resulting in decreased agricultural productivity. High salt levels increase soil erosion risk, damage water-using appliances, and lead to loss of wildlife habitat and recreational areas.

Extensive clearing of trees from highlands and plains, and large-scale irrigation are the main factors contributing to increased groundwater recharge. Dissolved salts in irrigation water can also gradually accumulate in the soil and shallow groundwater.

Victoria's experience

Parts of Victoria - particularly the north-west - have a geological history of naturally occurring high salt levels. But this century, as a result of clearing and irrigation, salinization of land and watercourses has spread.

In the northern irrigation areas of Kerang and Shepparton, water tables have been rising rapidly, most significantly during periods of heavy rainfall - 1956, 1963, and 1973--75. As a result of the mid '70s rains, dryland salting - that is, in areas remote from irrigation - began to appear in many areas, and became a focus of public concern.

Deep below the soil's surface, pressure rises in regional groundwater systems - particularly in the extensive riverine plain of northern Victoria - have added another dimension to the State's salt problem.

Salt-affected sites occur throughout Victoria. In the north, sites occur in the riverine plain, the Mallee, the Wimmera, and the highlands (stretching from the Strathbogies in the east to the Grampians in the west). The problem also affects the Dundas Tablelands and the basalt plains in the west and parts of Gippsland in the south-east. Groundwater seepage is responsible for the high salinity of streams throughout the south-west, and in tributary systems that feed the major rivers of northern Victoria.

A shallow water table threatens about 385 000 ha of Australia's largest irrigation project, the Goulburn Murray Irrigation District. This salt-prone area includes 72% of the Kerang region and 22% of the Shepparton region, and already contains about 140 000 ha of salt-damaged land. Outbreaks of dryland salting are scattered throughout the State. It affects 45 000 ha of dryland-farming land, and an equivalent area is incipiently salted.

Throughout the State, groundwater pressures and levels are rising; hydrogeological evidence indicates that, in the foreseeable future, they will not stabilize. A further water table rise will increase the extent of saline depressions and brackish-saline streams.

For the riverine plain, if groundwater pressures continue to rise at present rates, most of the portion in northern Victoria - irrigated and non-irrigated areas alike - could become a zone of regional groundwater discharge within 100 years. Such regional discharge is presently confined to Kerang, but without further counter measures, in the next 40 years shallow water tables could underlie 90% of the Kerang region and 40% of the Shepparton region. For the dryland areas of both the Mallee and the highlands, salinized areas are expanding at a rate of 2% per annum - and faster during abnormally wet years.

Without further remedial action, water tables will continue to rise, resulting in extensive salinization of land and streams throughout the State.

Costs

Salinity damage already costs Victoria's economy more than $40 million per year directly, with considerably greater indirect cost, and these amounts could treble within the next 30 years. Of greater significance will be the loss of productive capacity of affected land for future Victorians, and degradation of the environment, vegetation, and wildlife habitat.

The Parliamentary Salinity Committee (1984) estimated that salinity-related production losses amounted to $32 million per year in irrigated areas; in dryland areas, they totalled $4 million per year. To this must be added the cost of salinity-control measures.

The damage takes a number of forms. For example, salt has impaired the quality of drinking water in a number of towns in the west; household equipment sustains continued damage from salty water supplies; road foundations are weakened by high water tables and salinity; and for the farm enterprise, flexibility is reduced and agricultural potential limited.

In some locations, particularly the northern irrigation areas, salinity has already been responsible for significant psychological and social hardship.

Interstate - the River Murray

The salinity problems of Victoria, New South Wales, and South Australia are linked by the River Murray.

A century and a half ago, natural saltiness of the river was noted in its middle and lower reaches. Salinity during dry periods was a feature of the river until major water regulation works were constructed. Salinity re-emerged as an important issue of public concern during the dry years of the mid 1960s.

The salinity increases with distance downstream until, at Swan Hill, it reaches a level sufficient to damage irrigated plants. Although minor in Victoria, the economic effect is significant in the Riverland region of South Australia.

Salt enters the river from a number of sources: natural discharges from tributaries and groundwater; 'induced' groundwater outflow from irrigation and dryland areas; and saline drainage from irrigated areas, towns, and industry. Irrigation outflow is the main cause.

The interception of saline inflow and the provision of freshwater for dilution - have helped offset the effects of development. Nevertheless, the average salinity at Morgan seems to have increased in recent years by about 6 EC units (10 mg/L) per year.

The hydrogeological imbalance in northern Victoria has its counterparts elsewhere in the Murray--Darling Basin. The discharge of saline groundwater will increase as water tables rise, posing a greater, future threat.

Preventative measures

Salinity control is not new to Victoria. Soon after the introduction of irrigation to parts of northern Victoria last century, drainage systems were constructed - in 1914 around Kerang - to protect some areas from rising water tables. The Lake Hawthorn groundwater-interception scheme and evaporation basin, in the Sunraysia area, and the Barr Creek--Lake Tutchewop drainage interception both came into operation in 1968.

At Sunraysia, sub-surface tile drains were installed in the 1930s, and a further scheme with disposal to Lake Hawthorn began at Merbein in 1980. Surface drains have been progressively constructed in the Shepparton region as has a groundwater-pumping scheme.

Since 1980, loans have been made available on concessional terms to irrigators for salinity control. Assistance for drilling to assess the feasibility of pumping groundwater is also being provided.

In dryland areas there have been extensive groundwater investigations, assessments of land management techniques, and demonstration and extension programs to encourage improved farming practices.

Despite this activity, salinity has continued to spread.

An all-party Joint Select Committee of the Victorian Parliament began an inquiry in 1982 to examine all aspects of land and river salinity. Early in 1985, the government committed itself to a major program of salinity control and established the Cabinet Task Force on Salinity - now the Natural Resources and Environment Committee of Cabinet - to co-ordinate salinity-control activities. Salinity-control budgets are now prepared across departments, and the Committee has increased funding for salinity control. State and federal

government expenditures totalled $10, $11, and $14.2 million for salinity control in the 1984/85, 1985/86, and 1986/87 financial years.

The Committee encourages and assists rural communities to participate in decision-making. To this end, it set up in 1985 the Goulburn--Broken Region Salinity Pilot Program, which includes the participation of a community advisory council. Regional communities and the government have joined forces to prepare salinity-management plans for the Shepparton, Campaspe, Barr Creek, Kerang Lakes, and Tragowel Plains areas.

The community's role

More and more landholders are becoming aware of salinity and taking action to tackle the problem. In irrigation areas, on-farm drainage systems are now common. Farmers have spent millions of dollars on land-layout and groundwater pumping. In dryland areas, some farmers have revegetated land and changed their cropping practices because they have realized the benefits of these practices for salinity control. Landholders in several dryland areas have co-operated in group conservation projects.

Local communities have also: formed regional advocacy groups for salinity control; carried out farm-based demonstration and development projects, including the establishment of research farms; and set up groups for regional activities such as tree-planting.

The government's recently released draft strategy - 'Salt Action' - suggests various options, including evaporative basins - where appropriate, and subject to careful evaluation of environmental effects. Long-term solutions include reducing recharge and accession to the groundwater by planting trees (and other plants that require large volumes of water) in the recharge zone and by adopting more efficient means of watering irrigation areas.

Salinity in relation to public land

While most of the problems associated with salinity are confined to freehold land, certain areas of public land have been, or will be, increasingly affected, especially in parts of northern and western Victoria. Public land most affected includes stream frontages, lakes, and wetlands as well as naturally saline depressions in the Wimmera and Mallee.

The major effects on public land include the dieback of native vegetation and replacement with salt-tolerant species with consequent reduction in wildlife habitat values and in diversity. Increasing salinity in streams, lakes, and wetlands has resulted in the modification of the natural system and a reduction in nature conservation values, including significant wildlife qualities. Naturally saline areas are expanding, with a consequent loss of conservation values associated with their margins. Vegetation loss is occurring on stream frontages and adjacent to a number of billabongs that are used for the disposal of saline water. Salt can

also render water unsuitable for domestic, stock, or irrigation purposes.

Salt-induced destruction of vegetation along roads can be significant, in predominantly agricultural areas, as roadsides often contain the only remnants of the region's native plant associations. They also provide habitat for some native animals, and can have special significance as pathways permitting dispersal and migration of species, particularly birds.

Council recommendations relating to salinity

In specific recommendations for the South-western, District 2, Murray Valley, North-eastern Review, and Wimmera Areas, Council identified more than 120 relatively small parcels of public land for revegetation, in part to assist in alleviating the local salinity problems.

In its Murray Valley Final Recommendations, the Council recommended that the government encourage research into tree-growing assistance schemes, agroforestry, cropping and grazing techniques, and the use of deep-rooting pasture plants to reduce rainfall accessions to groundwater, alleviating the effects of dryland salting. It further recommended that, where possible, native trees be retained or replanted on road reserves, especially in recharge areas and catchments where dryland salting is occurring.

In the Wimmera, the Council recommended as a matter of urgency that a research program be developed to gain an understanding of the processes at work in the Lake Buloke system. In East Gippsland, the initial effects of salinity are being seen on the Snowy--Brodribb and Cann River flats and the Council recommended an investigation into salinity susceptibility of particular land systems prior to such land being considered for alienation.

All these recommendations have aimed at reducing the impact of salinity on public land values, and the Council has consistently supported a catchment-wide approach. The government has accepted these recommendations and they have been endorsed in the Government's Conservation Strategy. In response, several agencies - in particular, the Department of Conservation, Forests and Lands - are implementing various initiatives, including the establishment of local catchment protection groups to deal with salinity and the revegetation of public land, especially in identified high-groundwater-recharge zones.

Issues

* The continuing need for efforts toward better catchment protection is evidenced by the failure of most water supply samples to meet international water quality standards.

* Proclamation or declaration of water supply catchments is considered to be still a useful preliminary to land use determination.

* With regard to the alternative approaches to land use determinations outlined, the Council would consider proposals using the alternatives in the light of their provision for the various catchment uses and products, including water.

* The expanded consultation contained in the Land Protection Bill would not replace the viewpoints and forum for discussion provided by the Council.

* In its current review of the Melbourne Area, District 2, Council will consider public land in the Melbourne and Metropolitan Board of Works catchments in the light of various studies, reports, and information produced since its earlier investigation.

* Where recharge zones supply fresh water to aquifers, controls are needed to stop pollutants entering the aquifer, to prevent over-use of the resource, and to restrict changes in land use that may significantly alter the amount of recharge.

* The ways in which public land can be used and managed to mitigate and prevent salinity require investigation.

* Provision of access for groundwater investigations and geophysical surveys may lead to some conflicts.

* The small number of prosecutions for failure to comply with catchment protection provisions may suggest ineffective enforcement.

Table 37A

DRYLAND SALINITY CLASSES

Class		Indicator agricultural plant species
S0	Non-saline	Salt-sensitive pasture and crop species present
S1	Slightly saline	Reduced productivity of pastures and crops
		Strawberry clover present, no other clovers
		Sea barley grass abundant
S2	Moderately saline	Salt-tolerant species dominant; no clovers present
		Facultative halophytes common
		Some bare ground
S3	Severely saline	Only salt-tolerant species present
		Obligate halophytes present
		Large areas of bare ground, with obvious salt encrustment

Source: Land Protection Division, Department of Conservation, Forests and Lands, 1986

16. TIMBER AND OTHER FOREST PRODUCE

Among its responsibilities under section 5(2) of the *Land Conservation Act* 1970, the Council is to have regard to the present and future needs of the people of Victoria in relation to:

* 'land required by government departments and public authorities in order to carry out their functions'

* 'the creation and preservation of areas of reserved forest'

In formulating recommendations for public land use throughout the State, the Council has set aside areas for various purposes including timber production, gravel and stone production, and a number of other uses. This is the first of three chapters that discuss these uses and the way in which the Council's recommendations impinge on them.

Timber

The State's forests supply a broad and expanding range of products and services, one of which is timber - a most important and extremely versatile raw material. Because of its strength, durability, easy working characteristics, and relatively low cost, it is used for a variety of purposes such as the construction of buildings, bridges, and wharves as well as in furniture and internal fittings. Timber can be reconstituted to provide the raw material for the manufacture of paper and paperboard products, hardboard, and plywood and can serve as a fuel for domestic and industrial purposes. Other forest produce includes charcoal, posts and poles, railway sleepers, props and mining timbers, garden mulch, broombrush, and eucalyptus oil.

Timber grown in Victoria can be classified into two main types: hardwoods, which are derived mainly from indigenous forests in which eucalypts predominate; and softwoods, mostly derived from plantations of exotic pines.

As an indication of relative importance, hardwood sawn-timber production in Victoria in 1984/85 amounted to 543 000 cubic metres while softwood sawn-timber production was 605 000 cu.m, or 95% and 20% respectively of total sawn timber production (see Table 38). The proportion of softwood sawn timber is increasing as the large areas of privately and publicly owned plantations established since the early 1960s reach maturity.

Silvicultural systems

The practices by which forest establishment, composition and growth are managed are termed silvicultural systems. Applying different systems to suit different forest types makes

it possible to control the quality and quantity of timber production. A variety of systems, which result in a range of forest compositions from even-aged forest to mixed-aged stands, are used in Victoria. Harvesting techniques include clearfelling, selection and shelterwood fellings. Regeneration can be achieved by various means of seed-bed preparation followed by direct seeding, seeding from retained trees coppicing, or planting of seedlings raised in a nursery.

Choice of the most appropriate silvicultural system for a particular forest stand depends on:

* growth characteristics of tree species
* the condition of the forest, including its age-class distribution
* evaluation of ecological characteristics
* aesthetic and environmental factors
* operational and economic aspects of harvesting and regeneration

Hardwoods

When discussing their uses, Victoria's commercial hardwood timber species are generally put into three groups: durable, ash, and mixed species. Forests of durable species are principally located in the Council's Murray Valley, Mallee, North Central and South-western District 2 study areas. Ash forests grow at higher elevations in the Alpine, East Gippsland, Melbourne, South Gippsland, Corangamite, and North-eastern areas. Mixed-species forests occur extensively in the foothills and mountains of most study areas.

Of the durable species, red gum, box, and ironbark are particularly useful where high strength and durability are required, such as in exterior and in-ground applications. Red gum, the most significant of this group, is used in sawn form mainly for house stumps, fence posts, and railway sleepers, but it also has potential for specialty uses in furniture-making and decorative applications.

Timbers in the ash group come from mountain forests that grow in the upper reaches of major streams in the Central Highlands, Alps, Eastern Highlands, and the Strzelecki and Otway Ranges. These forests are usually even-aged, having originated from regeneration that followed a severe wildfire or timber-harvesting, and usually consist of alpine ash (*Eucalyptus delegatensis*), mountain ash (*E. regnans*), or shining gum (*E. nitens*).

This group provides the bulk of high-quality seasoned timber. Timber is dried before use, to impart stability (absence of the tendency to bow, warp, or shrink) in use. Decorative qualities and freedom from surface defects are also taken into consideration.

Applications include stabilized framing timbers, flooring, joinery and furniture stock, mouldings, veneer, and plywoods. The ash group has the best potential for further processing - that is, adding value beyond the green sawntimber stage.

The mixed-species group comprises eucalypts from foothill and coastal forests - mixtures of various stringybark eucalypts with gum, peppermint, or silvertop, or of gums and peppermint.

Mixed-species timbers are generally used in an unseasoned condition in applications such as house-framing because of variable quality, difficulty in seasoning, and greater ease of use when unseasoned. However, high-quality mixed-species logs can be, and have been, seasoned to produce a variety of value-added products.

Table 38

APPARENT VICTORIAN CONSUMPTION OF WOOD PRODUCTS DURING 1984/85 AND PROPORTION SUPPLIED FROM VICTORIAN PUBLIC LAND

Product	Apparent consumption[1] ('000)	Proportion supplied from Victorian public land (%, rounded)
Sawn timber (cu.m):		
Hardwood	543	95
Softwood	605	20
Combined	1 148	56
Railway sleepers (pieces)	175 000	50
Plywood (cu.m)	50	40
Particle-board (cu.m)	193	100+[3]
Hardboard (cu.m)	24	100+[3]
Paper products (tonnes)		
Newsprint	175	
Printing and writing	121	
Other papers	165	
Paperboard	136	
Combined	597	22[2]

Notes:

1. Derived by apportionment *per capita* of national consumption (ABS, 1986) (except for railway sleepers, for which actual Victorian consumption is given).
2. Derived using roundwood-to-product conversion factors (Eddy *et.al.* 1983). Pulpwood grown by Australian Paper Manufacturers and private landholders and recycling provide approximately an additional 50% of apparent consumption.
3. 100+ denotes export of product

Softwoods

Radiata pine (*Pinus radiata*) is the principal (commercially significant) and softwood species grown in Victoria. Substantial quantities have been planted in the Council's South-western District 1, Ballarat, Corangamite, Melbourne, South Gippsland, and North-eastern Areas. Its versatile medium-density timber can be seasoned more quickly than can hardwood. Radiata pine sawn timber is used in house construction, furniture, joinery, and containers. It is not naturally durable in exterior applications, but is relatively easy to treat with preservatives to provide protection against fungal and insect attack. Radiata pine is also used to produce veneers for plywood manufacture and to produce pulpwood for particle-board, newsprint, packaging, and tissue-paper manufacture. Small-diameter material is treated with preservatives and used in such applications as fencing and playground equipment.

Timber supplies from State forest

As Table 38 reveals, the State does not presently fulfil its own needs in a number of forest products. To overcome this shortfall, timber is imported from interstate and overseas. Sawn timber is the most widely used forest product, but at the present time Victoria can only produce about 56% of its requirements.

Production from forests

Table 39 shows the volumes of forest produce harvested from public forests in 1986/87. Note that these figures are log volume, and are not comparable with the timber-product volumes in Table 38. The recovery rate - how much of the log volume is converted to finished timber products - varies according to the product, but for sawn hardwood is approximately 50%.

Effects on the economy

Forest industries have a significant impact on the Victorian economy, having a turnover of about $2300 million per year, an estimated added value of $1000 million per year and employment totalling approximately 30 000 people, or nearly 8% of the total labour force in State-wide manufacturing.

Forestry, logging, and the primary processing industries of sawn timber, panel products, and pulp and bark products em ploy about 6500 rural workers and provide from one-fifth to one-half of all manufacturing employment in many rural communities, although employment is gradually declining owing to mechanization. These industries therefore comprise a relatively large component of the rural economy.

Further processing industries using timber - such as joinery, furniture, fibre containers, and other paper products - rely wholly or substantially on the output of the primary industries. These industries tend to be located closer to their market and have a correspondingly lesser significance in rural communities.

Future consumption

It is difficult to make long-term projections of the demand for timber products, because a multitude of interdependent factors such as demographic trends, taste and technological changes, and the cyclic nature of housing commencements affect consumption. Nevertheless, general historical trends in demand are evident.

Table 39

OUTPUT OF TIMBER FROM STATE FORESTS[1], 1986/87

Produce	Quantity ('000)
Sawlogs and veneer logs[2]	
Hardwood	1031 cu.m
Softwood	362 cu.m
Fencing timbers	851 pieces
Sleepers	87 number
Poles and spars	64 lineal metres
Pulpwood for paper	
Hardwood	411 cu.m
Softwood	186 cu.m
Pulpwood for panel products	
Hardwood	52 tonnes
Softwood	111 cu.m
Firewood	211 cu.m

Notes:

1. Including output of produce obtained from parks pursuant to section 25 of the *National Parks Act* 1975
2. Figures shown are for gross log volume.

Total sawn-timber consumption, for instance, has remained at approximately the same level for some years. However, the availability of sawn timber is increasing as the large areas of privately and publicly owned softwood plantations established since the early 1960s reach maturity. Although consumption of sawn timber fluctuates with cycles of growth and recession in the economy, in the long term both total consumption and consumption *per capita* are expected to fall marginally. The market for sawn timber is extremely price-competitive and consumption is also influenced by price levels of substitute materials, such as steel, aluminium, and panel- and paperboard products.

The long-term consumption of pulp and paper will depend especially on price relative to that of substitutes. The current rate of increase in consumption of newsprint is expected to be reduced by a long-term trend towards use of

electronic media for advertising and lower base-weight paper. Consumption of printing and writing paper has been increasing rapidly, but is expected to stabilize by the end of the century at about twice its 1984/85 level. Future consumption patterns may be affected by technological developments.

The proportion of total production held by paper- and panelboard products has increased while the proportion of sawn timber has decreased. Use of veneers and manufactured boards is likely to fluctuate around the present level until the end of the century. The consumption of paperboard has decreased because of the emphasis in industrial design towards light-weight packaging. Wrapping and packaging papers have also been under strong competition from plastics.

Earlier this century firewood production accounted for most of the 1 million cu.m of timber consumed in Victoria. Consumption declined steadily from about the 1950s and reached its lowest level in the 1970s. Consumption is now slowly increasing, and in some parts of Victoria supplying the demand is causing some problems in forest management.

Future availability

Under its recent Timber Industry Strategy, the government is committed to managing the State's forests on a sustainable-yield basis. Over the next 15 years this will mean that hardwood sawlog production will decrease from an annual average of 1 million cu.m to 860 000 cu.m as old-growth resources are depleted. Supplies will then begin to increase in subsequent years as material from regrowth forest becomes available.

In contrast, the annual availability of softwood sawlogs from State plantations is expected to increase from 500 000 cu.m to about 1 million cu.m by the year 2000. The volume of small roundwood from these plantations will remain at about 550 000 cu.m per annum. In addition, softwood volumes available from private plantations are expected to double to about 900 000 cu.m per annum.

Figures provided by the Forestry and Forest Products Industry Council (1985) indicate that sawlog volumes in Victoria will increase by 61% by the year 2000 - that is, from about 900 000 cu.m to around 1 450 000 cu.m per annum - largely as a result of increased softwood sawlog availability. Thus, while the State cannot currently produce all its sawn timber requirements (see Table 38), in total volume terms it will be able to do so by the year 2000. Depending upon market trends and other factors, however, it may still be necessary to import specialty timbers. This will also depend upon the degree to which softwoods will replace hardwoods in the market-place.

The Victorian timber industry is sensitive to trade, and external influences are important in determining the quantity of wood required from Victoria's forests. Potentially, the increasing availability of softwood from New Zealand and Chile is likely to affect the demand for Victorian timber.

One view is that the domestic timber industry will not be able to compete with imports, especially from New Zealand given the Free Trade Agreement. This view overlooks such factors as transport costs, the quality of timber available from Chile and New Zealand, and possibly more attractive export prospects elsewhere. Recent analyses have shown that the availability of sawn timber for domestic use or export from North America will be reduced to 50% of previous estimates. Studies have concluded that Australian forestry and industry can maintain a competitive position, subject to achieving economies of scale.

Sectors of the Industry

Sawmilling

Sawn timber is the most widely used timber product, the bulk of which is either used in construction and furniture-manufacture or exported. Victorian sawmills differ considerably in their type, scale of operation, and productivity, depending on whether they are hardwood or softwood mills.

The structure of the industry has been changing over the last few decades as the number of establishments with a small log intake, mainly hardwood sawmills, has declined substantially while the number with large intakes has increased, probably to take advantage of increasing economies of scale. The bigger mills with large log intakes are comparatively more labour-efficient than smaller ones in terms of sawn timber per employee. Some small mills on the other hand have a better rate of recovery than big ones, in terms of the amount of total log volume recovered as sawn timber.

Softwood sawmills differ considerably from hardwood sawmills in both size and distribution. Relatively few of them are small and the larger mills have a common tendency to facilities that integrate seasoning and further-processing activities. Hardwood sawmills are smaller, more numerous, and often uneconomic or inefficient in their operations on both counts. Typically, they are located in small rural communities near their sources of supply while softwood sawmills are located in larger rural centres with wider supply areas.

Ownership of sawmills reflects their size, type, and location, and also their levels of investment, innovation, and efficiency. They range from individual proprietorship through family partnerships and private companies to large companies also engaged in other forms of wood processing or marketing. While the industry has only a few public companies, and a fairly high proportion of sawmills are owned by families, there is a concentration of production in relatively few of the larger, more modern mills.

Panel products

Panel products manufactured in Victoria include plywood, particle-board, and hardboard.

Plywood is produced by peeling or slicing veneers from logs and combining these veneers in various ways, depending on

the strength and finish required. Radiata pine is the main species used in the manufacture of structural plywood. Selected logs from the ash group of eucalypt species are also used for this and in products with a high-quality finish.

The particle-board industry mainly uses softwood sawmilling residues and timber produced by thinning of radiata pine plantations. The hardboard industry is based on hardwood sawmilling residues, and on mixed-species hardwood timber that is not suitable for sawlogs.

Panel manufacture is highly capital-intensive; that is, an individual processing unit is very expensive, requires a large production volume to be economically viable, and employs a relatively large number of people. Units operating in Victoria include particle-board plants at Ballarat, Benalla, and Portland, a hardboard mill at Bacchus Marsh, and plywood mills at Keon Park and Myrtleford.

Paper and paper products

Pulpwood from Victorian forests is used to produce newsprint, tissue papers, industrial and packaging papers, and paperboard. As in the case of panel manufacture, production is concentrated in a small number of plants.

Hardwood pulpwood is currently obtained from sawmill residues and from timber that is unsuitable for sawlogs due to defects in growth or those caused by fungal or insect attack. This is used in conjunction with softwood pulpwood to make packaging papers.

Some hardwood pulpwood obtained from sawmill residue is exported. Implementation of the proposed trial Value-Adding Utilization System (VAUS) in Central and East Gippsland may make available volumes of hardwood pulp sufficient for domestic processing or export.

Softwood pulpwood is obtained from thinning of exotic pine plantations and, where sawn-timber production is integrated with pulp production, from sawmilling residues. Tissue papers, newsprint, and packaging papers are produced from it.

Roundwood

Most of this sector of the timber industry is operated by small companies or by self-employed contractors. The term 'roundwood' covers products such as fence posts, poles, sleepers, and firewood, which are sold with minimal processing. With the exception of preservation treatment, processing usually occurs in the forest. Hardwood timber from the durable and mixed-species groups and softwood timber are used for these products. Virtually all of the posts and poles produced from softwoods, and some produced from the less durable hardwood species, are treated with preservatives.

Eucalyptus oil

All eucalypts contain eucalyptus oil in their leaves and green branches. Both the amount of oil in the leaves and the

proportions of its various constituents vary greatly according to the species, age, and environmental conditions. Cineole, the main constituent sought from Victorian eucalyptus oil, is used mainly for medicinal or pharmaceutical purposes.

In Victoria, eucalyptus oil is extracted commercially from blue mallee (*Eucalyptus polybractea*) because this species gives a high yield, is suited to mechanical harvesting, and has an established traditional market, and because its oil has a high cineole content. Other species are used to a much lesser extent.

Eucalyptus oil is produced mainly from public land held under licence. The licences cover about 25 000 ha of land, of which about 3500 ha are harvested for oil each year. Almost all Victorian eucalyptus-oil comes from the Council's North Central area, the most important locality being near Inglewood. Oil is also produced from the St Arnaud, Wedderburn, Bendigo, and Rushworth areas, which together account for about 49% of the 50 tonnes distilled in Victoria annually.

Until about 1950 Australia was virtually the only source of eucalyptus oil, but now the bulk is produced overseas and Australia contributes only about 15%. The Australian cineole-rich oil industry depends on export markets. Its future is therefore subject to the way its costs and productivity compare with those of overseas producers. There is scope for increased production, based on plantations of cloned high-yielding eucalypt varieties, which could replace oil currently being imported.

Many eucalyptus-oil distillers are middle-aged or older independent operators, most of whom work part-time. Employment in the Victorian eucalyptus-oil production industry (not including further processing) is equivalent to about 18 full-time jobs.

Broombrush

Uses for broombrush include domestic fencing, shade-house construction, feature ceiling panels, and wind-diffusing material for tennis courts. It is cut from broombush (*Melaleuca uncinata*) plants in parts of the Big Desert and Sunset Country in the Mallee area, and the Little Desert in the Wimmera.

Optimum diameter of stems is about 1--2 cm, therefore stems from 10 to 30 years of age are selected for harvesting. Larger and smaller stems remain uncut, so the proportion of stems on a harvested area varies depending on the age-class distribution. Broombush plants are remarkably resilient to disturbance, re-sprouting from rootstocks after fire, severe frost, or cutting. They have a potential life span of at least 80 years, but the natural high fire frequency of the mallee vegetation in which they occur probably prevents most plants from attaining this age.

Significant harvesting began in Victoria fairly recently. Volumes taken out have fluctuated, but in 1983/84 reached

1460 tonnes. The main market is in domestic fencing in suburban Adelaide and Melbourne, where the material is erected as pre-fabricated panels or is packed on site. It costs considerably more than alternatives and its use therefore tends to be restricted to feature fencing associated with front gardens, swimming pools, or garden subdivision. Because it is new to the Melbourne market, statistics on likely future demand are not yet available. At least one harvester is attempting to establish an export market.

Cutting is done manually under licence from the Department of Conservation, Forests and Lands. Licences restrict the numbers of cutters who may operate, and specify fire-protection requirements and the area from which material may be removed. A large proportion of broombrush harvested comes from corridors that are scheduled for fuel-reduction burning as part of the fire-protection planning for the region.

Land Conservation Council Recommendations

The Council has recommended that some 4 416 000 ha be available for hardwood-timber production. This includes uncommitted land, hardwood-production areas, and, more recently, land recommended as State forest. A number of smaller recommendation categories also include timber-harvesting. Areas within which timber production is a permitted major use comprise 20% of the State and 55% of public land in Victoria. In addition, substantial areas of mature forest have been identified for once-only logging, either within parks and conservation reserves or recommended for addition to parks after logging. Figures 1 and 6 illustrate the categorization of public forests.

Following Council's adoption of the concept in 1983, this land is collectively termed 'State forest'. The Council believes that this term best describes public land in timber-production areas and uncommitted land, even though this may contain a range of vegetation types from tall mountain forests through to woodlands, mallee, scrub, heathlands, and swamplands. The name is only used in a descriptive sense, rather than as defined in the *Forests Act* 1958. State forest is discussed more fully in chapter 6.

Public Land Classification

State forest areas have a range of capabilities to meet a range of uses and while some parts are primarily suited to one of these purposes, some parts can be given over to a number of them. In practice the land managers accommodate or conserve these other uses and values to the extent necessary by managing harvesting operations according to management prescriptions, which cover such points as:

* preparation of annual harvesting plans
* delineation of areas to be excluded from harvesting so certain recognized values can be protected
* coupe size and design
* field marking of areas to be harvested or retained
* trees to be retained within harvested areas for seed or habitat

* reserved strips on streams
* felling and utilization prescriptions

In proclaimed water supply catchments, water quality is further safeguarded by limiting the period when operations can occur and, in some instances, by limiting the number and size of coupes in which harvesting may take place in any one year.

Code of Forest Practice

The government is currently preparing a code of forest practice to regulate commercial timber-harvesting operations on both public and private land. It establishes broad guidelines for harvesting operations and will form the basis of detailed prescriptions incorporated in coupe plans, harvesting plans, and forest management plans. A draft code has been released for public comment.

The Council also recommended that some 153 500 ha of public land be managed for softwood-timber production including existing softwood plantations as well as land yet to be planted. Some of this land had been purchased by the government specifically for softwood plantation extension.

The area recommended included provision for a maximum of 110 000 ha that could be planted with softwoods. The balance mostly carries native forests, which are retained within and around the plantation to minimize the environmental and aesthetic effects of plantation establishment. Some of this 110 000 ha had not been planted when a government ban on clearing native forests for softwood plantation establishment came into force in June 1987. The Council's softwood plantation planning guidelines will need to be reviewed in the light of this policy, although they should still apply to existing plantations. Such a review will also need to take into account the guidelines for plantations in the Code of Forest Practice.

In addition, the Council identified a further 30 000 ha (23 000 ha net) that could be available for softwood production in the event that the government decides it would be required. In total, these comprise just over 1% of public land.

Softwood plantations on State forest in Victoria as at March 1987 covered approximately 95 400 ha, 94% of which had been planted since 1960. In its Timber Industry Strategy, the government has made a commitment to expand the area of softwood plantations in several regions in order to provide a sustainable supply of raw material to support large, integrated wood-using industries. The total plantation area is to expand to 125 000 ha by 1996, and increases after June 1987 are to be achieved without clearing native forests.

Evaluation of the Council's Recommendations

Government acceptance of the Land Conservation Council recommendations for parks and reserves on public land has, of necessity, meant that a reduced area of public forest is

available to the timber industry. It should be noted that the area of 'Reserved Forest', which traditionally contains the forests most important for timber production, has increased since 1970, from 10% of the State to 12% at present, as shown in Table 7 and Figure 5.

Table 40

NET PRODUCTIVE AREA[1,2] (HA) AND PERCENTAGE OF TOTAL AREA BY BROAD FOREST TYPES

Forest types	Land use		Total
	Available for timber production	Not available for timber production	
Ash[3] species	225 000 (69%)	100 000 (31%)	325 000
Mixed species	990 000 (78%)	285 000 (22%)	1 275 000
Box/ ironbark	150 000 (75%)	50 000 (25%)	200 000
Red gum[4]	50 000 (83%)	10 000 (17%)	60 000
Total	1 415 000[6] (76%)	445 000[7] (24%)	1 860 000

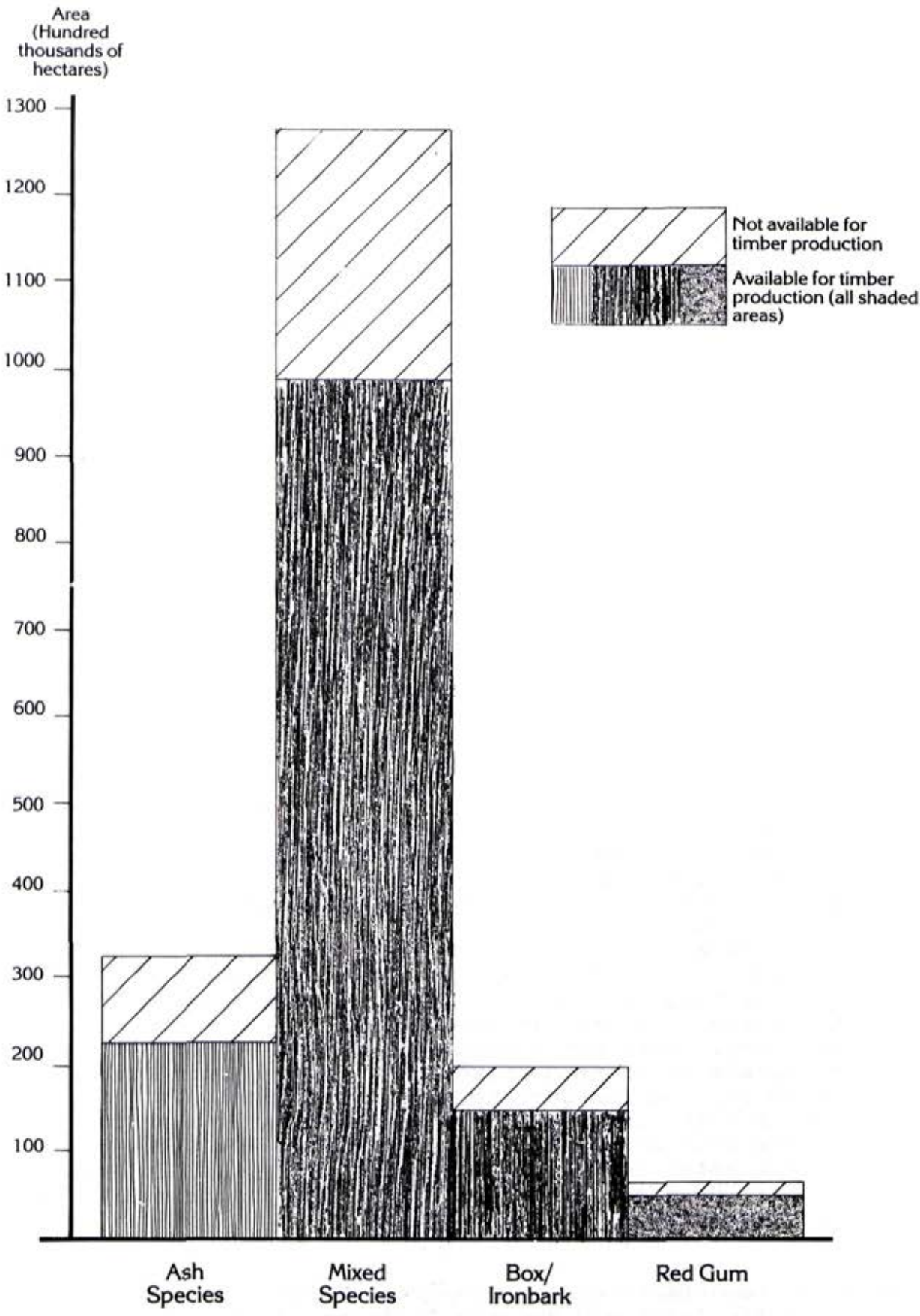
Notes:

1. Includes mature and regrowth forests, and potentially productive unstocked areas.
2. Figures are rounded to nearest 5000 ha.
3. Includes adjustment for Council's East Gippsland Area Review recommendations.
4. Includes adjustment for Council's Murray Valley Area recommendations.
5. Area not available includes parks and reserves, recommended by Council and approved by the government, that exclude timber-harvesting, plus Melbourne and Metropolitan Board of Works catchments.
6. The 'available' net productive area averages 77% of the available gross productive area, varying from 83% (box, ironbark, and red gum) to 75% (mixed species).
7. The 'not available' net productive area is a notional figure indicating what would have been available prior to the establishment of parks and reserves. It averages 73% of the gross productive area, varying from 83% (box and ironbark) to 67% (red gum).

Source: Department of Conservation, Forests and Lands, Public Lands and Forests Division, July 1987.

FIGURE: 11

NET PRODUCTIVE AREAS OF FOREST TYPES



The Council's recommendations have resulted in 2 300 000 ha being included in parks and reserves. This comprises some 26% of the public land in the State. In order to evaluate the impact of these recommendations on the availability of timber, however, it is more relevant to look at the net productive area included in parks and reserves, compared with that still available for harvesting. Net productive area is land actually carrying economic timber resources or capable thereof, excluding the following: steep or rocky land; stream-side buffers; scenic corridors; wildlife corridors; sites of biological significance; and other areas identified as having particular conservation values. Such areas are generally excluded by prescriptions and make up the difference between gross productive and net productive area.

As Table 40 and Figure 11 show, more than three-quarters of the net productive area in the State is available for timber production under the Council's recommendations. To put these figures in context, the available gross productive area is some 1.84 million ha; reserved forest totals 2.71 million ha; and the State forest recommended by Council totals 4.42 million ha.

Alternatively, the State-wide system of parks and reserves contains nearly one-quarter of the net productive forest area on public land, when regrowth stands are included. Note that, of the productive land in parks and reserves, a much smaller proportion currently has mature forest. There are substantial areas of young regrowth, unstocked sites, and overmature forest, and, importantly, large tracts specifically approved for once-only logging.

The above figures include resources within the Melbourne and Metropolitan Board of Works catchments, which are currently unavailable for timber production. While these statistics provide a State-wide perspective, they should be viewed with some caution since variations in the accuracy of resource assessment, and in actual growth rates, could lead to an assumption that an even distribution of age classes would promote a smooth supply of timber. This is not the case in practice because of the loss of timber resources due to wildfires.

Sustainable yield

Selective harvesting of sawlogs early in Victoria's history and the 1939 wildfires have resulted in substantial tracts that, although included in Table 40 as productive area, are now poorly stocked with trees suitable for sawlogs and have no potential for growth of sawlogs. The high level of demand for hardwood timber caused by the housing boom following World War II resulted in the need to harvest timber from some parts of the State at levels that cannot now be sustained.

As indicated earlier, the government is committed to the introduction of a policy of regional sustained yield from Victorian forests and intends to implement this policy in all administrative regions of the Department of Conservation, Forests and Lands within 10 years. To achieve this,

the annual volume harvested must be reduced from the current level, which has averaged approximately 1 000 000 cu.m for the 5 years to 1985/86, to about 860 000 cu.m by 1996. The sustainable yield could increase early next century as more regrowth forests become available.

Table 41 shows the potential long-term sustainable yield of timber that could be derived from the present available net productive areas set out in Table 40 assuming the average annual growth rates shown. Note that the figures in the right-hand column total more than 2 million cu.m - that is, more than double the present average annual cut of 1 million cu.m. To achieve such a yield would, however, require an even-age class distribution in order to maintain an even flow of wood products over a whole rotation, and the rehabilitation of all the unproductive forest stands referred to above.

Table 41

POTENTIAL LONG-TERM SUSTAINABLE YIELD FROM THE AVAILABLE NET PRODUCTIVE AREAS

Forest types	Net productive area (ha)	Average annual growth rate (cu.m per ha)	Sustainable annual yield (cu.m)
Ash type	225 000	2.5	562 500
Mixed species	990 000	1.5	1 450 500
Box/ironbark	150 000	0.3	45 000
Red gum	50 000	0.3	15 000
Total	1 415 000		2 073 000

Source: 'Net Productive Area' - Department of Conservation, Forests and Lands, Public Land and Forests Division. 'Average Annual Growth Rate' - Timber Industry Strategy.

The Council has been acutely aware of the potential effects of making productive forest land unavailable for timber-harvesting, especially where mature forest resources are concerned. It has therefore endeavoured to minimize such losses by the careful selection of boundaries to exclude valuable stands of timber from reserves where possible while retaining representative areas for conservation, including specific habitat requirements, and by providing for stands to be harvested prior to the land's inclusion in conservation reserves where this does not directly conflict with recognized values. This was a major consideration during the preparation of recommendations in the Alpine area. In some cases, however, it has not been possible and the Council has included both mature and regrowth resources in order to protect significant conservation values and to preserve representative examples of mature forest types, habitats, and relatively undisturbed ecosystems in appropriate parts of the State.

In relation to softwoods, the Council has recommended the allocation of sufficient land for plantation establishment in several of its study areas. In fact, under current government policy, some of this land will not be converted to softwood plantation as it carries native forest. Through its recommendations the Council has also encouraged government purchase of suitable freehold land for plantation establishment, and has further recommended that private companies develop or expand their own softwood plantations. As indicated earlier, the volume of softwood sawlogs from State plantations is expected to double by the year 2000, and this will provide a substantial timber resource given that consumption is expected to remain relatively stable, and that resources from private plantations are expected to greatly increase also.

Issues

* Greater emphasis needs to be placed on a more efficient use of wood products available from public land.

* Hardwood pulpwood production as a by-product of sawlog production will continue to be a major issue.

* The issue of clearfelling versus other harvesting or regeneration techniques is currently being investigated.

* State forests are to be managed to achieve sustainable yield of all forest goods and services in accordance with government policy.

* Further research is required into:
  - flora and fauna protection in forests used for utilization
  - impact of various harvesting techniques on flora and fauna, timber yields, and water quality and quantity

* The Code of Forest Practice currently being prepared by the government will ensure that the utilization of forest products is environmentally sensitive and that their provision is consistent with sustainable yield.

* Further protection of the State's flora and fauna will be provided in the proposed Flora and Fauna Conservation Guarantee.

* Consideration could be given to the establishment of hardwood and softwood plantations for intensive timber production.

* The area of public land available for timber production and the sustainable volume of timber that it could provide currently exceed estimated future consumption, although in the short term the volume of mature sawlogs must be reduced to sustainable levels.

* The impact of newly developing forest industries such as broombush cutting and charcoal production require the development of adequate management controls and accurate assessment of available resources.

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17. MINERALS, FOSSIL FUELS, AND STONE

Victoria is a major producer of oil and gas, brown coal, gold, and quarry products. In addition, it currently produces gypsum, kaolin, bauxite, and diatomite, and in the past has also produced iron ore, black coal, tin, copper, and bentonite. Recent successful exploration programs have suggested good prospects for future mining of copper, zinc, lead, silver, and the heavy mineral sands zircon, rutile, ilmenite, and monazite.

In making comparisons with other States' production, care needs to be exercised that comparable figures are being used.

Minerals Extraction

Mining

Excluding coal, petroleum, and quarrying, the mining sector in Victoria produced minerals valued at $30 million in the 1984/85 year, directly employing 650 people with a further 170 people engaged in exploration. The sector is dominated by gold-mining which accounts for more than three-quarters of total sector employment and more than half of total capital turnover. The gold-mining industry comprises two distinct groups:

* small-scale operations including individual miners and prospectors, eductor-dredge operators, and metal-detector operators
* larger formally constituted companies

The small-scale sector includes Miner's Right claim holders, who are not required to provide statistical information on mineral production to the Department of Industry, Technology and Resources. This sector therefore lacks reliable production information. Metal-detecting and prospecting under the authority of a Miner's Right comprise a popular activity and it is estimated that 3000 to 4000 people were engaged in this in 1985 as either a commercial or leisure occupation.

Mining on Miner's Right claims was estimated to involve 630 people, mining or development-lease operations involved 202, and eductor-dredge operations 437, while 12 others carried out operations under tailings treatment licence. People were engaged in these activities on either a principal employment or recreational basis. Production estimates vary widely and 400 kg for 1985/86 is considered a conservative figure.

Six major mines have contributed more than 90% of the State's recorded production since 1970. These are the Stawell Joint Venture, Wattle Gully, Gaffney's Creek, West Bendigo, Wandiligong, and Logan Mines (see Table 42). All

Table 42

GOLD PRODUCTION 1970--85
(After Kinhill Stearns, 1986)

Year	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983*	1983/4	1984/5
Total (kg)	253.3	107.9	167.9	101.4	125.6	195.2	61.9	8.0	11.7	26.3	42.0	86.2	109.7	148.0	149.4	877.2
Value ($000)	256	110	183	99	196	775	182	27	68	178	503	1012	1070	1850	2051	11045
Production by main mines (kg)																
Gaffneys Creek	236.2	106.3	55.3	33.4	28.0	-	-	-	1.2	3.6	2.9	0.6	-	17.8	28.8	75.1
Wattle Gully (at Chewton)	-	-	98.6	54.1	74.7	97.6	54.2	7.9	6.4	18.8	20.2	72.4	96.2	87.6	55.1	6.4
West Bendigo	-	-	-	-	-	-	-	-	-	-	-	-	-	35.8	36.1	58.5
Logan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	18.2
Wandiligong	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15.9	49.9
Stawell Joint Venture	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	665

* In 1983/84 the time basis of data collection was changed from calendar year to financial year. Totals have been adjusted to reflect this by exclusion of half 1983 production.

of these mining operations occupy mostly public land, although in the Stawell case the underground workings extend below freehold land. Currently there are applications to mine below freehold land at Bendigo and Ballarat.

Exploration

Mineral exploration employed 170 people and involved an expenditure of $15 million in 1984/85, $11 million of which was for gold. This exploration takes place on Exploration Licences that cover areas ranging from 25 ha to 500 sq.km. Current licences cover a large portion of the State, as shown in Map 17.

Mining regulation

The *Mines Act* 1958 is the main Act regulating mining. It provides various mining titles to permit and regulate mineral exploration, mine development and production, and mineral extraction from tailings and dredging.

Regulation is also exercised through statutory planning controls applying to mining on private and public land, and through the statutory requirement for the Department of Conservation, Forests and Lands to be consulted regarding proposed mining or exploration undertakings on Crown land.

The *Mines Act* 1958, *Crown Land Reserves Act* 1978, and *Forests Act* 1958 contain provisions to exclude exploration and mining from certain identified areas. In addition, section 40 of the *National Parks Act* 1975 requires consent of the Minister for Conservation, Forests and Lands for mining proposals in parks included in the schedules to the *National Parks Act*. However, current government policy is that no new exploration or mining be permitted in national parks. Exploration and mining under way prior to the acceptance of new national parks is permitted, subject to specified conditions.

The *Soil Conservation and Land Utilization Act* 1958 provides for control of land disturbance in proclaimed water supply catchments.

Fossil Fuels

Victorian oil and gas reserves

Oil and gas resources in the Gippsland Basin are fundamental to the economy of the State and the nation. The Gippsland Basin contains more than 85% of Australia's declared commercial natural gas reserve. From 1968 to June 1986 Bass Strait has produced 333 000 million litres of oil and is now producing approximately 65% of Australia's requirement. Gas production for the same period has been 66 300 million cu.m. Victoria's royalties total $1271 million over this period and are currently running at a level of $150 million a year. In addition to its share of royalties (about $70 million a year), the Commonwealth receives approximately $4000 million annually in excise duty on petroleum, which represents 0.65% of Commonwealth revenue.

The State has responsibility for exploration and production of oil and gas resources onshore and within 3 nautical miles (territorial sea limit) offshore, and the Commonwealth has responsibility beyond 3 nm offshore. State exploration and production responsibilities outlined in the *Petroleum Act* 1958 are administered by the Department of Industry, Technology and Resources, which also administers the Commonwealth legislation on behalf of the federal government.

Activities beyond 3 nm offshore, including oil and gas production in the Gippsland Basin, are outside the Council's charter. However, considerable exploration activities take place within the 3-nm limit and onshore. The transmission lines all traverse the 3-nm limit of State jurisdiction.

Major basins and exploration areas

The Gippsland and Otway Basins, which underlie much of the coastline of Victoria, are substantially covered by petroleum exploration permits. All of the Otway Basin and 85% of the Gippsland Basin are at present under onshore exploration titles (shown in Map 17). Exploration titles also exist in the Murray Basin.

More than $10 million was spent in 1984/85 supporting new onshore exploration and development tenements.

Onshore natural gas is currently being produced from the Otway Basin near Port Campbell for use in Warrnambool.

Brown coal

Victoria has substantial brown coal resources, most of which are concentrated in the Latrobe Valley. The total resource is estimated to be about 202 000 million tonnes (Mt), of which 43 300 Mt are regarded as readily accessible reserves (Table 43).

Production has totalled 890 Mt since commercial development commenced in the 1920s up until June 1986, and has a present annual rate of about 33 Mt. Most of the coal has been used for electricity-generation. Although production will increase with new uses, it is unlikely to exceed 100 Mt per annum for at least 20 years. The six open-cut mines current in Victoria comprise four located in the Latrobe Valley, one at Anglesea, and one at Bacchus Marsh. Substantial reserves underlie existing towns, industrial developments, and transport infrastructure, while two areas - the Holey Plains State Park and part of the Nooramunga Marine and Coastal Park - are excluded from mining by government policy following Council's recommendations.

Definition of Activities

Fossicking and prospecting

The terms 'prospecting' under a Miner's Right and 'fossicking' are linked in the preamble to Council recommendations for Mineral and Stone production, stating that these activities are legitimate uses of public land and should not

be unduly restricted or regulated. Further, most Council recommendation categories permit fossicking and prospecting where they involve minimal disturbance to soil and vegetation, other than in those limited areas where exclusion of these activities is warranted. Council has regarded prospecting under a Miner's Right and fossicking as essentially recreational pursuits.

Fossicking is a generic term that covers casual working-over of old mining sites and settlements in the hope of finding coins, bottles, etc. This small-scale operation often has only a minimal localized impact, and is not regulated by the *Mines Act* 1958.

Although fossicking is generally understood to include the small-scale searching for minerals, particularly gold, by strict definition any seeking or recovering of minerals is regarded as prospecting, which is a mining activity and is thus defined and regulated by the *Mines Act* 1958. It includes all operations conducted for the purposes of discovering or establishing the presence or extent of mineralization or of a mineral. The term includes any search for or recovery of minerals, including gold, through to all kinds of exploration.

Table 43

ESTIMATES OF BROWN COAL RESOURCES AND READILY RECOVERABLE RESERVES (Mt)

Source	Recoverable reserves		Resources	
Latrobe Coalfields				
Existing open cuts	1 900			
Future development options	5 700			
Prospective stage	9 700			
Identified stage	22 400			
Subtotal		39 700		162 000
Other coalfields				
South Gippsland	1 500		6 400	
Otway Basin	100		9 600	
Murray Basin	2 000		19 600	
Subtotal:		3 600		35 600
Inferior coal		-		4 500
Total		43 300		202 100

Source: Victorian Brown Coal Resources Development Study

Small-scale prospecting such as metal-detecting, panning, etc. requires a Miner's Right, and is often a recreational

pastime. (See chapter 14). A prospector who wishes to establish a claim in order to undertake mining operations at a particular location may apply for a Miner's Right claim.

Larger exploration activities are usually undertaken under an Exploration Licence or Lease, which can extend over large areas and is appropriately regulated and conditioned. Successful exploration would normally lead to application for a Development Lease to allow for more detailed studies or a Mining Lease to allow for mining.

Eductor dredging

Although a form of prospecting, eductor dredging is treated separately by the *Mines Act* 1958 and the Mines (Mining Titles) Regulations 1983.

Eductor dredging for gold in stream-beds is popular activity (as indicated in Table 44). An eductor dredge is designed to recover gold from stream-bed sediments. Gravel and finer sediment are pumped from the stream-bed, passed through a riffle or sluice box - which traps any gold - and discharged back into the stream. The process is small-scale, normally involving one or two operators. The device is usually collapsible and can be transported by a conventional vehicle.

Table 44

EDUCTOR DREDGE LICENCES
1980-1986

Dredge year (Nov--Nov)	Number of licences
1980--81	517
81--82	472
82--83	490
83--84	432
84--85	341
85--86	361
86--87	357

In some rivers mercury, which occurs either naturally or as a result of ore treatment during past gold-mining, is also sought since it is usually in the form of an amalgam - that is, a mixture of mercury and gold.

An interdepartmental committee provides annual advice to the Mining Consultative Committee, which advises the Minister for Industry, Technology and Resources on which streams should be open to dredging. The list of available streams must also be approved by the Minister for Water Resources.

Council's Provision for Mining and Exploration

Area of State accessible for mining

Mineral and petroleum exploration and extraction have often been contentious public land issues. The Land Conservation

Council has sought to balance exploration, production, and conservation demands in its recommendations for public land use, and the wording of its recommendations and policies reflects this.

The reservation of conservation areas following Council recommendations does not automatically exclude exploration for mineral and fossil fuel resources, except in reference and wilderness areas and buffers around water storages. Some areas are specifically recommended for exclusion from these activities on the basis that certain other values are considered to be more important in them, and because exploration and mining are not compatible with their recommended uses.

Other parcels of public land that are not available for exploration or mining include national parks, which are excluded by government policy; and many smaller reserves for specific purposes are individually excepted or exempted from mining under the *Crown Land (Reserves) Act*, the *Mines Act*, or the *Forests Act*. In water supply catchments proclaimed on recommendations of Council, restrictions may also be imposed on certain mining operations.

Council's recommendations are subject to the important principle that some land surfaces, because of their inherent instability or special public significance (for example, community assets or areas with important scenic, archaeological, historical, recreation, or natural conservation values), warrant permanent or temporary exclusion from exploration and/or extraction of 'minerals'. The Department of Industry, Technology and Resources and the land manager (the Department of Conservation, Forests and Lands in most cases) should together determine those areas that should be excluded from, or the conditions under which particular areas of public land should be used for, mineral exploration and production.

It is difficult to accurately determine the proportion of public land that is excluded from exploration and mining as a result of the land use decisions following Council recommendations. Table 45 shows estimates of the area unavailable, by land use category.

Areas recommended by the Council to become national parks cover 1.434 million ha, representing 16% of Victoria's public land and 6% of the State. If national parks and other areas excluded from exploration and mining were added together, these would total 19% of the public land or 7% of the State. However, it is likely that a large proportion of this land would not be prospective for mining.

Predominant control of land use activities on freehold land, including mining, is exercised through municipal planning schemes and Interim Development Orders. These planning controls zone land and indicate permitted uses and conditions of use. Mining is specifically prohibited from certain zones in some planning schemes, and is subject to a planning permit, in addition to a mining title in many of the remaining schemes.

Because of its generally minimal land disturbance, exploration can occur without a planning permit in some zones, but is subject to permit requirements in the majority. In a few zones in cities, for example, exploration is specifically prohibited. Amendments to a planning scheme would be required to gain access to such zones. Current applications in Ballarat and Bendigo illustrate this. While larger companies may pursue such planning scheme amendments, most individuals probably would not.

Table 45

AREA EXCLUDED FROM EXPLORATION AND MINING

Category	Area (ha)	% of public land	% of State
Wilderness areas	152 700	2	> 1
Reference areas	84 460	1	> 1
Total	237 160	3	1
National parks*	1 434 470	16	6
Total	1 671 630	19	7

* National Parks excluded by Government Policy.

Council's provision for brown coal

Final recommendations have dealt with brown-coal-mining in various study areas - South Gippsland Districts 1 and 2, Gellions Run Special Investigation, the Melbourne Area and Melbourne Area District 1 Review. In the case of Melbourne Area District 1 Review, final recommendation R6 for the 'Anglesea Lease Area' proposes that 5960 ha of the 7359 ha of public land should continue to be available for the extraction of brown coal by Alcoa Pty Ltd, under the provisions of the *Mines (Aluminium Agreement) Act* 1961. For the remaining 1399 ha covered by the Act,significant conservation values were identified and the Council recommended that the government enter into negotiations with Alcoa with the aim of reaching agreement to excise this area from the lease and include it in the State's system of conservation reserves.

The South Gippsland Area District 2 includes the major State Electricity Commission-operated brown-coalfields of Yallourn, Morwell, and Loy Yang. Recommendations for coal production cover an area of 15 000 ha for open-cut removal and associated essential developments.

In the South Gippsland Area District 1 final recommendations, Council proposed the establishment of the Holey Plains State Park. Noting that part of the Coolungoolun coalfield underlies some of the park, Council recommended that exploration to prove the quality and extent of the resource should be allowed in this area. Government policy, however, has subsequently excluded its mining.

The Gellions Run Special Investigation divided the known Gelliondale coalfield into two, recommending a flora reserve for the coastal area and leaving the remainder uncommitted. Reservation of an area as a flora reserve is of course not compatible with open-cut coal extraction, and the government has excluded the reserve from future coal-mining. The South Gippsland Area District 2 recommendations later proposed that the flora reserve at Gellions Run be included in the Nooramunga Marine and Wildlife Reserve, a reserve category with equivalent or greater nature conservation status.

Summary of Council's Recommendations

Council recognizes that fossicking, prospecting, exploration, and mining activities are legitimate uses of public land, but must be subject to certain principles and guidelines. These identify instances in which areas of the land surface warrant permanent or temporary exclusion from such activities. In addition, the recreation sections of many of Council's published final recommendations refer to prospecting under a Miner's Right and to fossicking, as Council regards both activities as essentially recreational and therefore acceptable uses of public land, again subject to certain principles and guidelines.

The percentage of land directly excluded from mining and exploration as a result of the Council's recommendations is approximately 3% of public land or 1% of the whole State (see Table 45). As indicated earlier, government policy does not permit new exploration or mining in national parks, and no new mining or exploration will be approved in proposed parks except in some special circumstances where exploration had commenced before the parks were proposed. This policy excludes an additional 16% of public land or 6% of the State.

Stone

The *Extractive Industries Act* 1966 defines 'stone' as rock, gravel, sand, earth, and soil used in the construction industry, and clay used in the brick and ceramics industries. As outlined below most of the extraction of stone from public land takes place under other Acts.

State consumption and demand for stone

Production of stone in Victoria has fluctuated between 30 million and 40 million tonnes per annum since 1971. Crushed and broken stone, sand, and gravel are the major stone products, representing by weight 51%, 19%, and 13% respectively of 1984/85 production.

Most stone resources in Victoria are well distributed and stone can usually be extracted at locations close to point of use, thereby minimizing transport costs. Based on current consumption trends, supplies of most stone products should continue to be locally available for some time, except for some high-quality materials in many parts of the State, and declining supplies of readily available concrete sand in the Melbourne area.

Table 46

STONE PRODUCTION 1984/85

	No of establishments	Sources under the Act[1] Production '000 tonnes	Sources not under the Act[1] Production '000 tonnes	Total Victorian production Production '000 tonnes	Value $000
Clay					
- clay	30	1 290	-	1 290	2 900
- brickclay and shale	3	7	-	7	48
- fireclay	5	55	-	55	370
Total:	38	1 353	-	1 353	3 318
Crushed and broken stone					
- basalt	49	11 969	19	11 989	92 981
- dacite, rhyolite, rhyodacite	5	2 111	-	2 111	21 965
- granite	10	560	515	1 075	7 235
- hornfels	8	1 041	18	1 059	9 572
- limestone	7	338	667	1 006	3 014
- sandstone, quartzite	23	1 125	1 916	3 041	7 482
- shale and schist, other	3	12	54	266	991
Total	105	17 158	3 391	20 551	143 242
Dimension stone					
- granite, marble, slate, limestone, and sandstone	8	28	-	28	1 342
Earth and soil	23	296	226	522	1 992
Gravel	77	2 014	3 191	5 206	13 294
Limestone					
- for agriculture	14	150	-	150	2 445
- for cement	3	2 274	-	2 274	9 496
- for other purposes	2	34	-	34	305
Total	19	2 458	-	2 458	12 247
Salamander	7	169	3	172	491
Sand					
- for concrete	54	4 106			
- for other purposes	83	2 148	1182	7 437	30 805
Total	137	6 254	1 182	7 437	30 805
Scoria	24	1 191	241	1 432	6 689
Tuff	10	177	-	177	429
Other construction materials	2	76	-	76	443
Filling	15	476	250	726	1 609
Grand total	465	31 655	8 487	40 143	215 896

Note:
1. Extractive Industries Act 1966

Source: Department of Industry, Technology and Resources

Regulation of stone extraction

Legislative controls and conditions for extractive activities are specified in various Acts. Although the *Extractive Industries Act* 1966 is the major legislative control for commercial operations on public and freehold land, most of the stone production from public land takes place under the control of other Acts. For operations on freehold land an Extractive Industry Licence is required. Operations on Crown land require an Extractive Industry Lease, for which the approval of the Minister for Conservation, Forests and Lands is necessary. Land alienated in Victoria generally after 1891 is alienated to a depth of 15 m and any operations extending below that depth on such land require a lease in addition to a licence for the surface 15 m. Operations on freehold land where there is no depth limit require only an Extractive Industry Licence.

Stone extraction on public and freehold land

Because of the multiplicity of Acts regulating the control of stone extraction on both freehold and public land and the statistical collection of production data that do not match the various regulatory controls, no estimate of production of stone from public land is readily available.

Production data for sources under the *Extractive Industries Act* and those not under that Act are summarized in Table 46.

For quarries under the Act it is estimated that 2% of the production (630 000 tonnes) comes from public land. For sources outside the Act it is estimated that more than 70% (6 million tonnes) comes from public land.

Most of the production from public land occurs in rural Victoria. The Melbourne and Barwon Statistical Divisions, which together account for about 50% of stone production in Victoria, produce very little from public land.

Freehold and public land differ significantly in the types of material they produce. Freehold land operations account for the bulk of production of all stone products, as the table shows. For freehold land the predominant products are crushed and broken stone (55%) and sand (20%), which together thus account for about 75% of extraction under the Act. For public land the predominant products are crushed and broken stone and gravel comprising in total 78% in approximately equal proportions.

The large percentage on stone costs arising from transportation creates a considerable incentive to extract stone from locations close to the point of use. With the exception of northern and north-western Victoria, well-distributed lower-grade resources occur throughout the State, and it has generally been possible to develop stone quarries close to the point of use. The *Extractive Industries Act* excludes any operations where the depth of extraction is less than 2 m.

The *Mines Act* 1958, through the issue of Tailings Licences, allows for the removal of tailings from current or former

processing sites. This material is commonly used for the same purpose as natural sand and gravel.

Both the *Mines* and *Extractive Industries Acts* are administered by the Department of Industry, Technology and Resources. Except in certain parts of Melbourne where there are proved deposits of stone and where no planning permit is required, quarrying is either a prohibited use or a use subject to a permit. Under the *Extractive Industries Act* a lease or licence cannot be issued until such time as the necessary planning permit is issued.

In addition to the *Extractive Industries Act*, materials that would be classified as stone under that Act may be produced under the *Local Government Act* 1958, the *Soil Conservation and Land Utilization Act* 1958, the *Land Act* 1958, and the *Forests Act* 1958. In contrast to the Extractive Industries Act, under which most production takes place from freehold land, the greater proportion of production under these Acts is from public land. The provisions of these Acts relating to the removal of stone are summarized below.

Under the provisions of section 39 of the *Extractive Industries Act* 1966, government agencies and municipalities carrying out stone extraction for their own purposes are exempt from control unless the depth of extraction exceeds 2 m, in which case the agency or municipality is bound to observe the operating regulations that cover safety aspects, excavation practice, use of explosives, etc. Under a recent amendment to the Act, agencies or municipalities must notify the Department of Industry, Technology and Resources of their intention to extract stone. The Department, however, has no say in the suitability of a particular site, or the availability of alternative sources.

Under section 658(1) of the *Local Government Act* 1958, municipalities have the right to extract gravel and stone from public or freehold land, except where such extraction would affect a watercourse, building, etc. Before commencing any extraction, however, the municipality is bound to notify the Department of Conservation, Forests and Lands, regardless of the extent of the proposed extraction.

Where shallow extraction (less than 2 m depth) exceeds 2000 sq.m, that is, one-fifth of a hectare, the consent of the Department of Conservation, Forests and Lands must be obtained in writing under the *Soil Conservation and Land Utilization Act* 1958. Municipalities have the right to extract from any land, without the consent of the Minister for Conservation, Forests and Lands, provided that the extraction does not exceed 2000 sq.m.

Section 190 of the *Land Act* 1958, however, permits the removal of stone and other construction materials, including timber, from Crown land generally for the construction or maintenance of roads and bridges within the municipality.

Thus, the *Land Act* 1958, which requires the consent of the Minister for Conservation, Forests and Lands for any extraction by municipalities on Crown land, is in direct contrast

to the *Local Government Act* 1958, which only requires municipalities to notify the Department of Conservation, Forests and Lands of any extraction.

Importantly, this provision exempts the municipality from fees or licences other than those charged or issued under the *Mines Act* 1958.

The *Forests Act* 1958, under section 52(1), allows for the removal of 'forest produce', subject to a licence or permit being issued by the Department of Conservation, Forests and Lands, the maximum term of which is 3 years. Forest produce in reserved forest includes stone, gravel, limestone, salt, loam, and brick earth.

Section 82 of the *Mines Act* 1958, as amended, allows for the removal and use of mining tailings for any purpose, under a Tailings Removal Licence granted by the Department of Industry, Technology and Resources. Tailings includes any material discarded by plant used for extracting minerals, and materials produced in the course of mining. It does not include any undisturbed sand and gravel resources on or under an abandoned mining or mine processing site.

A Tailings Removal Licence does not require the consent of the land manager, although applications must be referred to the Department of Conservation, Forests and Lands for comment on appropriate conditions for rehabilitation of the site.

The *Vermin and Noxious Weeds Act* 1958, section 16(1)(b), provides penalties for the removal of stone from ground on which there are noxious weeds without first obtaining the written permission of the Minister for Conservation, Forests and Lands. All land is subject to this provision, including land under an Extractive Industries title or a Tailings Removal Licence, or land reserved for the purpose of stone or gravel extraction.

The *National Parks Act* 1975, under section 40(1) and (2), does not allow the issue of a lease, licence, permit, or other authority under the *Mines Act* 1958, the *Extractive Industries Act* 1966, or the *Petroleum Act* 1958 except with the consent of the Minister for Conservation, Forests and Lands, and subject to any terms and conditions that the Minister may impose.

Council's provision for stone extraction

Council has provided for stone extraction through a range of final recommendations. Its general recommendations and principles and guidelines for stone extraction appear in the chapter on minerals, fossil fuels, and stone, but specific references have been made in various other chapters, under parks, hardwood and softwood production, and uncommitted land.

At or near stone-extraction sites the primary values and uses of recommended parks are adversely affected. In the parks chapters, the provisions for extraction that already

occur prior to a park being recommended fall into three categories. Extraction may be:

* allowed to continue
* allowed to continue pending location of similar sources outside the park
* phased out within a specified time

In the South Gippsland Area District 2 final recommendations, the limestone extraction from within Wilsons Promontory National Park was to continue under present arrangements, unless an alternative source outside the park was found. A similar recommendation was made for the shale quarry within Tyers Regional Park. In the North Central Area final recommendations, various State and regional parks were recommended, encompassing several existing extraction sites.

The Kooyoora State Park recommendation limited the sand pit to its existing size, with all extraction to cease by 1983. The government amended the recommendation, excluding the sand pit from the park, and made it a stone reserve. Similarly, in the Kamarooka State Park recommendations extraction was to cease by 1985.

In this case, particular mention is made of alternative gravel resources made available in the minerals and stone chapter. In connection with the granite quarry within Mt Alexander Regional Park, Council recommended that the feasibility of relocation be investigated. In the Melbourne final recommendations for Angahook State Park, the existing quarry at Bambra Road was to continue but be screened from the road by native vegetation. Similar recommendations are made in the parks chapters of other sets of final recommendations.

Stone extraction is generally accepted as a secondary use in hardwood and softwood production areas, and from uncommitted land. These cover in total some 52% of all public land in the State.

Summary of Council's Recommendations

Council's present policy with regard to the extraction of stone is clear, and has been published in the minerals and stone sections of proposed and final recommendations since 1975. In summary, the Council recommends that specified principles and guidelines be followed, and that for particular proposals the land managers should consult the Department of Industry, Technology and Resources about exploration and extraction from public land.

Council has consistently urged uniformity with regard to the application of these procedures, stressing that all operators - commercial, municipal, and departmental - should work within them. In addition, the Council's policy is that sufficient funds should be set aside to ensure adequate reclamation, and that further funds should be made available to expedite rehabilitation of existing extraction areas on public land.

Council has also urged that royalties and other payments for extraction from public land should be related to the commercial value of the materials, and that extraction should be concentrated in the smallest number of sites, with a preference for deeper, restricted workings rather than shallow surface stripping. Where an area is deemed to be of greater value for other uses, extraction should not be allowed. This is particularly applicable to removal of stone from streambeds and areas adjoining watercourses.

Council's recommendations specifically exclude stone extraction from wilderness and reference areas. Stone extraction is thus excluded from about 2% of the State, or 3% of public land but elsewhere is subject to a number of principles and guidelines set out in the recommendations.

Stone resources potential from public land

A line connecting Cranbourne, Pakenham, Broadford, and Bacchus March encompasses the major suppliers and this area could be loosely defined as the Melbourne supply area, consisting mostly of freehold land. Within these confines the combination of high population concentration and desire for open space and recreation in natural environments places great pressure on limited public land. It thus restricts the prospects for quarry and pit development on public land, despite the potential in some locations. This limitation of source areas is appropriate given community demand for the other uses, although it inevitably results in greater pressure on other stone-resource locations that are accessible at a similar cost.

Outside the Melbourne area other market components are centred on provincial towns and cities and a similar situation often occurs. The extensive tracts of public land distant from Melbourne and the provincial towns and cities contribute a small proportion to total supply, with the range of stone products, type and size of operation, and end-use of the stone being limited. Quarries and pits are often relatively small and intermittently produce gravel, sand, or crushed and broken stone for construction and/or maintenance of lower-standard roads, for which the stone quality is of less importance.

Cost minimization and budget restraints encourage agencies and municipalities to seek the closest practicable source of materials, which has often meant the nearest source on public land. Such sources have in the past presented the least number of problems with regard to access, compensation, and local public relations, regardless of the rights of municipalities to extract road-making materials from freehold land under section 658(1) of the *Local Government Act* 1958.

Major determinants of preferred pit or quarry locations are the existence of suitable deposits in close proximity to point of use and limited budget. These considerations result in little incentive to investigate stone resources over wider areas and develop them in a planned manner, although the absence of such practices is at odds with good natural resource management principles and contrasts with management

planning for other natural resources throughout the State's public land.

Unwise excavations

The Council has stated in recommendations for numerous study areas that a considerable number of unwise excavations have been made on public land. The rehabilitation has been inadequate in many instances, particularly with older excavations. Such practices were common in the past but are no longer acceptable.

Typical shallow gravel excavations, small unplanned sand and gravel pits, and stone quarries involve removal of vegetation and surface stripping, usually to a depth of 50 to 150 cm. Often relatively large areas are stripped and land disturbance can be very conspicuous where such exposures lie alongside the roads on which the gravel is to be used. Many excavators have made little or no effort to revegetate stripped and abandoned areas.

Further problems occur with some sand and gravel pits and stone quarries where development and subsequent rehabilitation of the site are unplanned and haphazard. In a number of cases little is known about the extent and quality of stone, and the development of the pit or quarry is to be a large extent determined by sporadic localized needs, with decisions to expand operations typically made on an *ad hoc* basis.

In many instances large resources of gravels lower down a profile exhibit good road-making properties, but are not utilized either because they have not been assessed or because surface stripping is perceived as a simpler and cheaper alternative. This approach represents inefficient use of the total resource and does not take account of the environmental cost of exploitation in terms of dust, noise, run-off, and visual impacts during operations, followed by long-term visual and erosion problems after operations have ceased. It usually entails little pre-planning for rehabilitation and low standards of performance with progressive and final rehabilitation.

The cost difference between this *ad hoc* approach and gravel extraction from *Extractive Industries Act*-titled operations is significant. The ex-pit value of gravel from non-Act operations, including those described above, was approximately half that of Act-titled operations in 1983/84. No detailed analysis of the reasons for this has been undertaken, but the information supports the view that many untitled excavations have been undertaken on a minimum-cost basis with limited regard to factors such as sensible siting and proper reclamation.

Quarrying in parks and reserves

Following the recommendations of the Council, the government has established an extensive system of parks and reserves across the State. Extraction of stone resources in certain categories of parks and reserves is sometimes contentious.

For reasons of noise, dust, site destruction, and frequent heavy traffic, stone utilization is not compatible with the primary conservation and environmental objects for parks and reserves. In many areas, therefore, stone extraction - particularly in commercial operations - is clearly an inappropriate use.

Council policy provides for stone extraction from public land including parks and reserves, in accordance with guidelines outlined in its recommendations, and for specific sites and conditions as agreed by the land manager and the Department of Industry, Technology and Resources.

Government policy on stone extraction from parks and reserves is not explicit. Section 40 of the *National Parks Act* 1975 makes a provision requiring the consent of the Minister for Conservation, Forests and Lands for extraction, thus indicating that the intent of the legislation is not necessarily to prohibit quarrying in scheduled national parks. The current position is that both private quarrying operations and government agency stone extraction occur in parks and reserves, with private operations being in the minority. In most if not all cases, any private quarrying pre-dates the establishment of the park or reserves.

Issues

Exploration and mining

* Council has consistently put forward the view that where other values are regarded as being more important in certain areas, then mining and exploration should be excluded.

Impacts of mineral resource activity

* Some mining activities are incompatible with other special interests and uses.

* The interpretation and application of Council's exploration and mining policy has led to some significant problems in that the Council's guidelines are of a general nature. They have been interpreted to support both mining and protection of areas, resulting in an inconsistent and ineffective approach to resolving such conflicts in use.

* While adverse affects of mining and exploration may be reduced by careful applications of conditions and supervision of operations, these must still be balanced against the other values of a particular area.

* The Council's guidelines, as written, are broad and not readily applied to individual sites.

* There may be a need to develop detailed sets of guidelines that establish a clear framework for assessing particular values of sites, into which the details of specific mining or exploration applications can be added.

* One issue is whether the terms 'fossicking' and 'prospecting' need to be more closely defined and differentiated in Council's recommendations in order to avoid their confusion, and, furthermore, whether fossicking requires similar legislation to prospecting in order to control any potential for damage.

* Some concern is being expressed about the damage being done by prospectors in particular.

* Eductor dredging - does it have a significant impact, and should rivers proposed for inclusion in schedule 15 of the *Mines (Mining Titles) Regulations* 1983 be assessed with respect to their nature conservation, recreation, and scenic values, and to their bed and bank stability?

* It is considered that the Council's recommendations provide adequately - both now and in the future - for the perceived community needs for minerals and fossil fuel.

* Many mineral deposits that have been found in Victoria are not currently economic, but with changing circumstances may become so in the future; hence we need to retain an exploration or mining option on most public land.

* An issue is whether Council should recognize the primacy of undisturbed conservation values in the important reserves, and should specifically recommend the exclusion of surface-disturbing exploration and mining from some or all of the national and State parks, other major conservation reserves (in line with the policy outlined in the State Conservation Strategy), wilderness areas, and buffer zones around water supply storages.

* It is important to implement the Council's principles and guidelines for mineral exploration and extraction, particularly concerning interdepartmental action to establish and apply procedures excluding certain areas with other values from exploration and/or mining, and provisions for full reclamation or restoration to a standard appropriate to the site.

* The wide distribution of most stone resources throughout the State, together with the large area of the State where stone extraction is an acceptable use, effectively means that the exclusion of the limited areas specified Council recommendations has not materially affected real resource availability, although in some instances it may result in increases in the cost of the resource at point of use. However, local impacts may be more significant in some areas for particular types of stone.

* Recognized environmental concerns are the proliferation of small, badly sited pits and failure to apply appropriate standards of rehabilitation.

* Despite Council's policy, considerable problems associated with stone extraction still persist, mainly with

operations exempt from the provisions of the *Extractive Industries Act* 1966, and arising from contradictions in some of the applicable legislation.

* A perceived need is a State-wide assessment of resources to identify resource qualities, needs, best method and rate of extraction, and most appropriate source of supply for each municipality.

* Application of uniform procedures is required for exploration and extraction of stone by all users, including municipal councils and the Road Construction Authority.

* Provisions are needed for full reclamation or restoration to a standard appropriate to the site. Where abandoned sites require reclamation, it should be carried out at the expense of the operator if this is known.

* Stream-bed extraction should be avoided.

* Site numbers and distribution require rationalization.

* Interdepartmental action is needed to establish and apply procedures to exclude certain areas from extraction.

18. AGRICULTURE

Land settlement

A history of land settlement has been provided in chapter 3, from the perspective of the public land estate. This mentions the early use of land by the squatters, followed by settlement by the selectors. Powell (1973) describes the official process of making areas available for selection, and also the popular process of land choice, by both the squatters and selectors.

Crown land reserves - that is, areas unavailable for agriculture - totalled only about 1 million ha in 1881, some 4.8% of the State. Most of the remainder of the State was available for agriculture one way or another. The question is which areas did the settlers choose?

Squatters, selectors, and potential settlers of the land quickly gained experience in taking up the 'better' land for agriculture. Differences were recognized by subtle changes in vegetation and soil types, along with the obvious topographic and geological distinctions. Both squatters and selectors were mobile, the squatters moving their stock to fresh grasslands on new runs, the selectors shifting as cropped paddocks became exhausted of their small reserves of plant nutrients.

As well as deliberate preferences for land of certain types, the selectors and leaseholders suffered the effects of trial and error in some areas. Steep hills in the Strzeleckis and Otways and fringing the alpine areas, much of the dry Mallee, and leached sand-soil areas in Gippsland and the southwest were selected and farming attempted there. But as the inherent difficulties in farming these areas were soon exposed, many occupants walked off their land and large areas reverted to the Crown.

The State-wide distribution of freehold land today largely comprises those areas that are more suited to farming. Consequently the public land largely consists of those areas never wanted for farming - being too poor, cold, steep, wet, dry or remote - and those that have been abandoned after farming attempts, for the same reasons.

Land systems and preference for farming

No attempt was made last century to systematically retain examples of different land in its natural state. Crown land reserves were set aside for purposes complementary to agricultural or other uses - that is, for roads, water supply, timber, stream frontages, recreation, and public purposes.

Land systems are areas recognized as having repeating patterns of topography, geological material, climate, soils,

and indigenous vegetation, as discussed in chapter 9. The land systems are grouped into 29 geomorphic units. Freehold land occurs preferentially on certain geomorphic units, which are those listed in Table 22, chapter 9, with less than 10% public land.

In the preferred areas, much falls into five major groups: the Quaternary alluvial plains (geomorphic units 4.1, 4.2, 9.1 and 9.2); the Western District volcanic plains (units 7.1 and 7.2); the Wimmera clay plains (units 6.1 and 6.2); the Mallee clay plains (unit 5.1); and the Tertiary loam and clay plains (units 8.1 to 8.4).

Conversely, some geomorphic units largely remain as public land. Examples include units 5.2 and 6.3 (Sunset Country, Big Desert, and Little Desert sands) and units 1.1 to 1.3, 2.2, 3.5 (mountainous areas, mainly on palaeozoic sediments).

In contrast, however, public land remaining in the sedimentary and granitic foothills (unit 2.1) tends to be fragmented and scattered, reflecting areas retained last century as timber reserves and State forest and as auriferous areas, while the remainder is freehold.

The south-western sand belts (in unit 8.1) along the Lower Glenelg River, from Dartmoor to Dorodong, contain virtually all the public land within their general area. Within the sand belts lies a patchwork of freehold and public land, indicating the problems found in settling these areas.

Boundaries between geomorphic units are sometimes distinct and sharp, such as around the volcanic plains and on the fringe of the Big Desert sands. Often, however, they are diffuse, especially where the land changes gradually between adjacent units. The boundaries of freehold land around a unit that is broadly unsuitable for agricultural use often encroach, perhaps optimistically, onto that unit. However, it is these areas that are the least economic.

The basic distribution of freehold and public land is therefore determined by the nature of the land. Nevertheless, the inherent weaknesses of some lands can be and have been overcome with special inputs. The Mallee, for example, became permanently settled following construction of the stock and domestic water-supply channel system; similarly, some areas with leached sandy soils can only sustain grazing after the addition of appropriate trace elements.

Discovery of the latter led to renewed interest in the 1960s in settling some remaining parts of the public land estate, particularly the south-western sand belts. In 1966 the Land Utilization Advisory Council was given the task of identifying appropriate areas of public land in this region for alienation, and Table 8 summarizes the localities it studied from 1966 to 1969, and its recommendations.

Public land in many parts of Victoria has traditionally been 'occupied' for grazing under annual (or longer) licences. The use of the high plains in the Alpine area for grazing by

cattle is familiar to many, as is the red gum forest grazing and annual muster in the Barmah Forest. Road reserves and water reserves have also been traditionally grazed. Less familiar is the widespread use of smaller areas of public land adjacent to farms.

In the Mallee a range of tenures has occurred over public land. These include annual licences, 21-year grazing leases, limited cultivation leases, land in the process of alienation under improvement purchase leases, and agistment rights.

Current Use of Public Land for Agriculture

The major agricultural uses of public land in the various study areas are listed below.

East Gippsland

* forest grazing under lease, often adjacent to freehold land (this provides valuable feed reserves in droughts, and dry grazing areas during floods)
* limited grazing on public land along river and stream frontages
* apiculture - forest areas have a very high capability

Gippsland Lakes Hinterland and South Gippsland

* forest grazing of alpine foothills in the northern areas
* carefully controlled grazing in the northern part of Wilson's Promontory National Park, as a result of historical land tenure agreements (to be phased out by 1992)

Melbourne

* grazing of stream frontages and limited forest areas
* limited but intensive horticulture on the Goulburn River flats
* limited cultivation of stream frontages

North-Eastern and Alpine

* forest and plains grazing in mountain and alpine areas, which provide summer feed and are of considerable value to a limited number of individuals
* substantial use of unused roads and stream frontages for grazing
* limited cultivation for tobacco along the Ovens and King Rivers
* apiculture in mixed-species foothill forests

Murray Valley

* open-range forest grazing of cattle in the Barmah, Gunbower, and Terrick Terrick Forests, either under licence or agistment by adjacent landholders

* grazing on river and stream frontage reserves along the Goulburn, Ovens, and Murray Rivers

* apiculture in the Gunbower, Terrick Terrick, and Killawarra Forests and the Warby Range State Park

* grazing on unused roads

North Central

* grazing of small blocks and stream frontages adjacent to freehold land

* apiculture in forested areas

Wimmera

* high-yield cropping on the Lake Buloke overflow, but subject to risk of inundation

* grazing on Lake Buloke when dry

* grazing of small blocks and stream frontages adjacent to freehold land

* apiculture in the Little Desert, which is used as an important over-wintering refuge for thousands of bee colonies

* grazing and cultivation of roadsides and unused roads

South-Western

* grazing of small blocks and stream frontages adjacent to freehold land

* apiculture in forested areas

Corangamite

* occasional and limited honey production in State forest and in the vicinity of Heytesbury, Cooriemungle, and Framlingham

* grazing of leased lands around lakes and flood-prone land north of Colac

* occasional (illegal) grazing of coastal reserves by livestock during winter or drought years

* grazing of public land along stream frontages, and utility reserves

* grazing on unused roads

Ballarat

* red volcanic soils in the Ballarat water supply catchments leased for potato, prime lamb, beef, and grain production

* apiculture in the forested ranges near Langi Ghiran, Ben Major, Creswick, and Ballarat

* limited forest grazing of beef cattle

Mildura

* extensive grazing of sheep in the Big Desert, Sunset Country, and Millewa

* forest grazing along the Murray River

* cultivation in the Sunset Country, near Robinvale, and other smaller blocks

* apiculture in the Big Desert and Sunset Country, which are important for both over-wintering and honey production

Other aspects of agricultural use of public land

As well as the primary uses of public land listed above, small areas of public land often have major significance for individual landholders. Public land water frontages are of particular importance in this regard. The forage along them is often of better quality than that on adjacent freehold land, and often a licensed water frontage provides an adjoining farmer's only access to permanent water. In fact irrigated grazing of stream frontages takes place in north-eastern Victoria in summer periods and demand for this use is expected to increase. Grazing of water frontages can, however, cause erosion problems, and also water-quality problems in the adjacent streams by increasing sediment and nutrient loads.

Agricultural use of public land, including water frontage reserves, can come into conflict with recreational use, especially in areas closer to Melbourne. Irresponsible recreationists occasionally cause problems by careless use of fire, damaging fences, leaving gates open, and careless shooting. On the other hand exclusive agricultural use of water frontages restricts public access to streams for recreational activities.

As well as using public land for grazing or cultivation, many landholders also value adjoining public land as a source of farm timbers. These timbers, which are harvested in small quantities under licence, are used in the construction of fencing and farm buildings, and for firewood.

Normally agricultural use of land takes place under licences issued under the *Land Act* 1958 or the *Forests Act* 1958. There is, however, a considerable amount of illegal use of public land for grazing or cultivation, especially on

roadsides, unused roads, small blocks, and coastal reserves in the western half of the State. Although the total area affected by these activities is not great, it is still significant in a part of Victoria that has been largely cleared of native vegetation.

Apiculture

The apiculture industry depends on the introduced honey bee (*Apis mellifera*). This social insect collects and stores quantities of plant nectar as a carbohydrate food source and the excess is harvested as honey. Bees also collect pollen and in the process transfer pollen from plant to plant. Pollen is a protein source that is stored, along with nectar, for feeding. The pollination activity of honey bees, especially in relation to agricultural and horticultural crops, is probably more important than their commercial value as producers of honey.

On agricultural and horticultural land, lucerne, seed crops, and various clovers are important sources of nectar and pollen. Declared noxious weeds such as blackberry, thistles, and Paterson's curse are also important sources. On forested lands most of the honey is produced from eucalypts. The best producers are considered to be the box and ironbark species, especially yellow box and red ironbark, and river red gum.

Commercial beekeeping is a migratory industry. Beekeepers regularly move their hives during the honey-producing season to areas of high yield, following the honey flows of different flowering plants. They also travel to over-wintering sites where the bees can build up their stocks of pollen. While apiaries may be located anywhere in the State, commercial beekeepers are largely based in central and north-eastern Victoria.

A survey of honey-producers conducted by the Department of Agriculture in 1982 found that Victoria contains a large proportion of small producers, including hobby producers, who supply very little honey and that most honey is produced by a small number of beekeepers who have large numbers of hives. For the purposes of the survey a commercial beekeeper was defined as one who operated more than 400 hives and who received at least 60% of his or her income from honey and allied apiary products. On this basis, 53 commercial beekeepers were operating in 1980/81. Commercial production averaged 3217 tonnes from 1971/72 to 1980/81; this represents 16% of Australian production. About half of the honey crop is exported.

Beekeepers are issued with licences to work their bees on public land. Licence conditions stipulate area of operations, the occupancy period, and the rental charged. Public land is also used by unlicensed beekeepers who locate the apiary on adjacent private property.

The Council's recommendations allow honey production on virtually all public land except within or near reference areas.

In the case of parks, the Council has usually recommended that the number of existing sites be maintained. However, where beekeeping is not a current park use it has not been permitted, for example, in the Bogong National Park.

Land Conservation Council Provisions for Agriculture

Alienation of public land

Part of the charter of the Land Conservation Council under the *Land Conservation Act* 1970 is to make recommendations to the Minister with respect to the use of the public land in order to provide for the balanced use of land in Victoria; and where the Council recommends alienating any land the recommendation shall include the Council's opinion as to the best method of alienating the land to ensure the most satisfactory use and management of the land in the public interest. The Council has recommended alienation of public land in various of its published final recommendations, and these areas total 96 500 ha.

The Council now takes the view that further large-scale alienation of public land could deplete the public estate of appropriate representation of remaining land systems. Those land systems most sought-after for alienation are those represented least well on public land. Requests in submissions for small-scale alienation in localized areas have been treated on their merits by the Council, but these can have a similar effect; the areas requested are often the only remnants of a particular land system; or the request is for a land component (such as an alluvial valley) that is of value within the public land estate for other purposes, such as recreation or wildlife conservation. Susceptibility to erosion and potential fire danger are also taken into account in assessing applications for alienation.

Land exchange

Exchange of public land for freehold land has also been recommended by the Council on occasions, particularly where the freehold land-owners concerned and the public estate both benefit from the exchange. The Council recently developed a policy framework for assessing land exchanges.

Using this framework the following matters are taken into account (with respect to both the freehold land and the public land proposed for exchange) when the Council is assessing land exchange proposals:

* nature conservation values
* occurrence of commercial resources
* soil conservation and catchment protection
* current and potential uses
* efficiency of land management
* additional public costs that would be incurred

Traditional uses of public land

The Council has considered long-term agricultural uses of public land in its recommendations. With regard to high

plains grazing in the Alpine area, the Council recommended that grazing continue to be excluded from the Mount Buller alpine resort, Mount Hotham--Razorback area, Mounts Feathertop and Bogong, and around Falls Creek, thus reinforcing previous government decisions. In addition, Council recommended that grazing be phased out from the wilderness and reference areas - as, by definition, grazing is an inappropriate use in these areas - and from parts of the Wonnangatta--Moroka and Bogong National Parks, The Bluff--Mount Clear park addition, and the Howitt Plains area, because grazing conflicts with other values and uses in these areas. This leaves grazing on 3688 sq.km or 95% of the area grazed before the 1979 recommendations.

In its Murray Valley final recommendations the Council discussed grazing in the Barmah, Gunbower, Terrick Terrick, Killawarra, and Lower Goulburn River Forests. After full consideration the Council recommended removal of grazing from the proposed Barmah State Park (27% of the Barmah Forest), but that grazing continue in the remainder of the Barmah and Yielima grazing areas. A subsequent amendment in Parliament, however, allowed grazing to continue in the Barmah State Park as well. In the proposed Terrick Terrick State Park, Kooyoora State Park, and the Killawarra Forest, grazing is recommended to be permitted only where necessary for management or fire-protection purposes.

In its previous Mallee study, the Council specified two main recommendations for agricultural use:

* F1 (73 200 ha) - for alienation with erosion-prevention clauses where necessary (some 71 300 ha has since been alienated)

* F2 (34 000 ha) - to be retained as public land but used for grazing and cropping under Limited Cultivation Leases, a new form of tenure allowing supervision by the land managers (there are currently 14 F2 leases covering 9200 ha)

The Mallee area is currently being reviewed by the Council, and the allocation of public land for agriculture is one of the major issues in this review. In particular the F2 areas are being considered in detail.

Future Use of Public Land For Agriculture

In general, land in Victoria that was not alienated following settlement either is unsuitable for intensive agriculture or has been reserved for specific purposes and provision of other community values and is thus unavailable for agriculture.

Substantial areas of public land are currently being used for some purposes, however, under a range of tenures including lease, licence, or agistment. Usually, such use is of considerable value to the individual farmer in improving his economic viability. For example, forest grazing frequently provides summer feed that increases the capacity of the

freehold farm. It may also provide benefits in stock health and greater management flexibility during unfavourable seasons, both drought and flood. In times of drought though, the ability of public land to provide grazing falls and its susceptibility to damage - by both increased erosion and effects on sensitive plant species - rises. Reduction in risk and improved flexibility are likely to be at least as important to many lessees as are production increases *per se*. Use of public land is especially valuable in this sense where the lessee is the adjoining landholder.

Well-managed forest grazing can also provide community benefits through weed control and fire-fuel reduction. On the other hand, adverse effects may include loss of palatable or sensitive native species, reduction in floral diversity, changes in species dominance, weed introduction or spread, and damage to soil structure. Licensed grazing of small public land reserves, including water frontages can cause these effects. Clearly, some significant problems apply throughout the State with regard to standards of management of public lands, by both licensed users and illegal users. In particular, stock access to public land along water frontages can cause water-quality deterioration and stream-bank erosion.

There is thus a recognized need in some areas to improve standards of agricultural management of public lands, but withdrawal of grazing from such lands is not a complete solution unless alternative management is supplied by the Crown. Continued but improved management by adjoining landholders may be the most efficient option, where other important community values are not prejudiced.

Security of leasehold land tenure is an important determinant of the standard of agricultural management likely to be applied. Improvements such as fencing and water supply are expensive, but lessees will invest in such improvements more readily where they are confident that tenure will be secure enough to sustain the expenditure.

In most instances, the Department of Agriculture and Rural Affairs considers that the economic benefits to individuals arising from the use of public land is not reflected in significant improvements in the regional or State economies, because of the relatively small production increases. Improved economic viability of farming enterprises is likely to be reflected, however, in the welfare of local communities. The use of public land for fattening mature stock could provide longer-term benefits.

There are many fragmented and isolated public land allotments throughout the State. The Council has recommended many such allotments for reserves of various types, as they are sometimes the only examples of public land on particular land systems. They are also very important for their nature conservation, landscape, and in many cases recreation values. These are the reasons why the Council has seldom acceded to the many requests for alienation of such areas for adding to adjacent farms. In some places it is recognized that this can lead to interface conflicts.

Considering that relatively few individuals benefit from the use of public land for agriculture, the apparent trend in community values against this use, and a general lack of land suitable for extensive alienation, there is wide agreement on the lack of justification for further substantial allocation of public land to agriculture in Victoria. In some instances, it may even be difficult to sustain arguments for continuation of present agricultural use of some freehold lands, resulting in considerable scope for further return of land of low agricultural potential to the Crown.

Concerns recently expressed about high plains grazing in particular are that the cattle preferentially eat certain alpine herbs thus reducing their distribution, that they cause increases in shrub cover, that they damage the fragile moss-beds around the bogs, and that they foul springs and waterholes with excreta carrying intestinal worms and liver fluke.

The Council has taken the view that these concerns, although real, they do not justify the removal of grazing from areas other than the most sensitive or important for conservation or walking, as previously mentioned. The Council has recommended further studies, however.

Compared with some other activities, beekeeping as a land use has not produced major conflicts. Potential management problems include the physical disturbance associated with installation and removal of hives, clearing for fire protection, and public recreation access to particular sites and water supplies in summer. Because the honey bee is an introduced species, there are also potential ecological problems, including:

* a reduction in nectar supply to native fauna
* long-term decline in native pollinators, as a result of competition
* inefficient pollination and/or increased hybridization of native plants
* increased establishment of feral bee colonies that usurp fauna nesting sites in tree hollows

Silvicultural practices such as thinning in forests may temporarily reduce the availability of a flowering crop, but rapidly result in enhanced crown development and more profuse flowering in the retained trees.

Long-term research into the ecological impact of the introduced honey bee is in progress in South Australia. The results of this and other studies can be incorporated into the Council's recommendations where appropriate.

Issues

In summary, the following major issues need to be faced regarding agricultural use of public land.

* In most of its study areas, the Council has recommended some public land for alienation, usually to consolidate existing farms. However, it has opposed large-scale

alienation, except in the Mallee where extensive areas of public land were already cleared or used for farming. The question is whether further alienation of public land for agriculture is warranted.

* Should public land continue to be used for agriculture under licence, particularly in the Alpine high plains, the Mallee, and the Murray Valley areas?

* The effects of apiculture on natural ecosystems and native flora and fauna require further investigation, particularly in relation to the impact of competition from honey bees on native pollinators, competition with native fauna for nesting and roosting sites, and hybridization of native plants.

* Public land adjoining agricultural areas has traditionally been used to supply farm timbers, although in recent years demand has declined due to the use of alternative materials such as treated pine, steel, and concrete fence posts and other timbers.

Reference:

Evans, S. (1984). An economic survey of the honey industry in Victoria: 1980/81. Department of Agriculture, Victoria, Research Project series No. 186, August, 1984.

19. UTILITIES

Public utilities and associated activities comprise the essential services of water supply, drainage, and sewerage; the provision and reticulation of electricity and gas supplies; the disposal of domestic and industrial waste and toxic waste; the provision of road, rail, air, and communications networks and terminals; the distribution of fuel; the installation of air and marine navigational aids; facilities for the military and police; and a host of other institutional uses including schools, hospitals, prisons, and cemeteries.

Many installations associated with these activities are located on public land, and are vested in a wide range of government departments and statutory authorities, such as the Melbourne and Metropolitan Board of Works, the State Electricity Commission of Victoria, the Departments of Community Services and Health, the Gas and Fuel Corporation, and the Office of Corrections. For the most part the visual impact of these services is considerable, frequently in the form of pylons, pipelines, masts and beacons, and an extensive variety of purpose-designed buildings. As a result of the unequal distribution of associated resources around Victoria, many public utilities fall within the eastern part of the State, and particularly in the Latrobe Valley.

State distribution

Public utilities are significant users of public land in a number of quite localized areas. Most notable are those parts of South Gippsland (in the Latrobe Valley) under the ownership and operation of the State Electricity Commission of Victoria. This land is held mainly for recovery of brown coal (discussed in detail in chapter 17), but also for the siting of power stations and associated works and facilities, including cooling-water ponds.

The Commission also currently holds a number of areas as linear corridors and easements for the purpose of carrying power-transmission lines across country to urban population centres. Similar corridors are used to carry oil and gas pipelines from the Bass Strait fields to the refineries and distribution centres around the State. The policy of the responsible agencies in these instances has commonly been to keep such corridors free of vegetation on the grounds of fire prevention and maintenance access.

Two major areas of public land used for public utilities are the Latrobe Valley Water and Sewerage Board's Dutson Downs waste-disposal facility (9417 ha) and the Melbourne and Metropolitan Board of Works sewage-treatment farm at Werribee (11 600 ha). These installations treat domestic and industrial effluents on a large scale. Neither facility occupies its extensive site fully as yet.

As a secondary function, nature conservation has become significant in both locations. Werribee Farm has emerged as an internationally renowned wetland for the conservation of waterfowl, while part of Dutson Downs is included in the Gippsland Lakes Reserve. Attention to the requirements of nature conservation has become an active part of their management.

The transport network throughout the State occurs almost entirely on public land, and has been extended by land purchase from time to time for specific road or highway projects. Designated road and roadside reserves occupy more than 500 000 ha.

Although these often vegetated strips are normally maintained for access, safety, the protection of adjacent properties, and potential road-widening or track developments, many have become notable in their own right for wildlife habitat. Often these areas hold the only remnant of original or near-original vegetation in landscapes that have been extensively modified. They are thus especially vital as habitat, refugia, and migratory corridors for wildlife living or moving within their vicinity.

While endorsing their primary purpose for transport, the Council has recognized the potential other values of road reserves, and the need for their maintenance for all uses, and this is reflected also in the government's State Conservation Strategy, which highlighted the role of various forms of linear reserve such as roads and railways in urban and rural areas, and riparian and coastal strips, in their habitat-protection function.

The remaining parcels of utility land are scattered throughout the State, frequently clustering near population centres. Their purposes range from the location of airfields, prisons, hospitals, and educational institutions through to cemeteries, rubbish tips, and a variety of special-purpose buildings or structures such as fire lookouts, trigonometrical stations, communication towers, and air and marine navigation installations.

Impact of such structures on other adjacent or associated land uses is generally minimal in terms of area affected, being most often visual where it occurs. Unfortunately the purpose of some utility structures such as communications towers necessitates siting them prominently and intrusively. A longer-term and more random problem is the uncontrolled, indiscriminate and illegal dumping of rubbish in non-allocated areas.

Provision for and Evaluation of Utility Land in Council Recommendations

Public utility land is generally described in 'Utilities and Survey' chapters of Council's recommendations. The Council has made specific recommendations for utilities covering some 45 000 ha of public land, although this is only a proportion of the total amount, given the extensive easements on freehold land.

Council's recommendations make general provision for the remaining utility uses, by means of the following guidelines for management.

* Utilities should be planned to minimize disturbance to public land and protect the values associated with this land. They should not be sited on public land without the agreement of the management authority, and new pipelines and power lines should follow existing easements if possible (this may require widening of some easements).

* Where isolated remnants of the original vegetation remain on land associated with utilities, every effort should be made to protect that vegetation, consistent with management practices.

* Where a pipeline or overhead wires are to follow a road carrying trees and shrubs in a rural district, every effort should be made to locate the easements on private land alongside the road if this is already cleared, rather than clearing roadside vegetation to accommodate them.

* While recognizing the need for clearing or pruning vegetation close to power lines to reduce the associated fire risk, the State Electricity Commission should consult with the Department of Conservation, Forests and Lands regarding the manner in which the risk posed by vegetation can be reduced, while at the same time reducing the environmental impact to a minimum.

* Burning off, slashing, or clearing of vegetation along roadside and in utility easements should be kept to a minimum consistent with providing adequate fire protection. Disused utility easements should be retained as public land where they may have value for use as cycling or walking tracks or where they may eventually be needed again as routes for public transport.

A substantial area is tied up in long-established services. The routes of the State's roads and railways and reserves for many public purposes (such as cemeteries, court houses, and the Melbourne and Metropolitan Board of Works' sewage-treatment farm at Werribee) were laid down in the latter half of last century.

The Council generally makes recommendations for utility services where necessary, reflecting their essential nature, their often specific locational demands, and the relatively small amount of land needed to accommodate them. In doing so, the Council examines alternative sites or routes, and potential conflicts are either resolved or minimized as far as possible.

In this field it is not usually possible for the Council to provide for future requirements of land for additional utility purposes in the absence of firm or detailed planning proposals. The use of further land for these purposes has to be considered as the need arises, although Council has

considered proposals where these exist and where utility agencies are looking ahead to future developments, and has recommended sites accordingly.

Government agencies concerned with the provision and construction of utilities should, in the Council's view, submit proposals involving occupation agreements or the setting aside of sites on public land to the appropriate land managers at an early planning stage. This will assist in achieving the co-ordination that is essential in planning, and may perhaps avoid the necessity for costly resurveys.

Likely future needs

Although future utility needs cannot be known with any certainty, prospective needs can be assessed to obtain a broad picture of likely public land requirements for these purposes. Where appropriate the Council will be involved in recommending sites. Whatever the decision-making process, it will include extensive public consultation and participation.

The generation and reticulation of electricity supplies is expected to continue to take up significant parcels of public land, particularly in the Latrobe Valley. The State Electricity Commission of Victoria holds substantial land over brown-coal deposits in this region, for possible use over the next 30 years, although the total available reserves of brown coal extend far beyond this.

Options for electricity supply and associated public land requirements beyond the mid 1990s are currently being examined by a Parliamentary Natural Resources and Environment Committee Inquiry. At present the Latrobe Valley facilities produce more than 80% of the State's electrical energy requirements.

New electricity transmission lines are likely to be needed, but considerable capacity remains for further installations in existing corridors. Alternative site options for electricity generation are being considered, against the locational requirement of coolant water, and so a range of site possibilities have been 'tagged' for future investigation in the vicinity of Westernport and Port Phillip, in various places around Victoria's hill country, and in the Murray Valley.

The extent of further oil and gas pipelines will be determined to a large extent by the life of the Bass Strait reserves and future rates of utilization. In the long term, as the Bass Strait oil and gas reserves dwindle, there will be a need to consider other sources of energy, including brown-coal-to-oil conversion, solar power, and ethanol fuels. Special siting requirements may therefore have to be considered in the light of technological progress and alternative energy demands.

While most sewerage authority land is not public land under the *Land Conservation Act* 1970, the Council has from time to time made recommendations relating to future use of public land for sewage treatment and disposal.

In the area of solid-waste disposal, problems are being felt in communities of all sizes throughout the State. This is likely to become an increasing issue over time as all the available disused quarries and suitable landfill sites are used up, and other means must be found to dispose of the steadily mounting quantities of industrial and domestic refuse. High-temperature incineration is planned, and sites for this purpose are currently under consideration.

In the fields of transport and communications, most developments are likely to involve upgrading facilities rather than the construction of entirely new routes. The road and rail network has been in place for many years although a considerable amount of road realignment has been undertaken subsequently, while certain stretches of railway line either are now disused or have been dismantled. Further road realignment will doubtless be carried out in the future, but extensive rail development outside the metropolitan region is unlikely, perhaps apart form the suggested high-speed Canberra--Melbourne railway. Telecommunications services are adequate at present, but appropriate upgrading will inevitably take place in step with technological progress - for example, the present construction of transmitting points for cellular telephones.

Any extension to ports and docks would most probably occur on the periphery of existing installations, with the greatest potential for expansion in Westernport. Victoria's needs for airport services are generally well served at the moment, with development potential still at Tullamarine. It remains possible, however, that Melbourne may need another international-standard airport in the years ahead or, alternatively, a replacement facility for Essendon. As yet, no firm plans exist for any of these extensions, although future needs are being kept under constant review.

Certain disused rail routes with particular values could be used for linear conservation reserves and/or recreation areas, while there may be prospects for allowing multiple use in other forms of easement where such opportunities exist. New port and airport developments could be extensive and the impact on coastal plant and animal communities and wetlands adjoining potential sites would need careful attention. In all of these cases, special efforts should be made to ensure optimal site selection and impact reduction during and especially after construction.

Critical needs are currently being identified with regard to small utility areas, and these will need to be addressed in future Council reviews. All are likely to require sites on public land in order to meet rising demand. The Office of Corrections, for instance, is in the process of seeking or acquiring suitable land for new prisons, in addition to sites already held. Concern has been expressed on the need for appropriate cemetery land close to a number of townships throughout the State. The need for more waste-disposal sites and refuse tips is becoming increasingly urgent and is exacerbated by rising costs and increasing distances, which make alternative waste control, recycling, and disposal methods worth urgent investigation.

Disposal of public land

Section 2(1) of the *Land Conservation Act* 1970 defines 'public land' to include land vested in any public authority (including the Melbourne and Metropolitan Board of Works but excluding municipalities and sewerage authorities) outside cities, towns, and boroughs.

Having carried out an investigation in accordance with the procedure laid down in sections 7 or 8, then 9 and 10, the Council makes recommendations to the Minister. Some public authorities accord with the Council's process, and for example the Council has recently made recommendations for land no longer required by the Albury--Wodonga Development Corporation and land surplus to State Electricity Commission of Victoria requirements in the Latrobe Valley.

If the government accepts them, subsequent management of the land is to be in accordance with the recommendations. Having been considered in an exhaustive process involving public participation, and having had its values identified, all public land with specific recommendations must obey the important principle that it be treated equally. At issue is whether one public land management agency should be required to 'purchase' public land from another agency, in order to manage it in accordance with the recommendations. Current government policy is that each agency must identify land surplus to requirements and that any other agency of government, if wishing to retain it as public land, must purchase it. While this is not an appropriate matter for Council to address when making recommendations, it is important that the implementation of significant recommendations is not unduly delayed or prevented due to a lack of funds or rigid time constraints associated with the purchase of these areas.

The Council's recommendations specify uses for public land areas, which any agency can implement. It would be in accordance with the intent of the main recommendations for various agencies to implement them. However, the Council also commonly recommends specific land managers because these have the knowledge and experience to best protect the identified values, that being the statutory object of the whole process, as previously described.

Given limited land-purchase budgets, it is not considered appropriate that certain public land areas with important values not be protected because one arm of government controls them rather than another.

Where Crown land is vested for the time being in, for example, a government utility but is no longer required for its purposes, that land should in the Council's opinion be divested to the agency best equipped to manage and protect public land values - the Department of Conservation, Forests and Lands.

Currently, the government is reviewing the State's holdings of Crown land, with a view to rationalizing ownership. The Land Classification Review Committee is classifying small

parcels of Crown land, such as disused roads, temporary school reserves, etc., as either public land (which is retained and managed by the Department of Conservation, Forests and Lands) or government land (which is transferred to the Department of Property and Services, for possible disposal). Land is classified according to a set of criteria that take into account the conservation values of the land.

Other departments - particularly larger utilities - are also rationalizing their landholdings through the Assets Management Review Committee, an interdepartmental committee of the Department of Premier and Cabinet. This Committee is concerned to dispose of any lands no longer required by a particular department. Council believes that such lands should be assessed for their other values, that is, conservation, recreation, etc. - and, where these are important, they should be protected by retention as public land.

Issues

* Most utility services are vital to the welfare and livelihood of the community at large and it is therefore essential that these be maintained and extended where necessary in order to preserve our current standards and qualities of life.

* It is a function of the Land Conservation Council, under section 5(2)(h) of the *Land Conservation Act* 1970, to ensure that appropriate provision is made for utilities across the entire stock of public land, recognizing at the same time the different types and levels of impact that each may bring to adjoining land uses.

* Where public land has other values, in general it should not be allocated to use for a new utility whose operations commonly reduce such values. However, in many specific cases Council has recommended the use of public land for a utility.

* The management practices of many utilities are orientated towards vegetation control in the interests of unrestricted access and fire control. Refined management techniques may render it possible to meet the needs of government agencies in carrying out their roles, while maintaining habitat values of their easements.

* Linear reserves as a means of fostering flora and fauna conservation are likely to be given greater attention, with the growing realization and acceptance of their importance as remnant habitat for endangered species, as small-scale refugia, and as migration routes. It is therefore important that the most relevant management techniques are devised and employed to reconcile the primary aims of each of these agencies with those also aimed at protecting wildlife, and furthering recreation opportunities.

* The visual impact of utilities is frequently a cause for complaint where these are close to public view (for example, large-scale buildings in rural areas), where they

intrude on otherwise pleasing landscapes (as in power transmission lines and pylons), or where their presence may be a source of offence (as in garbage tips).

* Visual amenity can be preserved in proximity to utility sites or structures - by careful site selection, by appropriate design of the structures themselves, by suitable landscaping, and by effective screening.

* Disposal of land no longer required for utility purposes is an important and current issue. It is important that utilities, and other bodies considering public land disposal, recognize that such areas may have other particular values that warrant their retention as public land.

* Disposal of public land from one government agency to another should not delay or prevent implementation of Council recommendations.

* There is likely to be an increasing need for development of the existing infrastructure on utility land. Such development will have implications for that land as well as for adjoining land, and Council will need to monitor these changes when reviewing its recommendations.

* All public land with recognized values should be managed to protect these values where possible, no matter which arm of government is the manager.

Part IV
DATA COLLECTION AND VALUES ASSESSMENT OF PUBLIC LAND

20. ECONOMIC VALUATION OF PUBLIC LAND

In making balanced land use recommendations the Council has to decide between competing alternative uses for public land, its values, and its resources. If all such factors were easily priced, the Council would be able to make rational judgements between public land use options, based on a comparison of dollar values. In fact many such values and resources are not easily priced.

To pursue this problem the Council commissioned a report by Associate Professor J.A. Sinden of the University of New England. His complete report is available in the Council's library and a summary is provided in this chapter, together with some comments by the Council.

Professor Sinden has taken the approach that the government's three strategies - conservation, economic, and social justice - provide limits on the way land use options could be considered by Council. He proposes that, to meet these constraints, the Council should:

* consider only land use options that meet the objects of the State Conservation Strategy

* compare these options by using an economic framework, to assist in selecting the preferred ones

* choose a method of implementing the preferred options that would not diminish social justice

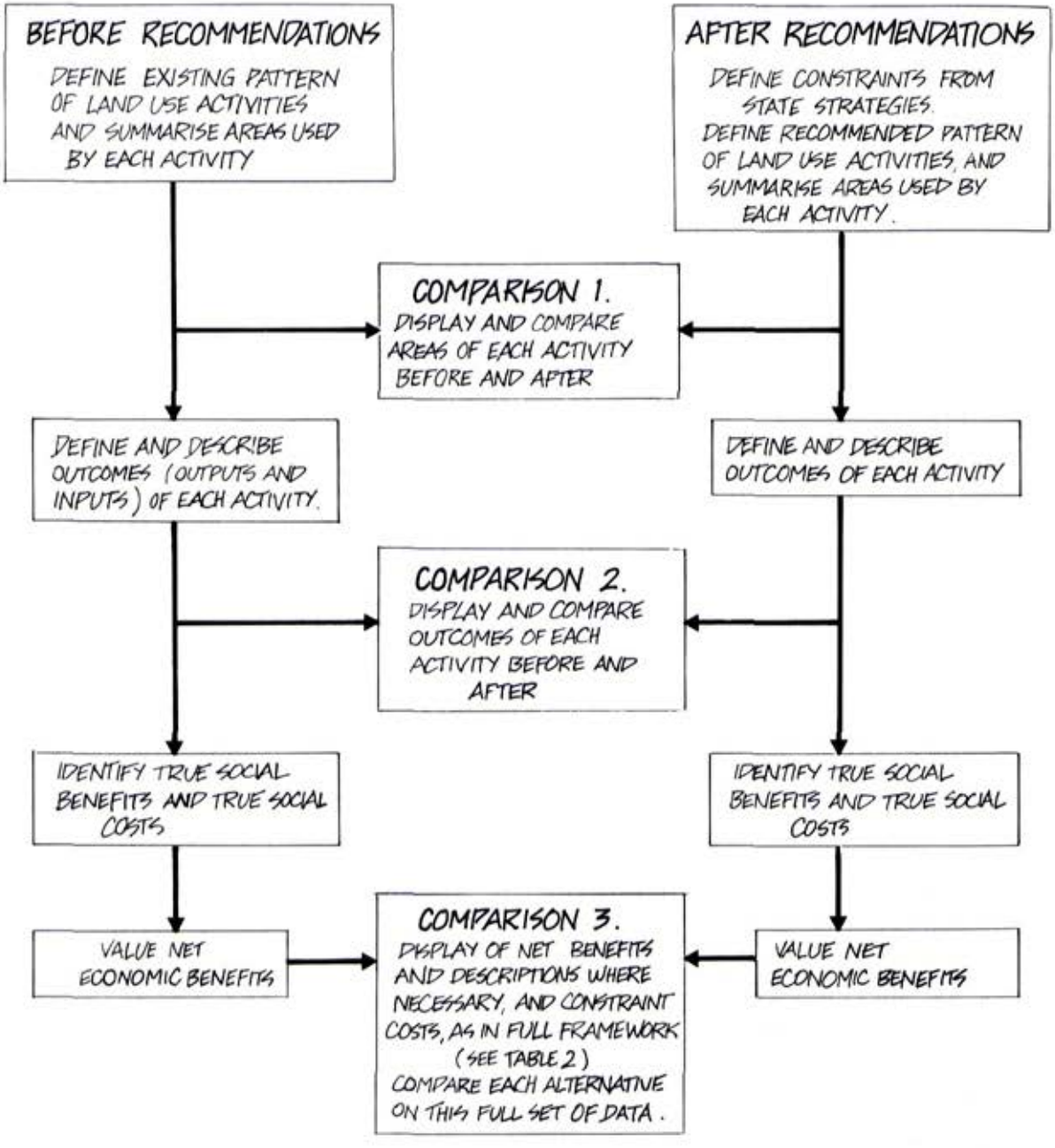
Professor Sinden proposes social benefit/cost analysis as the preferred method for the economic comparison of land use options. This method uses the benefits and costs to society as a whole from a use or product, rather than just its immediate market price. Side-effects and flow-on benefits and costs are therefore included.

Methods for valuing or assessing intangible benefits are described, so that they can be used in a benefit/cost analysis. Table 47 illustrates how such an analysis could be presented, and Figure 12 shows where this analysis could be used in the Council's process, to assist in the formulation of recommendations.

The proposed framework rests on arguments of economic theory, and of welfare economics in particular. Nevertheless, it is developed and applied in a practical way. For example, asking the right questions can be as important as finding complete answers; identifying the right social benefits and costs can assist choices without full economic values; consistent presentation of before-and-after information on recommended changes to land use can improve the available information even when quantities of output are used instead of full economic values; and systematic estimation of the

FIGURE: 12

FLOW DIAGRAM OF THE ECONOMIC FRAMEWORK



costs of recommendations can sometimes be useful when the full benefits cannot be assessed.

This approach is systematic and is orientated to the problem; it should encourage the community-wide perspective of Council and minimize the importance of short-term or local issues.

Social Goals - the Three Strategies

At any given time, each society has several broad goals. These goals provide the standards against which changes in land use can be judged, and provide the concepts to measure the social worth of these changes. As in many developed societies, the government of Victoria has identified three goals, namely improvements in economic efficiency, in social equity, and in environmental quality. In less theoretical but less rigorous terms, these are improvements in: total net income to society; the distribution of that income; and the protection of natural habitats and the quality of the natural environment in which we live. These goals have been comprehensively laid down in the three State Strategies discussed below.

An economic goal - the State Economic Strategy

A fundamental economic goal of every society is to improve the use of its scarce resources to satisfy more of its citizens' wants. The resources of land, labour, and capital are usually scarce, while the wants of the population always seem unlimited. The use of resources imposes costs, and the satisfaction of wants confers benefits, so achievements towards this goal can be assessed in terms of net benefits.

An equity goal - the State Social Justice Strategy

Most populations are strongly motivated to improve equity, or fairness, within their own societies, including improvements in the distribution of income to narrow the gap between rich and poor, in access to social services such as health education, and in the well-being of young, elderly, handicapped, or ethnic groups.

An environmental goal - the State Conservation Strategy

Like members of most societies, Victorians desire improvements in the quality of their environment. To this end, the Government's Conservation Strategy embodies five aims for resource conservation. These are:

* to maintain essential ecological processes and systems
* to preserve genetic diversity
* to ensure sustainable use of renewable resources
* to use non-renewable resources wisely
* to protect natural systems and their diversity for the non-material needs of society

A Framework to Assess Economic Importance

Professor Sinden considers that an economic framework to assist in land use choices must recognize the various State Strategies and, after examination of several such frameworks including environmental impact statements and trade-off tables, he concludes that the benefit/cost analysis method is the best.

An economic framework cannot show which land use alternative is best, even if the choice depended only on the economic information it contained. But it can help to prepare and organize information on benefits and costs of alternatives, and hence can indicate the relative economic importance of each in line with meeting the aims of the three government strategies.

Benefit/cost analysis

This analysis is the systematic assessment of benefits and costs, and the comparison of alternatives in terms of their net benefits to society. It develops the trade-off matrix by: ensuring that all outcomes are true social outcomes; valuing as many of these outcomes as possible; and then structuring the analysis to fit the decision-making context as closely as possible.

Benefit/cost analysis applies economic theory to choices through a problem-solving, scientific method. The problem is defined, alternatives are identified, the outcomes of each alternative are defined and valued, and the net benefits to society are calculated and compared. Constraints such as the Strategies discussed above are part of all such analyses. The references to this chapter describe various approaches to the use of benefit/cost analysis for land use choices.

Identification of social costs and benefits

Any assessment of economic importance must rest on correct identification of what is a true social benefit and what is a true social cost - that is, those that accrue to society as a whole, not just to the parties immediately involved. Factors such as external costs and benefits (externalities or spill-overs) must be included, while transfer costs are omitted. This process of identification is never simple.

A benefit is anything that increases anyone's enjoyment, and a cost is anything that increases anyone's 'pain'. More analytically, a benefit increases net social benefit, while a cost decreases it. So the basis for identification is the question: does the change in the particular outcome change net benefits to society?

The following list gives some guidance for assessing social costs and benefits.

* Include increases in output.
* Include increases in costs, including externalities.
* Include associated output falls including substitutions.

* Include associated falls in costs.
* Exclude transfer payments, such as taxes, subsidies, or government charges.
* Exclude double-counted outcomes.
* Avoid the 'sunk' costs or benefits - that is, those that occur before the land use change.
* Include the 'extras' - that is, costs or benefits that can be avoided by making no land use change.

Table 47

METHODS OF VALUING UNPRICED BENEFITS AND COSTS BY NATURE AND RELIABILITY OF DATA SOURCES (with potential land use applications)

Nature of methods	Nature of required data	Comments
Observed data from actual market exchanges (reliable)		
Estimate demand and supply curves (agricultural products, recreation)	Prices and quantities of the actual good, from each of many observations of market exchange	The methods estimate economic surpluses directly; travel-cost method is used for recreation
Estimate changes in money income (loss from reducing plantation rate to protect water supply, loss from reserving areas for scientific research)	Actual money incomes from relevant cases	Estimates minimum values for total benefits, or losses in income
Estimate savings in cost (benefit from improved provision of a good or service such as recreation, or wildlife preservation)		Value of benefit equals saving in cost
Observed data from related markets		
Interpret changes in land-sale value (benefits from landscape, benefits from heritage preservation, costs from loss of adjoining grazing leases)	Needs data from many comparable sales	Estimates a benefit or cost as the change in land-sale value, due to changes in land characteristics
Interpret values in past decisions (benefits from preservation for wildlife or heritage purposes)	Opportunity costs, or increases in benefit, from many comparable decisions	Estimates benefits or costs as valued by decision-maker
Derive residual value (timber)		Returns of processed product less costs of harvesting, transport, and processing
Questionnaire data (potentially reliable)		
Estimate consumer surplus and total benefits from questionnaire surveys (benefits from existence of habitats, species, genetic diversity; benefits from landscape)		Must be validated

Professor Sinden considers that the land use choices must be made within the context of the three State Strategies, which can be met by imposing constraints on choices. In essence, any new land use alternative will have to exceed (or at least meet) minimum levels of achievement on the economic, social justice, and of course conservation criteria. If

these levels can be specified, land use alternatives can be designed to meet them, or be excluded if they fail them. Then the costs of meeting these constraints can be included as true social costs, and the associated economic benefits can be included as true social benefits.

The constraints ensure that all alternatives under consideration meet the Government's Social Justice Strategy and Conservation Strategy.

Principles of application of benefit/cost analysis

The data within the presentation require that: all easily valued priced outcomes be valued; all easily valued unpriced outcomes be valued and included; all remaining important unpriced outcomes are converted to constraints on the design of alternatives; and all costs to meet the constraints of the State Economic Strategy, the State Social Justice Strategy, and the State Conservation Strategy be valued and included.

Inclusion of the More Unpriced Values

Unpriced values and costs can be included directly in the assessment when they can be valued. When valuation is impossible, they can often still be included in the decision by certain well-established procedures. In general, reliable prices can only be obtained from observations of market exchanges. Nevertheless, methods exist for deriving social values where no market exchanges can be observed, as summarized in Table 47. They have been fully documented (Sinden and Worrell, 1979).

The Availability of Existing Data

For application, the benefit/cost framework requires that:

* effects of land use changes be defined and described (not necessarily valued) in terms of extra net benefits to the whole community

* net benefits be defined and described for the land uses both before and after potential recommendations

* a systematic attempt be made to compare the set of net benefits before to the set of net benefits after

* the necessary constraints be recognized through definition of recommendations, and the costs of implementation

None of these requires valuation *per se*, yet application with partial valuations would improve the information presented for decision.

The Broad Framework

A step-by-step procedure

The procedure outlined in the following points would be one method of incorporating the economic framework suggested

above into the Council's process of formulating land use recommendations:

* the existing pattern of land uses, before any recommendations, is presented in terms of the area of each land use activity

* the after-recommendations pattern of land uses is defined to meet any constraints (explicit or implicit) of the various State Strategies

* the pattern of land uses after the recommendations is presented in terms of areas of each activity

* the changes in areas are tabulated, permitting a systematic comparison of the set of changes without monetary information (this is Comparison 1 in Figure 12)

* the outcomes of the before and after alternatives are defined and described (not valued as yet) in terms of the flow of quantities of goods and services to the community; technical, quantitative descriptions are all that is necessary here

* the changes in outcomes between the alternatives are tabulated, permitting a systematic comparison of the entire set of changes, still without monetary information (this is Comparison 2 in Figure 12)

* net benefits of readily valued outcomes and potentially valued outcomes are now estimated in monetary terms and listed (as in Table 48); hard-to-value outcomes are not valued but their definition and description (from the fifth step above are listed in the final presentation (see Table 48)

* any costs of meeting strategy constraints, that have not shown up as changes in net incomes, are estimated and inserted

* the changes in net economic benefits are tabulated, as in Table 48; this permits a systematic comparison of economic information on the entire set of changes (Comparison 3 in Figure 12)

There may, of course, be more than one recommended pattern of uses and thus more than one after-the-recommendation alternative.

Two illustrative land use alternatives

The hypothetical land use alternatives of Table 48 are an existing pattern of uses and a recommended pattern of uses. For illustration, the recommendations include increases in recreation opportunities, increases in heritage and conservation benefits through reservation of parks and reference areas, and reduction in the area of forest logged, reductions in the area grazed by livestock, changes in the location of areas quarried, and removal of beekeeping to a new site.

Incorporating valuations and constraints

In Table 48, the changes in net social benefits of the readily valued outcomes are included in column 4 of Rows 1 to 4. The values of the presently unpriced, but potentially valued outcomes are included as Row 5, although in this example the row only concerns recreation. The recommended pattern of land uses will have been formulated so as to meet the constraints of the State Strategies, and the social costs of meeting these constraints are included as Rows 8 to 10. The changes in these social costs are noted in column 4 of the respective rows, and these changes are of course the actual values of constraints C8 to C10.

Table 48

AN ILLUSTRATIVE APPLICATION OF COMPARISON 3 IN THE FRAMEWORK

Outcomes	Alternatives		Change in social benefit or social cost $
	Existing land uses	Recommended land uses	
Readily valued outcomes			
1. Agricultural products	Yes	Yes, at reduced level	$-NSB_1$
2. Sawlogs and pulpwood	Yes	Yes, at reduced level	$-NSB_2$
3. Minerals and stone	Yes	Yes, at same level, but at new sites	$-NSB_3$
4. Honey	Yes	Yes, at same level, but at new site	$-NSB_4$
Potentially-valued outcomes			
5. Recreation	Yes	Yes, at increased level and in increased variety	$+NSB_5$
Hard-to-value outcomes			
6. Heritage benefits	Yes	Yes, at increased level	+ ?**
7. Conservation benefits	Yes	Yes, at increased level	+ ?**
Costs of Strategy Constraints			
8. Cost of providing substitutes	Nil	$C8	-C8
9. Cost of ensuring sustainability	Nil	$C9	-C9
10. Cost of employment constraints	Nil	$C10	-C10
Total:			?

Notes:

* NSB Net social benefit; C Cost of constraint
** These unvalued changes are described at this part of the presentation.

The loss in net incomes through any restrictions on forestry, agriculture, mining, or beekeeping are automatically included in the changes NSB_1 to NSB_4. The net benefits of potentially valued outcomes are included directly through Row 5. The benefits of other not-valued outcomes are described in Rows 6 and 7. Together, these inclusions should fully account for unpriced outcomes.

The framework incorporates concepts of natural resource accounting whereby:

* monetary cash flows have been converted to flows of true social benefits and costs for Rows 1 to 5

* the costs of maintaining resource stocks (analogous to capital depreciation) are specifically addressed and included through the constraint-cost 9.

Issues to be Resolved

Needs of the people of Victoria

The broad goals of Council's recommendations are to provide for the balanced use of public land, and to have regard to the present and future needs of the people of Victoria. Apart from information on certain values, however, the resources reports contain little information on the people's desires for the wide range of unpriced land use activities. This lack is unimportant for decisions that impose few social costs, but the information is a vital complement to the existing descriptions of resource availability for all choices that involve substantial social costs.

A product price reflects judgements by all producers and all consumers in a market. Where no markets exist, public participation is a useful and desirable step to obtain this information, but participation can rarely reflect the judgements of all members of the community. The whole prior process of formulation of issues and recommendations may benefit from broad indications of the preferences of the whole community.

One way to obtain such information cheaply is through questionnaire surveys. Surveys could be undertaken as and where required to determine relative preferences for critical land uses. These should take the form of Statewide assessments for general priorities, and local assessments for specific issues.

Partial or complete assessment?

All draft recommendations of Council are considered in detail, with two public consultation periods. The recommendations could incorporate some considered, systematic comparison of benefits and costs; however, many do not justify a full-scale evaluation of all benefits and costs - for example, a phased cessation of logging in a small part of a forest region, a slow or small reduction in the number of permits to graze cattle, or a shift of quarrying a few kilometres. The difficulty of identifying such recommendations from those requiring a full-scale assessment is, of course, clear. For this reason, the proposed framework emphasizes assessment of easily valued outcomes and of costs of constraints. General application of the partial analysis of the framework is considered to be more useful than occasional application of any more-comprehensive analysis.

Collection of the required information

Broadly, one can collect either of two alternatives - relatively precise but less-appropriate values or relatively

imprecise estimates of the appropriate values. In view of the long-term importance of Council's recommendations to the Victorian community, approximations of the right values would seem more useful than precise estimates of less-appropriate information.

Conclusions

Professor Sinden considers that estimation of the economic value of public land can be a complex process and always requires much detailed data. Nevertheless, application of the proposed framework would assist Council's land use choices even when data are sparse. The following summary of the more simpler ways in which the framework can be used provides a relevant summary of the chapter.

* Ask the right, initial questions. These normally are: what are the extra net benefits to the whole community from the recommended change; and what kinds of people will receive the extra benefits and costs?

* Present in a consistent manner the before-the-change and after-the-change information, even if these data are simply the areas and quantities of output.

* Identify the nature of the true benefits and costs to the community, even if full economic values are not available.

* Obtain approximate values of the true social benefits rather than precise values of less-appropriate concepts of benefit.

* Systematically estimate the costs of recommendations.

* Systematically estimate the opportunity costs of recommendations.

* Apply the proposed framework in a partial manner, even when complete application and full valuations are impossible.

Council's Current Process

The Council offers the following comments on Professor Sinden's economic analysis.

In its pursuit of balanced use of public land across the State, over the past 17 years the Council has acknowledged the considerable economic value that the resources on public land have. This is reflected in many recommendations which provide for the commercial utilization of such resources.

While not using a structured economic framework, Council does include economic aspects in its formulation of recommendations, and ensures it is fully informed on the possible impacts of recommendation options.

Indeed, much of the time in preparing recommendations is taken up with identifying the location and economic value of

major resources such as timber, minerals, and road-making materials. This ensures that Council has all the relevant information at its disposal - in particular, information on the impacts of land use changes on, for example, regional employment. This often involves evaluation of resource information compiled by government departments followed by extensive consultation with user groups in both the government and non-government sectors.

The Council's process also has other avenues for users of public land to put their views on expected impacts of Council recommendations. This is a major role of the formal submission periods, particularly the second period where there are specific proposals to comment on. Submissions are often very detailed, and some contain economic appraisals: examples include East Gippsland Area Review submissions from the Victorian Sawmillers Association, Timber Workers' Union, and the Conservation Council of Victoria's 'Jobs in East Gippsland' report. Throughout Council's investigation process, however, views can be and are put to Council members and staff, and to the government.

As its members represent the main users and managers of public land the Council is not a remote body. Each member's organization generally makes a submission, detailing its respective views, and when land use proposals are being considered by the Council, these can be presented and argued.

The Council has extended its standard process when considered necessary (such as for the East Gippsland Area Review and the Alpine Area), and the economic consultancies it has commissioned for various study areas, where there was a perceived need, are listed in Appendix XVII.

For example, when examining the East Gippsland Area Review proposals, Council considered each option for possible reserve status in terms of its conservation values and the timber resource and timber-industry jobs depending on it.

Accordingly when formulating its recommendations the Council is well informed of the impacts on individuals and groups and, when making decisions about competing land uses, always seeks to minimize impacts so far as is possible while protecting other recognized values.

Council has adopted various methods to reduce impact on the use of resources on public land where this has occurred. These include:

* phase-out periods for logging and grazing
* once-only timber harvesting
* deferred reservation until after logging
* removal of use from part of the area only
* limited continued use, or use subject to the land managers' discretion
* site-specific exceptions to the intent of the general recommendation
* careful selection of reserve boundaries to ensure that valuable resources are not unnecessarily excluded from use

Methods for valuing intangibles

The methods outlined by Professor Sinden in his framework are described elsewhere (Sinden and Worrell, 1979). They cover the present ways used, but there are res-ervations about several of them, leading to the view that the methods estimate a minimum value in some circumstances - that is, they reflect only part of the recognized attributes. For example, Kellert (1984) lists the following hard-to-price values of conservation reserves:

* naturalistic/outdoor recreation (appreciation) values
* ecological values, including measures of species diversity, population numbers, significance, representativeness, etc.
* existence (spiritual) values
* scientific/educational values - advancement of knowledge
* aesthetic values
* utilitarian values (present and future material benefits)
* cultural, symbolic, or historic values

It is difficult to imagine opportunity-cost or questionnaire data adequately attributing a value to all of these. It is also significant that these items are important in any assessment of the true economic value of public land.

Problems of the benefit/cost method

The method raises problems concerning: discounting of future benefits; pricing of depleting resources; comparing unlikes; avoidance of sunk costs; and use of employment data.

Discounting of future benefits becomes necessary in benefit/cost analysis, as this uses a comparison on the basis of present values of the flow of net social benefits into the future - that is, the values now of sums available at a specified future date. These are calculated by discounting estimated future benefits and costs back to the present, using an appropriate inflation-free interest rate, to determine what sum if invested now at that (compound) interest rate, would amount to the expected future sum? For example, at an interest rate of 4%, $1000 in 1989 has a present (1988) value of $962, $1000 in 1990 is now $925, in 1991 is now $889 and so on, and in 2006 is less than $500. This means in effect that estimated long-term returns, such as those arising from conservation or sustainable resource use, tend to be discounted to a low present level.

The nature of various conservation values is that they may have a modest economic benefit, measured annually, but that this persists into the distant future. The discounting of this future 'income stream' to present values fails to adequately measure such values, in comparison with immediate resource-sale benefits.

Pricing of depleting resources is more complex than indicated. The main determinants of whether a non-renewable public resource is sold in the market are the costs of extraction,

transport, and processing. The small 'royalties' paid rarely cover supervision, regeneration, and/or reclamation. This implicitly assumes that the resource is never-ending. The market makes no provision to recognize depletion of a non-renewable resource until costs of extraction rise near the end of its life, too late to ensure wise use.

Various non-renewable resources on public land include minerals, stone, and, where forest-age classes are strongly separated, mature forests for timber. Other public land values, such as wilderness or climax forests, can be seen as effectively non-renewable.

Both this question and the discounting discussed above reflect aspects of the problem of inter-generational equity - that is, the effects on future generations of present-day decisions that diminish environmental resources. The difficulty in assigning an economic value to this effect is reflected in its absence from Professor Sinden's analysis.

A major problem with Table 48 in this chapter showing benefits and costs, is that decision-makers are required to balance unlike values - dollar values against nebulous increases/decreases and unknowns. Kellert (1984) describes how intangible values tend to be under-emphasized, and dollar values over-emphasized, in decision-making where benefit/cost tables are used.

In the identification of social benefits and costs it is explained that 'sunk' costs - incurred before the proposed change - should be ignored. This is not suitable for regional or State-wide consideration of an industry or use, where past practices such as unsustainable levels of harvest provide important context for decisions on the future management of resources.

The chapter states that employment trends are likely to be unhelpful indicators of net (economic) benefits. While this may be true, the weighing of local social costs against more general socio-economic and environmental benefits should be given attention in Council and government deliberations; this was the reason for the economic-employment consultancies in the East Gippsland Review investigation.

Issues

* It may be appropriate for the Council to adopt a formal economic framework for comparing recommendation options.

* Some concern has been expressed that past recommendations have paid insufficient attention to economic values although, in most cases where it has perceived significant economic impacts from its recommendations, Council has commissioned studies to evaluate those impacts.

* Council's current approach to the various values contained in public land may contain some deficiencies, but it is questionable whether the benefit/cost method outlined by Professor Sinden provides a better one.

* It may be necessary to conduct surveys of the public's views on particular public land use issues, such as the relative needs for various types of recreation

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21. ENVIRONMENTAL DATA

Victoria is the smallest mainland State with an area of 22 760 000 ha (some 3% of Australia). Nearly 8 775 000 ha is public land, while the balance is held under freehold title.

Data relating to this land are held by a large number of organizations, individuals, government departments, and agencies. For example, about 1.7 million properties in the State that are in freehold ownership. In addition, government departments and agencies adopt advisory, protection, and management roles in regard to various aspects of land use, each role requiring some data collection.

Until relatively recently, much of this information had been collected in an unco-ordinated fashion, and access was in many cases limited. Since the late 1970s there has been a growing awareness of the need to provide an environmental data base that can economically be updated and that is relatively accessible for use by both individuals and organizations.

A Commonwealth--State workshop held in Adelaide, in November 1983, specifically addressed progress towards the establishment of an environmental survey of Australia.

The establishment of an Australia-wide environmental data-bank would benefit the Council, by allowing recommendations to be made in a national context. This is particularly important when recommending areas for the conservation of certain species. A particular plant or animal may be common (or rare) in Victoria, but its status may be the opposite on a national basis. Hence, its relative importance alters in relation to other factors, such as recreational use or resource utilization.

In Victoria many data-bases have been developed that hold environmental data, but these have not been co-ordinated. They include various flora and fauna records and information on hardwood and softwood forests, land capability, archaeological sites, air and water quality, and property dimensions and boundaries.

The two major Victorian computer land information systems currently under development - LANDATA, maintained by a division of the Department of Property and Services, and the Department of Conservation, Forests and Lands' Geographic Information System - are intended, among other things, to co-ordinate this information.

In addition, the Melbourne and Metropolitan Board of Works' Facility Information System and a State Electricity Commission system are under development, both designed to link in with LANDATA.

The intention with LANDATA is to have all the major land data bases computerized and networked over the next 5 years. By the end of stage one, LANDATA will offer five land information products: a land-owner system; a property boundary data-base; a register of government-owned land; public land data; and a directory of natural resources.

The Department of Conservation, Forests and Lands' Geographic Information System will be used in regions for strategic planning, to co-ordinate inter- and intra-departmental policies and activities, and, in the longer term, to evaluate regularly the condition of the State's natural resources.

One of the real benefits of the Geographic Information System can be gained from modelling long-term environmental processes on the computer from limited data, which previously could only be evaluated by many years of field research. Other benefits include more efficient data-recording and handling, and data-integration using sophisticated data-manipulation software to produce results beyond unassisted human capability in a fraction of the time.

As with any system that is large and complex and handles a wide diversity of data, the Geographic Information System is moving only slowly towards achieving its aims. An underlying factor in this is the paucity of staff and limited resources available.

The Land Conservation Council collects and presents environmental data and research results through its processes of public land investigation and recommendation.

Land Conservation Council process

The Council's principal role requires the collection and evaluation of substantial area-specific environmental data. Much of this information is provided by government departments and agencies. Where necessary, the Council commissions additional research to supplement its knowledge of particular areas and issues.

Chapter 4 discusses the process that the Council follows in conducting investigations into public land use.

Each of the stages in a Council investigation is accompanied by data collection and presentation, related to matters as diverse as population demographics, stock and crop production, rainfall, history, and timber-industry employment. Much of this information is available from existing sources, but is seldom specific to the precise area under investigation. It is usually provided on request by government departments, obtained by Council research staff, or through consultancies.

The material collected is incorporated into a descriptive resources report, specific to the area under investigation, which is made available to the public to assist in the preparation of submissions as to how the public land may be used.

Thus, the Land Conservation Council's approach to the development of a limited environmental data-base can be seen to comprise the following:

* preparation and publication of a descriptive resources report - collection and presentation of data relating to one of the areas into which the State has been divided for the purpose

* commissioning research studies into specific aspects relating to the values contained in an area, or land use

Once an investigation is completed, research effort is directed to other areas. No attempt is made to keep the full data-base current, in its diverse forms; thus the descriptive resources report becomes progressively out of date and ultimately no longer represents the actual situation within a study area.

While the establishment of a continuing data-base specific to the Council's needs could be considered, there are alternative reasons for a much more broadly based approach.

Issues

* The Land Conservation Council process has a major requirement for environmental information from diverse sources, in connection with its area-specific investigations.

* The issue is whether Council needs to establish and maintain its own environmental data management system, or utilize the systems being currently developed, particularly LANDATA and the Geographic Information System. Their development offers many opportunities to enhance the Council's decision-making process through the provision of relevant, current data.

22. ENVIRONMENTAL RESEARCH

Environmental research is necessary to ensure that the optimum decisions can be made regarding the use of a resource or the protection of an ecosystem, plant or animal species, water quality, etc. Decisions on land use are necessarily based on the best information available at a certain time. Where apparently conflicting uses of an area cannot be clearly placed in some order of priority, further research is often necessary to more clearly indicate an area's 'best' use. In some cases, the Council has not made specific recommendations, pending the outcome of further research (see Appendix XVIII).

Various government departments - concerned with the environment, agriculture, water supply, and land use - conduct a wide range of research projects within the framework of a variety of research units or institutes (see Table 49). The Department of Agriculture and Rural Affairs has the widest array of specialized units, conducting research into many aspects of agriculture in order to monitor and improve agricultural production and performance. All of these stations are located on public land.

The Department of Conservation, Forests and Lands also has a number of research establishments, utilizing either public land in general or land allocated specifically to research. Public land has been set aside for long-term scientific studies, such as those examining the effects of softwood plantation establishment on streamflow at Stewarts, Long Corner, and Cropper Creeks, and for long-running hydrological investigations at Reefton and in the Parwan Valley. At the same time the Department is carrying out a long-term fire-effects experiment in the Wombat Forest.

The Melbourne and Metropolitan Board of Works maintains catchment experiments at Coranderrk and North Maroondah.

Thus, the government and people of Victoria have a significant and continuing investment in scientific research, the results of which affect both public land and freehold land use.

Provision by Council

The Council has always maintained that its own role in data collection, assessment, and interpretation is essentially directed to the two latter, and indeed the Council's investigations budget hardly permits research other than short-term 'stop-gap' contracts. It has been suggested in submissions, however, that the Council should be playing a more creative, co-ordinating role in directing attention to areas of research that should receive priority, in order to better identify the significance of the natural values associated with public land and ways of managing its capabilities to meet the community's various needs.

Table 49

GOVERNMENT RESEARCH STATIONS AND INSTITUTES*

Managing authority	Research stations and institutes
Department of Agriculture and Rural Affairs	Horticultural Research Institute Rutherglen Research Institute Plant Research Institute Potato Research Station Vegetable and Turf Research Institute Animal and Irrigated Pastures Research Institute Irrigation Research Institute Ovens Research Station Crops Research Institute Mallee Research Station Sunraysia Horticultural Research Institute Animal Research Institute Gilbert Chandler Institute of Dairy Technology Milking Research Centre Pastoral Research Institute Agricultural Engineering Centre Apiculture Research Unit Seed Testing Station
Department of Conservation, Forests and Lands	Arthur Rylah Institute for Environmental Research Marine Science Laboratories Keith Turnbull Research Institute Snobs Creek Fish Hatchery Royal Botanical Gardens and National Herbarium
Melbourne and Metropolitan Board of Works	Forest Hydrology Branch Catchments

* Formally constituted stations and institutes only. Many departments have research groups or units conducting research that are not included here.

Council regards research as a necessary and critical tool in public land use determination and management. (See Appendix XVIII) Council has not provided for research as a separate recommendations chapter in each of its study areas, however, but has either noted a need for additional research or encouraged on-going research through the temporary or permanent reservation of areas of appropriate public land, as and where necessary. In this way, Council has directed and placed a priority on research needs. In some cases, Council has indicated areas where additional research is required in order to test whether results from a particular study are applicable to other areas; that is, Council has

identified uncertainties and gaps in the applicability of some research results.

In general, however, the Council has not included 'scientific research' as one of the regularly recommended appropriate uses for public land other than in education areas and reference areas, relying instead on designating specific areas for specific tasks, or recommending that studies take place.

Issues

* The Council's approach to proposing scientific research projects has varied, as in some instances a study or research need has only been mentioned in the preamble to recommendations, while at other times it has been included as a recommendation.

* Council's role in research has mainly been in identifying topics and areas for research - an important aspect of Council's work, which should perhaps be given more emphasis in future recommendations.

* Specific needs for environmental research have been identified in various of the Council's recommendations and in the Victorian National Parks Association Conservation Review - for example, marine environments and protection of endangered species.

* A formal process needs to be established to convey the results of recommended research back to Council prior to its review of particular issues. In some circumstances it would be appropriate for the Council to review its previous recommendations when these results become available, rather than waiting for its normal 10-year review period.

Part V
DISCUSSION OF ISSUES

23. DISCUSSION OF ISSUES

Throughout this report, a range of issues concerning the Land Conservation Council process, public land use, and future policy relating to land planning have been outlined. These are now discussed below in more detail. The Council would welcome comment on the issues raised as well as others that have not been mentioned. The issues are discussed and grouped according to the chapters in which they were raised although some are relevant to more than one chapter.

Chapter 4 - Land Conservation Council - Operation

Initiation of reviews and special investigations

Under the current procedure the Council carries out area reviews at about 10-year intervals, in accordance with a program approved by the Minister for Planning and Environment, and by the Governor-in-Council, under section 7 of the *Land Conservation Act* 1970. The program can be amended, and has been - for example, to bring forward the current Mallee Area Review. This change occurred in response to community and departmental concerns about certain land uses.

Special investigations are presently initiated by a formal request from the Minister administering the *Land Conservation Act*. However, it has been suggested that, in addition, a process could be established whereby individuals or organizations could write to the Minister requesting a study of a specified area, use, or value.

Amendment of the *Land Conservation Act* 1970

Several of the issues discussed in this chapter may require amendments to the **Act** in order for them to operate. Some of these are listed here.

* The definition of public land could be expanded to include Crown land in cities, towns, and boroughs. Such areas include many historic sites and buildings, and remnants of land systems almost entirely cleared for agriculture or township use.

* Council is constantly faced with the issue of minor or site-specific changes to its recommendations after their acceptance by government. There is no provision under the *Land Conservation Act* 1970 for the Council to alter its recommendations other than by processes contained within the Act; this can only be done by the government, although the Council may be asked to provide informal advice. It would seem appropriate for the Council to have a formal mechanism whereby it could consider changes to its recommendations between major reviews. This could involve an identifiable process which includes public consultation.

The new *Planning and Environment Act* 1987 may provide an opportunity for the Council to consider such changes by preparing amendments to planning schemes that, under the new Act, may apply to public land as well as freehold land.

* Alteration to the membership of Council (discussed below).

* Changes to the public consultation process (also discussed below).

Membership of Council

The membership of the Council, as described in the 1970 Act, reflected the central requirement that relevant perspectives on public land planning and evaluation should be represented on the Council by people with expertise in relevant areas and a high level of responsibility.

Areas of expertise are soil conservation and catchment protection, timber production and forest management, Crown land administration and survey, fisheries and wildlife, national parks, agriculture, and conservation. The Land Conservation Council was, and is, essentially an 'expert' body consisting of the heads of appropriate departments and services, and the members from outside government with complementary experience.

Until the formation of the Department of Conservation, Forests and Lands in 1983, separate submissions were received from the independent authorities with an interest in land management and planning.

The establishment and consolidation of the Department of Conservation, Forests and Lands which brought together five departments and authorities whose heads were members of the Land Conservation Council, has created some problems for the Land Conservation Council, individual members, the Land Conservation Council process, and public perception of the Land Conservation Council.

The presentation of a joint submission from the Department of Conservation, Forests and Lands means that some of the differences of opinion on facts and interpretation are now reconciled within the department, and other Land Conservation Council members may be denied access to a wider range of material and opinion that was available previously. The government has indicated that a review of the Land Conservation Council membership is required. The essential principle to be applied should be the requirement that appropriate perspectives, rather than organizational interest groups, are represented on the Council. Changes in policy responsibility within the Department of Conservation, Forests and Lands could justify a reduction of the number of members from that department.

A number of proposals have been made for widening the membership of the Land Conservation Council to extend representation.

The principle of appropriate expertise might justify the appointment of a member with experience in the relationship between local government and concerns with State and national governments' policies and planning.

The need to co-ordinate principles and practice in the planning of public land and private land, and the proposal in the draft Lands Bill for a Land Conservation Council role in relation to the planning of public land within cities, towns, and boroughs, suggests the appointment to the Council of the Secretary of the Ministry for Planning and Environment.

Draft proposals for the Lands Bill, currently under discussion, propose that the Council be involved in the re-classification and re-categorization of Crown land in cities, towns, and boroughs. In order for it to do this effectively, the Bill suggests that the Secretary for Planning and another person with expertise in urban planning issues be appointed as Council members.

Other Council membership questions have been raised - for example, the possibility of including representatives from local government, the tourism industry, regional industry, and the Ministry for Planning and Environment. Any review of membership should take these suggestions into account.

As mentioned in chapter 4, the Council was established as a technical advisory body, not as a forum for the many different community groups or for those with an interest in the commercial utilization of public land resources. Where an organization has a clear interest and can assist the Council by providing information and expertise, its representatives have been included on study groups, for example, the Ministry for Planning and Environment, Melbourne and Metropolitan Board of Works, and the State Electricity Commission have been represented on recent study groups. All organizations and individuals have the formal submission periods to present their views, and those with particular interest are contacted by Council's research staff in the course of investigations. These arrangements have been effective and should continue. In addition, the Council's chairman and staff are always available to discuss issues of concern with any person or community group.

Need for continual reviews

Current Council policy is to review areas previously studied at about 10-year intervals. The bases for this policy are:

* substantial areas were left as 'uncommitted land' in the earlier studies

* some of the Council's policies have changed or have been modified since the earliest studies

* an inadequate information base existed at the time of the earlier studies

* much new information of relevance has been produced

* more information is now available about the status of floral and faunal species

* unresolved issues remain from earlier studies

* demands for public land use have altered

* values of public land resources change as exploration, research, and technology progress

Accordingly, the Council considers that reallocation or adaptation of resources must be expected, in order to meet changed demands. Planning is also a dynamic process and as such any planning mechanism must allow for periodic review in the light of changed circumstances.

Reviews have been carried out under this policy for the South-western Area District 1, North-eastern (Benalla--Upper Murray) Area, East Gippsland Area, and Melbourne Area District 1; others are in progress for the Mallee Area and Melbourne Area, District 2. Future reviews are scheduled for the South Gippsland District 1 and Corangamite Areas.

The need for reviews can easily be illustrated: by the wealth of new information published in the review reports, in particular flora and fauna surveys in the East Gippsland and Mallee Areas; by the number of new recommendations made - some 230 for the South-western District 1, Melbourne 1, and North-eastern (Benalla--Upper Murray) Reviews; and by the continuing public interest in the planning of public land use, indicated by the 6750 submissions received during the East Gippsland Area review.

The 'trigger' for a review varies. For East Gippsland, the need for a review of 'special uncommitted land' and other unresolved issues was underlined by concern about protection of botanically significant areas, particularly on the Errinundra Plateau. The scheduled Mallee Area review was brought forward in response to proposed clearing of habitat of threatened bird species and links between major blocks of public land.

South-western District 1 and North-eastern (Benalla--Upper Murray) Reviews were initiated to update recommendations for these areas in the light of current Council policies and new information, as well as (for the south-west) to consider softwood plantation needs, and (for the north-east) to make recommendations for areas no longer required by the Albury--Wodonga Development Corporation. For Melbourne Area District 1 the reasons for the review included the need to take into account new information from recent studies, the resolution of particular issues, such as that relating to the Alcoa (Anglesea) lease area, and the recognition of the importance of small blocks of public land, particularly for flora, bushland, and streamside reserves.

Future reviews could be scheduled according to a priority order, which could respond to government requests or policies, perceived threats to certain values in a region of the State, or public requests for an area to be reviewed.

The Council recognizes that industries using public land require stability of access to resources on public land, and that it would not be appropriate to carry out repeated reviews of all areas. Rather, reviews should be carried out where the reasons discussed above apply. For example, the present Melbourne Area District 2 review includes the Central Highlands forests and the Melbourne and Metropolitan Board of Works catchments, which are likely to raise particular public interest, as are the areas in the Otways to be reviewed with the Corangamite Area.

Future reviews could also have an increased 'monitoring' role by considering existing land use recommendations in the light of changing community demands.

Chapter 5 - Public Consultation

The current process for public consultation is laid down in the *Land Conservation Act* 1970, extracts from which have been published in every one of the Council's resources reports. Chapter 5 has discussed its operation and achievements.

Some comments have been made on a perceived need to improve the Council's process, to obtain 'better' public consultation. Other processes are used in town planning. These involve a single period for submissions (or objections), followed by opportunities for appearance before a panel or appeal to a tribunal. These 'checks and balances' emphasize a fundamental difference between planning systems for freehold and public land. On freehold land the owner expects to do what she or he wants, with minimal restraint. Public land users on the other hand do or should recognize that the land is owned by all, and that their use should not limit the ability of others to use or enjoy it.

Freehold-land-use proposals are often site-specific, and the town-planning process allows those neighbouring the site or otherwise concerned to have several opportunities to put their case.

The Council's process on the other hand is designed to obtain both broad-ranging and specific information and opinions in the first round, and opinions and comments on the published proposals in the second round.

Note that planning schemes or amendments commonly involve exhibition of a single copy of the proposal in each of a few public locations, such as Shire offices. Land Conservation Council reports and recommendations, by contrast, are published and several thousand copies printed, so that they can be studied in detail at home or office.

Each process appears to be well suited, in general, to its task. However, some specific aspects of public consultation could improve the Council's process, and these are include:

* exhibition, in suitable locations, of the report or proposed recommendations on which public comment is sought, to increase public awareness

* organized opportunities, in the region under study, to meet the Council Chairman and staff and discuss points of view

* public meetings in the region to discuss viewpoints and to allow a planned presentation of information

* written reports, summarizing the content of submissions, to be incorporated with proposed and final recommendations (that is, following each submission period)

* informal hearings following publication of the proposed recommendations, to enable people to inquire as to the result of their submission, and to provide a channel for follow-up

* extended submission periods (that is, greater than the standard 60 days) to allow opportunity for better development of submissions

* the publication of an issues paper to focus public attention on major land use problems

* consideration, and publication in recommendations, of other land use proposals put to Council by community groups and organizations

Some of these proposals have been used by Council. Consideration needs to be given to the incorporation of appropriate measures into a revised consultation procedure.

Written reports on submissions and informal hearings could both be valuable additions to the consultation process. While written reports would not add materially to the consideration given to submissions by Council members, they would provide the public with summarized information on submission content and numbers, which at present is only available by inspection of individual submissions. It has been suggested that hearings may increase public confidence in the procedures. Consideration would need to be given to the circumstances they would be appropriate for, and how many members of Council would participate.

Requirements for written summaries on the submissions received, and extended submission periods would require amendment of the *Land Conservation Act* 1970.

Chapter 6 - Public Land Classification

The large number of different categories of reservations recommended by the Council reflects the development of Council's policies over time to meet the various issues that were raised in different parts of the State. A number of suggestions for rationalization or modification of Victoria's public land classification system have been made. These have included:

* reduction of the number of categories of parks and reserves, so as to achieve a degree of uniformity with classifications in other Australian States

* modification of Council recommendations so as to conform with IUCN definitions of conservation reserves

* grouping of Council recommendations into like-use categories such as those shown in Table 11 and suggested in the proposed changes currently being considered in the Lands Bill

It may also be appropriate to review the schedules of the *National Parks Act* 1975 so that these better reflect the hierarchy of parks according to their values and size.

Suggestions have been made - by the Victorian National Parks Association and in the Australian Labor Party (Victorian Branch) 1983 Environmental Policy, among others - that the system of parks and reserves in this State is complex and leads to public confusion. The Council would maintain that, while some benefits accrue from having a uniform system of parks and reserves throughout Australia, the category of reserve designated for an area should reflect that areas's intended primary use as well as the aims and requirements of management. Such a designation avoids confusion about the intent of the reserve, and reduces the possibility of future *ad hoc* decisions varying its uses to accommodate contemporary pressures.

Pressure has also been exerted for the Council to conform in its recommendations to the IUCN definitions of conservation reserves. One of the IUCN criteria for national parks is the absence or phasing out of exploitative activities. It would be unfortunate, however, if the rigid application of such criteria led to the apparent downgrading of parts of the Victorian system of national and State parks because of small areas with continuing exploitative uses. A 10 000-ha park, for instance - representing important Victorian land types, vegetation associations, and habitat types - should not be downgraded for the sake of, say, a continuing 10-ha quarry lease. Another example would be the downgrading of Cobberas--Tingaringy National Park and other parts of the Alpine area because of grazing. A better proposal would be to list all parks that on their conservation values justify IUCN National Park status, but to note those with existing minor exploitative uses.

At the same time, the Council recognizes that it has, in its recent East Gippsland and Melbourne Area District 1 Review final recommendations, departed from its policy of designating land according to a systematic reservation classification system based on scientific assessment and representation of land systems. Instead of maintaining its previous policy it has accepted the *status quo*, continuing the classification as national parks of areas now popularly known as national parks but not meeting the Council's criteria with respect to size, representation of land types and features of national significance.

The many types of recommended reservation that have developed over the life of the Council could be rationalized. However, it is important that the primary use of each reserved area be recognized both in its form of reservation

and in the requirements of management. The 17 categories shown in Table 11 group the various reservations into like-uses. This grouping could be one approach to reducing the number of reservations while retaining the intent of having them thus defined. The categories are similar to those outlined in the draft Lands Bill.

With regard to the *National Parks Act* 1975 schedules, one review proposal suggests three schedules, with schedule A having national parks, schedule B State parks, and schedule C other parks. If such revision were effected, the Council's existing policy would support uniform management of parks in schedules A and B, recognizing their places in the national and State park system. Schedule C parks on the other hand could have slightly different management aims, recognizing the broader objects of non-national 'parks' under section 4(b) of the *National Parks Act* 1975.

Chapter 7 - Current Status of Public Land Use

A number of important issues have arisen concerning the current status of public land since the Council began its work in 1970.

The most significant is that, although governments have approved most of the Council's recommendations, it has taken a considerable time for these to be implemented, and no material action has yet been undertaken for many of them. This issue highlights the lack of resources available to the land managing agencies, particularly the Department of Conservation, Forests and Lands, to implement the recommendations. Existing administrative implementation procedures are often complex and time-consuming, and need to be streamlined or modified to enable the implementation of approved recommendations to proceed more rapidly. The draft Lands legislation provides an opportunity for simplifying these processes.

Various categories of land have been given a low priority for implementation in the past. The most obvious is the Council's system of education areas, where only 1 of 55 recommended areas has been reserved and that one temporarily.

The government's conservation strategy places strong emphasis on the need to raise public awareness about environmental matters and increase public involvement in such issues. The document stresses the importance of environmental education in achieving the desired objects.

The strategy included a specific action aimed at increasing awareness of sites designated by the Council as education areas, and at developing appropriate education programs for their use. The Council believes that such areas should be given a higher priority for reservation and development, in line with the government's objects for environmental education.

Implementation of other reserve categories - such as scenic, historic, streamside, and natural features reserves, and regional parks - should also be given a higher priority.

The Council is concerned that, in some instances, government-approved recommendations are being varied by the departments responsible for their implementation, thereby downgrading the reserve system established by the Council and approved by government. Government agencies should try to ensure that implementation proceeds in accordance with approved recommendations.

There is a need to monitor the implementation of government-approved land use recommendations to ensure that conservation and other values are being adequately protected. This involves the consideration of both administrative and management implementation. The Government's Conservation Strategy also underlines this need.

At the present time responsibility for this task has not been assigned to any agency or government department, but it is important if the government is to achieve its environmental objects.

The Council is also concerned that sections of the community are ill-informed about the Council's process, its system of reserves, and the uses of public land as approved by government. The Council needs to increase public awareness and look at new ways of involving the community in public-land use issues such as those discussed in chapter 4 and in the section above on public consultation. A particular aspect that requires attention is the need to inform the public about government variations to the Council's final recommendations.

The delays being experienced between government acceptance of the recommendations and their formal implementation have, in the past, resulted in some damage to values, even though Council has maintained that management prior to implementation should be in accordance with accepted recommendations. This has often been due to the lack of legal powers available to managing authorities unless land has been formally reserved. However, the proposed Lands legislation should assist greatly in resolving this problem, as all areas of land for which recommendations have been made and accepted would be automatically reserved if and when the new Act comes into operation.

Information about the distribution and requirements of native flora and fauna is still very imperfect. The questions relating to adequacy of representation cannot therefore be answered satisfactorily until further information is obtained. The Council has thus adopted a policy of setting aside relatively large ecologically viable areas specifically for conservation where the impact of other uses is minimized. In other areas of public land the Council's recommendations emphasize the need to take account of nature conservation values.

Chapter 8 - Nature Conservation

Various studies have been carried out to assess the status of Victorian nature conservation. While differing in detail, they have generally concluded that a substantial

proportion of the native flora and fauna found in Victoria is now adequately represented in the conservation system, although gaps remain, which have been identified by Frood and Calder (1987).

For flora, the needs are:

* a limited number of further reserves to protect particular plant communities that are currently poorly protected (see Appendix VII)

* small reserves to protect occurrences of rare or endangered species, where they are identified

* attention in land management to the preservation requirements of particular species or plant communities

* further research to identify those preservation requirements, where necessary

The Council's process is appropriate for making recommendations to cover the first two needs, and Council should continue to identify such areas in future reviews. Communities in greatest need of protection occur in scattered remnants with various present uses. It may be appropriate to request the Council to conduct State-wide Special Investigations for such communities, using the normal process, to identify appropriate areas for reservation.

From time to time, the Council has also made recommendations suggesting broad directions for land management, and outlining research needs as indicated above.

Particular habitats of concern

The following habitat types have been identified by Frood and Calder (1987) as being poorly protected:

* lowland plains (extending to fertile foothill country and the north-west)

* riparian habitats and wetland areas, including saline marshes

* significant habitats near intensively utilized areas (such as settlements, coastal fringes, and some heavily used scenic and recreation areas)

Potential to increase representativeness

Observations have been made in various parts of this report that the degree of protection necessary to ensure the continuing survival of some species and their habitats is either felt or known to be inadequate, and therefore in need of reinforcement. The problem of 'adequacy' of representation has been discussed and is shown to be a concept requiring further research. Nevertheless, enhanced protection needs have been recognized in a number of specific areas, where early moves towards further reservation might commence. These include:

* protection of remnant vegetation in areas predominantly used for agriculture - for example, small conservation reserves, linear reserves, etc.

* far north-west - chenopod shrublands; Mallee woodlands; those land systems depleted by agriculture; and the Raak (PYf2, Pz2 and Pcz2) land systems

* wet sclerophyll and closed forests of central Victoria

* some forest 'alliances' are reasonably well-conserved in the broad sense, but the range of variation is not represented - for example, candlebark, peppermint, and messmate forests with grassy understoreys are poorly reserved in relation to shrubby versions

* some key areas of limited extent where competitive uses occur - for example, at Anglesea and Gellions Run (uncommitted land) - include species and communities that are not adequately included in the adjacent reserves

* reservation of forest types of the western highlands is still inadequate

Remnant areas of habitat

Retaining examples of the biota of the most depleted land types may involve a change in values and perspective of reservation. Linear reserves (road, rail, and water frontage) are currently under pressure from clearing, leasing for grazing, and fire-break construction, etc. While the first two are primarily used for transport, until portions of these are actively managed for conservation there can be little hope for the long-term survival of relics of many of the lowland plant communities.

Similarly, in largely cleared areas, the survival of local populations of the fauna that did not rapidly become extinct following settlement depends on fragmented relic vegetation.

Much could be done to improve (and retain) the effectiveness of small refugia for conservation purposes - for example, ecological management (weed control, appropriate fire-regimes, grazing controls, and cessation of destructive practices involving soil disturbance), and linkage with other such remnant areas where possible.

There is an urgent need to investigate those vegetation units that do not occur or are only very poorly represented on public land and to identify priorities to protect adequate examples of these. This may be achieved under the provisions of the *Flora and Fauna Guarantee Act* 1988.

Similar comments to those for vegetation would apply to Victoria's native fauna. Where specific sites have rare or endangered species, then special-purpose reserves may need to be recommended through the Council's process. Areas with a high diversity of fauna could also be identified for protection in larger reserves, to complete the system of representative reserves. Both of these needs could be effected by

Council's regional reviews, or by special investigations where appropriate.

A preliminary assessment of the adequacy of reservation with respect to native faunal habitat indicates that woodlands and grasslands of the western and northern plains are inadequately protected.

The potential for adequate representation of these habitats on public land is very limited and purchase and restoration of freehold land may be the only means of achieving the required protection. The other major deficiency in habitat representation in conservation reserves is associated with the Mallee region. Large areas of public land still remain in this area and thus the potential for further representation of these habitats is high. The Council is giving consideration to this in its current review of the Mallee.

Wildlife reserves recommended by Council have two shortcomings, with regard to the protection for native fauna their title implies. First, the standard wording of Council's recommendations for wildlife reserves is imprecise, and does not specify whether such reserves are to be sanctuaries or open to game-shooting. Second, the range of habitat types included in the system is limited, with wetland bird habitat comprising 134 of the 152 wildlife reserves.

In its early sets of recommendations, Council established the 'wildlife reserve' category without specifying uses, because the breeding requirements of certain species were not well-enough known to enable anybody to recommend the appropriate number of sanctuaries. Given that recommendations have now been made across the State, and that many research projects and surveys have been carried out over the last 16 years, it would seem that future public land use reviews could make more detailed and specific recommendations for wildlife reserves.

The Council's approach to conservation of wildlife has in general been to recommend that large areas of each habitat type be protected, so that the natural range of faunal species can thrive. This differs from the approach of reserving limited areas that at present contain small populations of individual endangered species. The latter is piecemeal, is unlikely to ensure survival of these species, and does not treat natural systems as an ecological unit.

Wildlife reserves are usually limited in area, and so they potentially suffer the drawbacks of that second approach. However, where remnants of public land in a generally freehold area do have wildlife habitat values, if appropriate they should be given protection. If the Council's intention is to include a range of habitat types in such small reserves, then an amended approach will be necessary. These matters could be addressed by two studies: a State-wide Special Investigation of wetlands, and a State-wide Special Investigation of fauna conservation needs.

Many nature conservation, other values, and various uses are associated with public land in valleys and river systems. A

special investigation by the Council of the ecological, recreational, scenic and cultural values of rivers and streams, and their appropriate uses, is now under way.

Other nature conservation issues

Other perceived needs in nature conservation, which relate to public land and which could be addressed by special investigations, are as follows:

* uses of marine areas
* uses of rainforests
* uses of specific forests areas with regard to their ecological condition
* uses of wilderness
* land system representation in reserves, and appropriate uses

Most of these would involve consideration of alternative and sometimes conflicting uses, and development of a balance between them, involving public consultation. The Council's process is thus ideally suited to these studies.

The Government's Conservation Strategy endorses the need for the above studies, in various chapters and actions.

As part of the implementation program of this strategy, the Land Conservation Council will aim at extending the system of already established reserves. It will pay particular attention to appropriate small-scale refugia and corridors in the form of bushland reserves, cave reserves, public land water frontage and streamside reserves, and linear road and railway reserves, and also to public-utility holdings.

Conservation requirements of particular species

The Council's recommendations are for broad public land use categories, with certain uses and management requirements specified. Frood and Calder (1987) have highlighted the need for more detailed attention to the habitat requirements or life cycle of particular species that may suffer from normal land management regimes. This is particularly true of the large areas of State forest recommended by Council. In making recommendations for State forest, and earlier for hardwood production and uncommitted land, the Council has often recommended that specific sites or areas of habitat significance be protected by temporary reservation or by prescription. Further attention to the specific requirements of species, communities, or habitats may be required in future, perhaps as part of a special investigation.

Further needs

Declaration of biological reserves alone is not sufficient - proper management is critical to maintain those features that are represented. Certain species remain threatened despite their presence in reserves (notably through grazing pressure from kangaroos and introduced stock). Inadequacies in the current status of knowledge about habitat requirements and the impact of human disturbance on fauna are of

major concern. While mosaics of vegetation age-classes can be desirable for the range of habitats they provide, this range should also include ecologically mature vegetation. The varying ecological requirements of different communities and species needs to be recognized by management. Further ecological research, the implementation of findings, and monitoring are therefore urgently required.

Knowledge of the non-target effects from the use of baits (notably 1080) is inadequate. Increased protection for species that appear to be declining or vulnerable is required. The effects of intensive utilization can be serious for species with specialized habitat requirements, notably those that make use of hollows - the loss of (ecologically) mature trees, for example, could reduce nesting sites, and hence populations, to critical levels.

Species with large home-ranges (such as predatory birds) can be vulnerable due to small territorial spans - reservations of sufficient extent to support viable populations may be a problem. Species with localized breeding colonies can also be vulnerable - for example, cave-breeding bats depend on a small number of maternity caves.

Ecological problems facing remaining bushland

In addition to considering the allocation of further land into the reserve system to extend the protection offered, it is essential also, Frood and Calder (1987) consider, to give equal consideration to the kinds of problems that continue to threaten the survival of ecosystems, which cannot be remedied by reservation alone. There are parallel requirements for appropriate management in addressing each of these problems, each of which will require its own solution, and possibly different solutions in different areas. Those so far identified include:

* alteration to ground-layer or soil characteristics (particularly in grassy understoreys and water frontages), salting, and other erosion processes such as stream entrenchment

* loss of specific habitats (such as nest-hollows, riparian fringes) at various successional stages - in particular, 'mature' vegetation in forests as a consequence of too-frequent harvesting, and species-rich early post-fire examples of grasslands and some heathlands

* inappropriate fire regimes, and management based on inadequate research

* potential for piecemeal destruction of remnant biota across large areas of freehold land in the State

* degradation of habitats by grazing impact, including damage by excessive kangaroo and rabbit populations and other inadequately understood disturbance factors

* introduced weed and faunal species, particularly through the inadequacy of some preventative measures

* pollution and poisons - pesticide accumulations have been recorded in some species, and this can severely limit breeding success through factors such as egg-shell thinning; decreases in water quality can lead to the deterioration of aquatic ecosystems

* water supply: alteration of river flows can have a range of effects, from limiting breeding success or survival of dependant species, to alteration of riverine forests through desiccation

Chapter 9 - Land Systems

The maps and descriptions provided in this report and in Rowan (1988) represent a major advance providing increased public access to information about the 711 land systems in the State. For the first time, land systems have been mapped on a consistent basis and are described using a standardized nomenclature. This will facilitate future planning and management of both public land and freehold land.

In relation to the work of the Council, it has enabled an assessment of the degree to which the State's land systems are represented on public land and within major conservation reserves. This assessment shows that some 45% of the State's land systems occur predominantly on freehold land and the only possibility for adequate representation of these is land purchase. This lack of representation is concentrated into several regions of the State including the northern riverine plains and in western Victoria on the Wimmera Plains, the Western District volcanic plains and the western Victorian uplands.

Of the 711 land systems in the State 394 (55%) occur on public land, with 227 (58%) of these adequately represented in the reserve system. Table 22 in Chapter 9 identifies the major gaps in representation and this information can be used by the Council to fill those gaps in future reviews of public land. This is in line with the Government's Conservation Strategy which states as one of its objectives 'to protect representative and ecologically viable samples of all Victoria's natural ecological systems, including land systems...' (p.28).

However, a more detailed assessment of these deficiencies will be required in future investigations for the reasons outlined in chapter 9.

Chapter 10 - Ecological Reference

Selection of areas

Various land use authorities both here and overseas have adopted different approaches to the selection of areas suitable for scientific reference and the appropriate tenure for their protection, control, use, and management.

The Council's approach to selection is based on land system representation; this basis can include values and features

such as undisturbed vegetation communities, undisturbed catchments, or other features that are usually associated with a particular land system. Conventionally a catchment is selected to topographically define the boundaries of the reference area. It may be necessary to reconsider some of the early reference area recommendations to ensure that whole catchments are included, where appropriate.

In selecting areas for scientific reference, some authorities elsewhere use criteria that resemble Council's criteria for recommending land for education purposes or for preservation of particular species of flora and fauna, rather than those used here for reference.

Suggestions have been made that the use of land systems as a basis for selecting reference areas may limit representation of some major vegetation types, some geomorphic features such as lakes, and other areas such as marine environments.

Tenure and protection of reference areas

The advantages of having specific legislation such as the *Reference Areas Act* 1978 for the establishment, protection, and control of reference areas are that it:

* facilitates strict control by the responsible Minister
* ensures maintenance of the area's value for reference in perpetuity
* provides a mechanism for uniform management and protection
* vests responsibility for administration in a committee independent of any single land management authority
* allows day to day management to be carried out by the authority responsible for the adjoining public land, who is logistically best suited to manage the area
* ensures that no one authority or department can gain control of a reference area at the expense of another user group

Further, legislation is superior to zoning for ensuring the long-term maintenance of an area's value for reference. Proposals in the draft Lands Bill maintain the protection afforded to reference areas under the existing *Reference Areas Act* 1978.

Reference area viability

The definition of viability needs to be explored, as it may be necessary to enlarge some reference areas in order to achieve genetically viable populations of a particular species or suite of species, or to include larger sub-catchment units. Such expansion may have to be at the expense of having a less viable reference area in terms of management, so trade-offs will have to be identified. Other issues that need to be examined in seeking viability for a particular

species, or for management, will be location, extent, prior use, presence of vermin and noxious weeds, and the ability to define appropriate buffer zones.

Land system representation

As mentioned earlier, 80% of Rowan's land systems do not occur within the State's array of reference areas. Many of these land systems have been altered by development for agriculture, and are subject to a number of agricultural practices such as fertilizing and ploughing. Accordingly, it may be expected that problems arising from the use of these lands could become apparent in the future. In addition only small parcels of public land are found on these land systems and those parcels have generally been disturbed in the past by a number of land use practices such as grazing and timber production.

In order to achieve representation in reference areas of the State's major land systems, these land systems and the public land found on them could be examined more closely and areas suitable for reference be identified. This identification process may mean a relaxation of certain criteria used in selecting reference areas, such as size, location, degree of past disturbance, and the location and size of the protecting buffer areas.

Chapter 11 - Education

This review has identified a number of issues related to the nature of education areas and their use.

* A concerted and sustained program throughout the education community is required to advertise the existence and utility of education areas. Both the concept of these areas and the opportunities they can provide those involved in environmental education are poorly understood. A specific action of the Government's Conservation Strategy is to promote a greater understanding of environmental education in the community. Promotion and use of education areas is one means of achieving this action.

* A program is required to promote the use of education areas and to assist in their use. This could be facilitated by the establishment of an 'Education Areas Advisory Committee'.

* There is a need to develop curricula materials based on the use of education areas in general and for the use of each area specifically through co-operation between the land manager, user groups, and other people with environmental education interests.

* The Council's education areas should be reviewed in terms of the range of land systems needing to be represented, and new or alternative areas should be sought if it is considered necessary. Those areas to which access will be a continuing problem should also be reviewed with the view to possible relocation.

Chapter 12 - Historic Sites

The process for identification of historic sites by the Land Conservation Council has evolved over a period of 15 years, with variable and inconsistent results. It has placed a heavy concentration on relics, which has been the main criterion for historic designation, and such relics have generally only been highlighted for special management in two situations:

* in broad areas, where many relics form a wide aggregation

* on small blocks where relics are prominent

As previously discussed, most historic sites identified in Council recommendations relate to mining history. Other themes have not received the same level of attention due to the paucity of relics on land within Council's charter. The information base contains gaps, both in the consultants' studies conducted for the Council, and in those study areas where consultants were not employed - Wimmera, South-western Area Districts 1 and 2, Murray Valley, Corangamite, Melbourne Area District 2, North-eastern Area Districts 3 and 5, Alpine, South Gippsland Area Districts 1 and 2, and Gippsland Lakes Hinterland.

While the outcome of the process may therefore be regarded as incomplete, the period of evolution has been useful in determining the role of the State in preserving and managing historical places on public land.

The major issue, is in the nature and extent of Council's current and future history-oriented surveys. The process of policy development regarding historic sites has meant that some areas of the State have not been examined extensively, if at all. In this connection, for future studies Council should perhaps consider the historical significance of a study area as a whole and allocate resources accordingly, rather than concentrating on what is essentially an inventory of sites, without further analysis. Guidance should be obtained from the Department of Conservation, Forests and Lands Historic Places Branch and from the Ministry for Planning and Environment, Heritage and Environment Division, about better ways to reflect the appropriate areas for future historic areas and reserves.

Extension of the Council's jurisdiction to areas of public land within cities, towns, and boroughs, regardless of the current management status, would enable it to conduct more complete historical studies. Alternatively, the responsibility could be placed on other agencies such as municipalities to carry out or commission historical surveys.

The Government's Conservation Strategy calls for the protection, restoration, and enhancement of rivers, wetlands, and the coast to ensure maintenance of cultural features, and requires the preparation of a Victoria heritage plan to guide the conservation and preservation of the State's cultural heritage.

Protection of Aboriginal Archaeological Sites

As only a very small proportion of the State has been systematically surveyed, it is probable that thousands of sites have yet to be identified. Aboriginal archaeological sites are a non-renewable resource and form an important part of Victoria's heritage. They are, however, under threat from various activities on public land including mining, forestry, and tourism, and to avoid inadvertent damage there is an urgent need for detailed site surveys to be carried out.

Surveys of this kind will also assist in obtaining a better understanding of the total resource and hence, enable a more systematic approach to the protection of a representative sample of Aboriginal sites. At present, however, the approach should be one of protecting the range of the archaeological resource and, in order to achieve this, it is suggested that emphasis be given to the protection of the various components of the landscape rather than concentrating on specific sites. This approach has the added benefit of preserving the relations between the archaeological resources and their environment, thus aiding an understanding of the archaeological history from both research and public education viewpoints.

In the past the Council's approach to the protection of Aboriginal archaeological heritage has been inconsistent and it would be appropriate in the future to develop policies, in conjunction with the Victoria Archaeological Survey and Aboriginal groups, for the protection of this heritage and to formulate appropriate land use recommendations. This would require a definition of archaeological significance that could be used to rank sites for the purposes of making recommendations.

In some areas investigated by the Council, particular reference has been made in the recommendations to the presence of Aboriginal archaeological sites and the responsibility of the land manager to protect such sites. However, land managers often face difficulties in the protection of sites because they lack detailed information about the location and management requirements of such areas.

Chapter 13 - Landscape

Proposals aimed at the protection and preservation of landscape have been contained in Council's final recommendations for most study areas, although without a specific chapter allocation. Instead, they have been addressed in a wide range of chapters and land use categories. The problem with this approach is that landscape may appear to be seen as less important than the other uses considered in specific chapters. It is acknowledged, however, that gaps do occur - particularly in Council's earlier recommendations - and this tends to indicate that landscape values and issues, like many other aspects of the recommendations, have evolved over the period of the Council's existence.

It is perhaps timely, then, to examine all areas of the Victorian public land estate from the current stance, and bring

up to date those areas that were viewed from the earlier standpoint. It may also be appropriate to include a separate chapter on landscape in future resources reports and recommendations.

As Appendix XI indicates, many of Victoria's public land areas identified as having high scenic quality are included in reserves that protect their landscape values. While large areas of public land recommended as reserves are in themselves major landscape features, the Council emphasises throughout that the small blocks of public land scattered through freehold tracts have equal importance - providing native vegetation and landscape diversity and interest in areas otherwise largely cleared of trees. In this way, many small or linear areas of public land can contribute markedly to a generally freehold landscape.

A further element of landscape protection is that applied to protect a small proportion of a large public land area, such as State forest in which clear-felling operations may reduce landscape values. In these cases, it is the land manager's responsibility to prepare and apply detailed landscape protection prescriptions where appropriate. The Council's role in such areas has been to recommend the application of suitable landscape protection prescriptions.

Future recommendations could perhaps give more attention to landscape as the context within which a large range of activities take place. Landscape assessment is relatively new and appropriate assessment methodologies are still being developed and refined. However, current techniques could be adopted by the Council to provide more detailed information and thus give greater emphasis to landscape values when preparing land use recommendations.

Perception testing, which is essentially a method of polling the public to determine the key landscape features, particularly on a local scale, is one method that Council could use. More detailed landscape assessments could also be appropriate.

Landscape chapters in future Council resources reports for a region could include descriptions and a map of landscape units, with their perceived relative value according to a systematic assessment procedure.

The importance of landscape values should be recognized in two particular areas: first, those areas where aesthetic appreciation of the surroundings is a primary reason for a recommendation - for example, in some parks and scenic reserves; and second in public land areas identified as having high landscape value but recommended for timber-harvesting, mining, extractive industries, utility easements, or other uses that may compromise landscape values.

Chapter 14 - Recreation

The underlying question of this chapter is whether Council's recommendations make adequate public land available for the community's desired range of recreational activities, both

now and in the future. Recreation and space in which to pursue given recreational activities are extremely important to the community, and its diversity means that many individual recreation groups will not be totally satisfied with the area available to them.

Given this diversity, Council considers it has met recreation demands, with most public land being available for recreation, many areas being specifically recommended for recreation uses, and a reasonable balance being struck between most activities, with almost every form of recreation allowed somewhere on public land. However, higher-profile activities with greater potential for environmental impact - especially use of off-road and over-snow vehicles, deer-hunting, and fossicking - may require more careful regulation to protect the environment in some areas. In addition there is a need to provide appropriate locations where high-impact activities can be pursued exclusively. The Council has been careful, however, to ensure that land allocated for various recreational activities is available to the whole community, rather than to particular user groups that require exclusive use of an area.

Hunting

Council's recommendations allow continued use for duck-, deer-, or vermin-hunting in most public land. Hunting is currently only excluded from national and State parks, reference areas, flora and fauna and flora reserves, wilderness areas, education areas, and most regional parks. Some proposed additions to the Alpine National Park also allow limited hunting. The remaining areas in which it is permitted total 5 203 740 ha, or some 74% of the State's public land. In addition, more than half the wildlife reserves recommended by Council have provision for hunting.

Hunting can clearly conflict with nature conservation and other forms of recreation. It may be appropriate for Council to develop further its policy on hunting to define areas for this use more clearly, and to remove it from unsuitable ones.

Fishing

Fishing is an implicit recommended use in most public land, including many categories of reserves.

Fresh-water fishing is only specifically excluded from particular areas where it may endanger rare fish, such as the trout-cod in the Seven Creeks Wildlife Reserve. Some other areas are excluded by management plan. While fishing is generally a low-impact sport, heavy use of any one area can lead to degradation of values.

The Council's policy on fishing requires development so that areas available for this recreation are identified, and that, if appropriate, it is excluded from certain areas.

Among its aims, the Government's Conservation Strategy includes protection of natural systems for the non-material

needs of society, and lists outdoor recreation and tourism as broad conservation issues for priority action. Under the objects for reviving rivers, coasts, and wetlands, these areas are to be protected, restored, and enhanced to provide (among other things) for present and future recreational uses.

Chapter 15 - Water Supply Catchments

The following issues relating to water supply catchments require resolution:

* the types and intensities of use that can be made of land in catchments providing water supply for domestic purposes

* the appropriate level of control over land use in catchments

* the most effective mechanisms of catchment protection under a range of circumstances

* the extent to which freehold and public land managers have a responsibility to moderate their practices because they are within a catchment

These have been addressed in chapter 15, so far as they relate to Council's public land use and water supply catchment roles. The Council has attempted to follow an approach between the two poles of 'closed catchments' and unconstrained use of catchment land.

This approach - involving the Department of Conservation, Forests and Lands, the water supply authorities, the Council, and the various land managers - has had success, given the limited frequency of water-borne disease occurrences resulting from the State's mixed-use catchment supplies. However, further effort towards better catchment protection is required to enable all water supply samples to meet international quality standards.

The small number of prosecutions for failure to comply with catchment protection provisions may suggest ineffective enforcement.

Catchment proclamation:

* creates an awareness of the use of an area as a catchment for water supply, within the community and by public authorities

* initiates processes contained in several existing Acts, such as the Mines Act, Extractive Industries Act, etc., for referral of proposals for detailed comment

* is intended to be shown on maps used in conjunction with the single planning schemes set up under the *Planning and Environment Act* 1987, and this will further increase awareness, and facilitate referral of development proposals for expert advice

* provides a line of defence against potential catchment management problems in that it improves information and awareness

* is an essential first step, which may lead to detailed catchment management conditions

* provides for special attention in the management planning processes of the Department of Conservation, Forests and Lands and in certain Codes of Practice prepared by the Department

The Council provides advice on catchment controls to the Minister for Conservation, Forests and Lands that is clearly useful and valued because it is broadly based, and independent.

The Land Protection Division has proposed four alternatives for the preparation of land use determinations to reduce the current backlog of investigations. Several of the alternatives could be used in particular catchments and the Council would consider any proposals, provided water supply and other values are adequately protected.

The Land Protection Bill 1987 contains an expansion of the consultation process associated with the declaration of catchments or approval of catchment protection plans. However, this does not replace the very important forum and opportunity for expression of a range of viewpoints provided by the Land Conservation Council. Such an opportunity ensures that a balance between alternative catchment management philosophies is achieved.

Closed catchments

With regard to closed catchments, the Council's view - published in all its relevant recommendations since 1974 - is that, in most situations a water supply authority does not need to control and manage all land in its water catchment.

Council is currently reviewing the use of public land in the Melbourne Area, District 2, which includes the Melbourne and Metropolitan Board of Works catchments. Their use is probably the most significant catchment issue and much new information about these areas has been gathered since the Council conducted its first investigation. This will be taken into account when the Council prepares its new recommendations.

Groundwater

The major groundwater issues involving public land concern aquifer recharge and pollution. Access to public land for groundwater investigations could also be an issue, particularly if extensive drilling programs are required in areas of high conservation value.

Aquifer recharge zones contain large areas of public land. Recharge is important, in returning fresh water to aquifers that would otherwise be depleted. Excessive rates of recharge, however, are responsible for raising water levels

and pressure in specific saline groundwater areas, resulting in salinity problems.

Recharge areas in the uplands, a substantial distance from groundwater-use areas or regions of salinization, are important contributors to these problems.

Too little recharge or over-use may allow aquifer depletion. On the other hand deforestation in recharge areas across Victoria has caused widespread increases in groundwater levels and consequently increases in stream salinities and land salinization.

Groundwater resource investigations and assessment, and the study of groundwater-related problems, often require access to public land. Most groundwater studies involve drilling and the installation of permanent monitoring bores. It may also require geophysical surveys involving some clearing of vegetation along survey lines.

Chapter 16 - Timber and Other Forest Produce

Several issues associated with the use of State forest for timber production have yet to be resolved. A growing body of evidence suggests that the wood fibre harvested from public forests could be utilized more efficiently than at present. This could be achieved in a variety of ways, including improvements in sawing techniques and log selection ensuring that sawn timber produced is commensurate with the quality of the log. Millable timber, although generally of a lower quality, is currently left in the bush in many areas of the State. Such timber has the potential to sustain certain products and, if so used, could allow high quality sawlogs to be deployed towards higher-value output.

Coupled with the greater efficiency of wood fibre use is the issue of 'woodchipping' or 'pulpwood production'. In some parts of Victoria, pulpwood is harvested from forests along with sawlogs in an integrated operation. In others, however, pulpwood utilization is not permitted and a potential resource is being wasted, with the result that potential revenue to the State and associated employment in the private sector is forgone.

On the other hand, some groups in the community consider that the current sawlog-harvesting methods such as clear-felling are very wasteful and other methods, including group selection, should be adopted. This may in turn reduce the environmental impact of logging, although that claim is yet to be verified. These alternative techniques could reduce the volume of pulpwood harvested from an area in a given time, but any harvesting operation would always produce some non-sawlog material.

State forest covers about half of all Victoria's public land and, as such, is of major significance as floral and faunal habitat. Concern has been expressed about the effect of timber-harvesting operations on these values. The distribution, biology, and habitat requirements of many species of flora and fauna are poorly known, and there is therefore an

ongoing need for research in these areas to identify as-yet-unknown values in State forest.

The Government has produced its Timber Industry Strategy, which addresses these and many other issues relating to timber production in Victoria and provides a framework for the ways it proposes to deal with them. For example, it is committed to: regional sustainable yield in all forest goods and services; the dominance of sawlog-driven activities; operational trials to determine the impact of using silvicultural practices other than clear-felling in certain types of forests; providing the maximum opportunity for all felled logs to be processed as sawlogs; the allocation of sawlogs by quality and species to companies with appropriate processing facilities; and to the provision of a government-controlled mechanism for the sale of non-sawlog material. Many of these aspects are part of the Government's Value-Adding Utilization System, presently undergoing a 3-year trial period. Conversion of quality timber into products of the highest value will have particular emphasis.

The Government is also committed to increased protection of the environment and has undertaken to introduce:

* a legislated Code of Forest Practices that lays down operational standards associated with forest use

* a legislated Native Flora and Fauna Conservation Guarantee

* a definition of rainforest and exclusion of timber-harvesting from all stands

* pre-logging surveys to identify significant flora and fauna habitats for exclusion from logging

* the cessation by July 1987 of clearing native forest for pine plantations

* the establishment of 2000 ha of native hardwood plantations per annum for intensive timber production

Most of these initiatives have been effected or are continuing, and the Council supports them, but for pulpwood harvesting has proposed (in the recommendations of the East Gippsland area review) that several other conditions be imposed to control the expansion of this industry. These include specifying in legislation the area to be available for pulpwood harvesting, together with the maximum volumes of sawlog and pulpwood that can be utilized consistent with the maintenance of regional sustainable yields.

Many of these issues will not be resolved in the short term and will require an ongoing commitment by government to the community to ensure that forest management is modified accordingly.

Availability of public land for timber production involves a number of issues. Tables 40 and 41 indicate that more than three-quarters of the suitable timber-producing public

land in the State is available, and that it has the potential, in the future, to produce twice the current cut of about one million cubic metres of hardwood. Aside from this, the Forests and Forest Products Industry Council has estimated that total sawlog volumes in Victoria will increase to 2.9 million cubic metres by 2000. Large areas of government, private, interstate, and overseas softwood plantations will mature over the next few decades, and softwoods are increasingly being substituted for hardwoods. The conclusions appear to be: that the area recommended by Council for hardwood production substantially exceeds the medium and long-term needs; and that, in the shorter term, the Timber Industry Strategy is addressing the more immediate shortfall in mature timber availability.

The Government's Conservation Strategy contains numerous references to timber production, including:

* renewable resources such as timber should be used at a sustainable rate

* forest management is identified as a conservation issue for priority action

* the separate chapter - protecting the forests - calls for the protection of both the ecological conditions in forests and the forest environment during harvesting

* actions include protection of rainforests, assessment of the ecological condition of forests, identification of ecologically mature forests, protection of water quality, flora, and fauna by prescriptions, and research into harvesting methods

The impact of new developing forest industries such as broombush cutting and charcoal production require the development of adequate management controls and accurate assessment of available resources.

Minerals, Fossil Fuels, and Stone

Mineral exploration and mining

Under the Council's recommendations most public land is available for exploration and mining. However:

* Some exploration and mining activities are incompatible with other special interests and uses.

* Council has consistently put forward the view that mining and exploration should be excluded from certain areas where other values are regarded as being more important. While adverse effects of mining and exploration may be reduced by careful application of conditions and supervision of operations, in areas so identified conditions provide inadequate protection.

* The Council's written guidelines are broad and not readily applied to individual sites. The interpretation and application have led to some significant problems. They

have been interpreted to support both mining and protection resulting in an inconsistent and ineffective approach to resolving such conflicts in use.

* Detailed sets of guidelines may need to be developed that establish a clear framework for assessing particular values of sites, into which the details of specific mining or exploration applications can be added.

* Further research is needed to ascertain whether eductor dredging has a significant impact on aquatic values, and whether rivers proposed for inclusion in Schedule 15 of the *Mines (Mining Titles) Regulations* 1983 should be assessed with respect to their nature conservation, recreation, and scenic values, and bed and bank stability.

* The *Mines Act* 1958 is currently under review and it is anticipated that a number of these issues will be addressed in that review.

Fossicking and prospecting

The terms 'fossicking' and 'prospecting' need to be more closely defined and differentiated in Council's recommendations in order to avoid their confusion; furthermore, fossicking may require similar legislation to prospecting in order to control any potential for damage. Some concern is being expressed about environmental damage resulting from activities associated with prospecting under a Miner's Right.

Other issues

* It is considered that Council's recommendations for public land provide adequately - both now and in the future - for the perceived community needs for minerals and fossil fuels. Only some 5% of the State is excluded from mineral exploration and mining under the Council's recommendations, while most of the fossil fuel resources in the State remain available for utilization.

* Many mineral deposits that have been found in Victoria are not currently economic, but with changing circumstances it may be preferable to retain an exploration or mining option, except in Wilderness and Reference Areas. In contrast, however, Council could recognize the primacy of undisturbed conservation values in other important reserves, and specifically recommend the exclusion of surface-disturbing exploration and mining from some or all of the parks in the national and State park system and other major conservation reserves. There is concern that important values are being disturbed by exploration and mining activity on public land, particularly in the North Central Area of the State.

Stone extraction

The wide distribution of most stone resources throughout Victoria, together with the large area of the State where stone extraction is an acceptable use, effectively means

that the limited areas specifically excluded from stone extraction by Council recommendations have not materially affected general resource availability, although in some instances they may mean increases in the cost of the resource at point of use. However, local impacts may be more significant in some areas for particular types of store.

Recognized environmental concerns are the proliferation of small, badly sited pits, and failure to apply appropriate standards of rehabilitation in some areas.

* Despite Council's policy, considerable problems associated with stone extraction still persist, mainly with operations exempt from the provisions of the *Extractive Industries Act* 1966, and arising from contradictions in some of the applicable legislation.

* A perceived need is a comprehensive State-wide assessment of resources on all land to identify resource qualities, needs, best method and rate of extraction, and most appropriate source of supply for each municipality. This would avoid the approach of using the 'closest parcel of public land' for extraction.

* Interdepartmental action is needed to establish and apply procedures to exclude certain areas from extraction.

* Uniform procedures for exploration and extraction of stone should be applied by all users, including municipal councils and the Road Construction Authority.

* Provisions are needed for full reclamation or restoration to a standard appropriate to the site. Where abandoned sites require reclamation, this should be carried out at the expense of the operator is this is known.

* The numbers and distribution of sites require rationalization, and stream-bed extraction should be avoided where possible.

Chapter 18 - Agriculture

In general, land in Victoria that was not alienated following settlement is either unsuitable for intensive agriculture - having been reserved for specific purposes and provision of other community values - or unavailable for agriculture.

Substantial areas of public land are currently being used for some purposes, however, under a range of tenures including lease, licence, or agistment. Usually, such use is of considerable value to individual farmers in improving their economic viability. For example, forest grazing frequently provides summer feed, which increases the capacity of the freehold farm. It may also provide benefits in stock health and greater management flexibility during unfavourable seasons, both drought and flood. Reduction in risk and improved flexibility are likely to be at least as important to many lessees as are production increases *per se*. Use of public land is especially valuable in this sense where the

lessee is the adjoining landholder. In times of drought though, the ability of public land to provide grazing falls and its susceptibility to damage - by both increased erosion and effects on sensitive plant species - rises.

Security of leasehold land tenure is an important determinant of the standard of agricultural management likely to be applied. Improvements such as fencing and water supply are expensive and lessees will invest in such improvements more readily where they are confident that tenure will be adequately secure to warrant expenditure. As previously explained, however, very few areas of public land are under lease for agricultural use.

In most instances, the Department of Agriculture and Rural Affairs considers that the economic benefits to individuals arising from use of public land is not reflected in significant improvement to the regional or State economies, because of the relatively small production increases. Improved economic viability of farming enterprises is, however, likely to be reflected in the welfare of local communities.

Well-managed forest grazing may provide community benefits, through weed control and fire-fuel reduction. On the other hand, adverse effects can include loss of native species, reduction in floral diversity, changes in species dominance, weed introduction or spread, and damage to soil structure.

Licensed grazing of small public land reserves, including water frontages, can perform useful functions, including fire-fuel reduction and control of pest plants and pest animals. Clearly, however, some significant problems remain throughout the State with regard to standards of management of public lands, by both licensed users and illegal users. In particular, stock access to water-frontage reserves can cause water-quality deterioration and stream-bank erosion.

There is a recognized need in some areas to improve standards of agricultural management of public lands, but withdrawal of grazing from such lands is not a complete solution unless alternative management is supplied by the Crown.

Continued but improved management by adjoining landholders may be the most efficient option for achieving improved management, where other important community values are not prejudiced.

Agricultural industries are attempting to diversify to cope better with economic problems. Subject to sensitivity to other community values, public land (in particular wetlands other than those of high conservation value) may offer some scope for diversified enterprises, such as the growing of yabbies and shrimps.

Many fragmented and isolated public land allotments occur throughout the State. The Council has recommended many such allotments for reserves of various types, as they are sometimes the only examples of public land on particular land systems. They are also very important for their nature conservation, landscape, and in many cases recreation values.

These are the reasons why the Council has not acceded to all requests for alienation of such areas for addition to adjacent farms. In some areas it is recognized that this can lead to interface conflicts. However, in most study areas the Council has recommended that some public land be alienated, although - apart from the Mallee, where extensive areas of public land were already cleared or used for farming - it has opposed large-scale alienation.

The fact that relatively few individuals benefit from the use of public land for agriculture, the apparent trend in community values against this use, and a general lack of land suitable for extensive alienation together indicate the wide agreement that there is no justification for further substantial allocation of public land to agriculture in Victoria. In some instances, it may even be difficult to sustain arguments for continuation of present agricultural use of some freehold lands, leaving as a result scope for return to the Crown of land of low agricultural suitability.

Some concern has recently been expressed about High Plains grazing, in particular, that the cattle preferentially eat certain alpine herbs, thus reducing their distribution; that they cause increases in shrub cover; that they damage the fragile moss-beds around the bogs; and that they foul springs and waterholes.

The Council has taken the view that these anxieties, while they are real, do not justify the removal of grazing from areas other than the most sensitive or important for conservation or walking, as previously mentioned. The Council has, however, recommended further studies.

Public land adjoining agricultural areas has traditionally been used to supply farm timbers under permit, although in recent years demand has declined due to the use of alternative materials such as treated pine, steel, and concrete fence-posts and other items. The establishment of woodlots on freehold land also reduces the reliance on public land.

Issues in public land apiculture

Beekeeping produces some conflicts that can be significant. Potential management problems include the physical disturbance associated with installation and removal of hives, clearing for fire protection, and public recreation access to particular sites and water supplies in summer. Because the honey-bee is an introduced species, there are potential ecological problems, including:

* a reduction in nectar supply to native fauna

* long-term decline in native pollinators, as a result of competition

* inefficient pollination and/or increased hybridization of native plants

* increased establishment of feral bee colonies, which usurp fauna-nesting sites in tree hollows

Long-term research into the ecological impact of the introduced honey-bee is in progress in South Australia. The results of this and other studies can be incorporated into the Council's recommendations where appropriate.

Silvicultural practices such as thinning in forests may temporarily reduce the availability of a flowering crop but rapidly results in enhanced crown development and more profuse flowering in the retained trees.

Chapter 19 - Utilities

Most utility services are vital to the welfare and livelihood of the community at large and it is therefore essential that these be maintained and extended where necessary in order to preserve our current standards and qualities of life. It is a function of the Land Conservation Council under section 5(2)(h) of the *Land Conservation Act* 1970 to ensure that appropriate provision is made for utilities across the entire stock of public land, recognizing at the same time the different types and levels of impact that each may bring to adjoining land uses.

An important feature of the major utilities is that they are often ratepayer- or user-financed, and can thus afford to purchase the most appropriate freehold land for their activities. Where public land has other important values, in general it should not be allocated to new utility use, whose operations commonly reduce such values. However, in many specific cases Council has recommended the use of public land for a utility use.

In general, existing utility services meet current needs and retain some spare capacity. Present services are located so as to serve community requirements in these areas. Where appropriate, plans are in train to accommodate foreseen or forecast short-falls for up to 10 years. It may be, however, that significant changes could take place in the use-intensity of certain public utility areas, depending on the interplay of changes in certain community needs, changes in community values, shifting economic considerations, the application of new technology, and enhanced conservation/recreation management regimes, all of which the Council will need to monitor carefully.

In the Government's Economic and Energy Strategies, and the State's brown coal reserves have been identified as one of nine economic competitive strengths, and not only in the field of power-generation - other forms of processing for energy production are possible. The continuing development of these resources will impinge on associated utility land and other adjacent areas, particularly in the construction of future power stations.

Even where existing power transmission easements occur, past management practices were heavily orientated towards vegetation control in the interests of unrestricted access and fire control, more perhaps than is necessary to achieve these goals. Refined management techniques may facilitate meeting the needs of government agencies in carrying out

their roles, while maintaining habitat values of such corridors and easements.

Linear reserves as a means of fostering flora and fauna conservation are likely to be given greater attention, with the growing realization and acceptance of their importance as remnant habitat for endangered species, as small-scale refugia, and as migration routes. Powerline and pipeline easements and roads and railway lines (both in use, or dismantled) and their associated reserves form a network of sometimes only partly disturbed corridors throughout the State, across many land types. Their conservation value is starting to be recognized by the land managers (such as the State Electricity Commission of Victoria, Road Construction Authority and V/Line), and it is, therefore, important that the most relevant management techniques are devised and employed to reconcile the primary objects of each of these agencies with those also aimed at protecting wildlife, and furthering recreation opportunities.

The visual impact of utilities is frequently a cause for complaint where these are close to public view (for example, large-scale buildings in rural areas), where they intrude on otherwise pleasing landscapes (power-transmission lines and pylons), or where their presence may be a source of offence (as in garbage tips).

The Department of Conservation, Forests and Lands' Visual Management System, described in the Council's recommendations for the Alpine Area Special Investigation, may offer a means of identifying important landscapes to be avoided by utilities.

Visual amenity can be preserved in proximity to utility sites or structures by careful site selection, in the design of the structures themselves, by suitable landscaping and by effective screening or buffering using embankments, water bodies, or belts of trees. The use and maintenance of native vegetation for landscaping and screening offers additional benefits in extending habitat while preserving aesthetic values, and it would be appropriate if such measures were adopted wherever possible in meeting these ends.

Disposal of land no longer required for utility purposes is an important and current issue. It is important that utilities, and other bodies considering public land disposal, recognize that such areas may have other particular values that warrant their retention as public land and these need to be identified and evaluated prior to a decision being made to dispose of them. However, in certain circumstances, it may no longer be appropriate for utility agencies to manage public land and it can be transferred to another agency. Such a transfer should not delay or prevent the implementation of Council's recommendations.

There is likely to be an increasing need for development of the existing infrastructure on utility land. Such development will have implications for that land as well as for adjoining land and Council will need to monitor these changes when reviewing its recommendations.

Chapter 20 - Economic Evaluation of Public Land

Some criticism has been levelled at the Council and its process in that insufficient attention has been given to identifying the economic impact of its recommendations.

However, whenever decisions are to be made that are likely to involve significant impacts on economic activity, the Council has endeavoured to provide an economic evaluation of its recommendations. Examples include studies of grazing on public land in the Alpine and Murray Valley Areas and timber production in the Alpine and East Gippsland Areas.

While these studies would not be regarded as a full cost--benefit analysis as described by Professor Sinden, they have certainly provided valuable information on which to judge the impact of the Council's recommendations. While the cost--benefit approach appears more systematic and comprehensive, the issue of unpriced values in the analysis is still a major problem.

As indicated in chapter 20, the cost--benefit approach also has other problems that can introduce inaccuracies to the analysis, and to the decision-making stage.

It may be appropriate, however, for the Council to adopt a more formal framework for assessing the economic impact of its recommendations. This could involve surveys of public views on particular land use issues, such as the need for various types of recreation.

Chapter 21 - Environmental Data

The Land Conservation Council process has a major requirement for environmental information from diverse sources relating to its area-specific investigations. The Council has contributed to the broader dissemination of environmental information through the publication of descriptive resources reports for these investigations, and in commissioning short-term research into particular issues.

The nature of Council's investigations program has meant that data, once published, have not been kept up to date until an area is reviewed. While such reviews have taken place at about 10-yearly intervals, there is a need to access a broader-based, current information system. Establishment and maintenance of its own wide-ranging data base would be beyond the Council's staff and budget resources.

Two systems under development in Victoria - LANDATA and the Department of Conservation, Forests and Lands' Geographic Information System - have been described. Their development offers many opportunities, including the enhancement of the Council's decision-making process through the provision of relevant, topical data.

Frood and Calder (1987) refer to 4000 papers, reports, and books showing the enormity of accessing environmental data. As well as the Geographic Information System, a uniform environmental data base for written material is another need.

Chapter 22 - Environmental Research

The Council's approach to proposing scientific research projects has varied. Occasionally it has only mentioned a study or research need in the preamble to recommendations, and at other times it has included one as a specific recommendation. The latter approach is preferable as, once approved, the study becomes a policy of the government and the relevant authority is required to undertake the work and committed to making budget provision for it. Council's role in research has mainly been in identifying, directing and prioritizing areas for research, but this important aspect of its work should perhaps be given more emphasis in recommendations, particularly as the use of public land in the State is reviewed.

Specific needs for environmental research have been identified in various of the Council's recommendations, and in Frood and Calder (1987). Broad areas of need are marine environments and protection of endangered species - in particular, conservation genetics, habitat requirements, and impacts of some land use activities. As research possibilities are immense but budgets limited, it is important that research be directed to priority areas. However, it is also important that the results of research projects recommended by the Council are conveyed to the Council, perhaps via a formal process. In some circumstances it would be appropriate for the Council to review these research results as they become available, rather than waiting for its normal 10-year review period.

APPENDICES

Appendix I

PUBLIC LAND USE CATEGORIES AND COUNCIL RECOMMENDATIONS

The following recommendations for use are general ones. Other uses may also be permitted for specific parks, reserves or areas and these are given in the recommendations for the study area concerned.

All recommendations have the following beginning: 'That the area (shown on recommendation maps) be used to:'

Category	Recommendations
National park	provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments
	conserve and protect natural ecosystems
	supply water and protect catchments[1]
State park	provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments
	conserve and protect natural ecosystems
Wilderness	provide opportunities for solitude and unconfined forms of recreation in substantially unmodified natural environments
	that its value for providing solitude be maintained by controlling the numbers of people using the wilderness at any one time
	that construction of roads or tracks and the entry of vehicles not be permitted, other than for the management purposes
Regional park	provide opportunities for informal recreation for large numbers of people
	conserve and protect natural ecosystems to the extent that this is consistent with the above
Multi-purpose park[2]	provide opportunities for recreation and education in natural environments
	conserve and protect the native animals and plants and landscape

Appendix I (continued)

Category	Recommendations
Multi-purpose park (continued)	produce hardwood timber (other exploitative uses permitted on a continuing basis in accordance with the recommendations)
Coastal park	provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments conserve and protect natural ecosystems, and that the management authority zone the park to accommodate the legal recreational activities traditionally associated with the area, such as surfing, fishing, gemstone collecting, camping, walking, and horse-riding
Reference area	maintain natural ecosystems as a reference to which those concerned with studying land for particular comparative purposes may be permitted to refer, especially when attempting to solve problems arising from the use of land, and that activities - such as grazing, exploration for minerals and gold, mining, logging and beekeeping - that conflict with the purposes of a reference area not be permitted, and any such activities cease when these recommendations are adopted
Marine reserve	conserve and protect significant marine ecosystems provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments
Marine and wildlife reserve	conserve and protect marine (or natural) ecosystems, particularly the habitat of international migratory waders provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments

Appendix I (continued)

Category	Recommendations
Gippsland Lakes reserve	provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments
	conserve and protect natural ecosystems and geomorphological and historical features
	ensure the conservation of both aquatic and terrestrial flora and fauna
Wildlife reserve	conserve the habitat of native animals, particularly water birds
	(and for) public recreation and education where this does not conflict with the primary aim
Wildlife management co-operative	conserve wildlife and for commercial and recreational activities, and
	that the managers prepare a management plan in consultation with the appropriate government departments with responsibility for various actiities associated with the area, and then submit the plan to them for agreement
Flora reserve	conserve particular species or associations of native plants
Flora and fauna reserve	conserve native plants and animals
Natural features and scenic reserve	maintain natural landscapes and features
	provide opportunities for recreation and education
	supply water and protect catchments and streams
	conserve native plants and animals
Water production[3]	(for) water supply purposes
	other activities permitted by the water supply authority after consultation with the Land Protection Division and the Environment Protection Authority

Appendix I (continued)

Category	Recommendations
Water supply, regulation and drainage	store and distribute water for irrigation and domestic purposes and flood mitigation
	dispose of drainage water
	(for) nature conservation and recreation to the extent consistent with the primary purpose
Education area	study the nature and functioning of reasonably natural ecosystems in a manner such that the integrity of these ecosystems is maintained as far as is practicable
	compare the ecosystems within education areas with other nearby natural and modified systems
	observe and practise methods of environmental analysis, and the field techniques of the natural sciences
	conduct simple long-term experiments aimed at giving an understanding of the changes occurring in an area with time
Historic area[4]	protect specific sites that carry or contain relics of buildings, equipment, construction works, and artefacts associated with the history of the locality
	provide opportunities for recreation and education associated with the history of the locality
Historic reserve[4]	protect specific sites that carry or contain the relics of buildings, equipment, construction works, and artefacts associated with the history of the locality
	provide opportunities for recreation and education associated with the history of the locality
Coastal reserve	provide opportunities for informal recreation for large numbers of people, and also for recreation related to enjoying and understanding nature

Appendix I (continued)

Category	Recommendations
Coastal reserve (continued)	protect and conserve natural coastal landscapes, ecosystems, geomorphlogical, archaeological and historic features, for public enjoyment, inspiration, education and scientific study
	ensure the conservation of aquatic, littoral and terrestrial flora and fauna
	provide facilities for shipping, fishing and boating, together with the necessary navigation aids
Scenic coast	give special emphasis to the protection of the outstanding natural landscape qualities in planning and management of the area
Public land water frontage	protect adjoining land from erosion by the maintenance of adequate vegetation cover and provide for flood mitigation
	maintain the character and quality of the local landscape
	conserve native flora and fauna
	provide opportunities for low intensity recreation
	allow access to water for grazing of stock by adjoining landholders under licence where appropriate
Streamside reserve	provide passive recreation such as picnicking, walking, angling
	provide opportunities for camping at the discretion of the local land manager if this does not conflict with the water quality of the adjacent stream
	conserve flora and fauna
	maintain the quality and character of the local landscape
	provide grazing, at the discretion of the land manager, if this does not conflict with the maintenance of the water quality of the adjacent stream or with the above uses

Appendix I (continued)

Category	Recommendations
River Murray reserve	protect natural and scenic values
	conserve native flora and fauna
	allow flood mitigation and streambank protection
	provide opportunities for informal recreation
Geological reserve	preserve features of geological interest
	provide opportunities for recreation and education to the extent that this is consistent with the above
Cave reserve	conserve and protect important geological, archaeological and biological features
	provide opportunities for recreation, education and scientific study where appropriate
Bushland reserve	maintain the character and quality of the local landscape
	permit passive recreation such as picnicking and walking
Scenic reserve	preserve scenic features and lookouts
Lake reserve	(for the following)
	recreation
	nature conservation
	scientific study
	water supply
	drainage
	(other uses, where appropriate)
Roadside conservation	(for) communication, transport, access, surveys and utilities, and that, when widening or re-alignment of roads is proposed, sites of geological, historical, habitat or botanical significance that may be affected be investigated and every effort made to retain and preserve them

Appendix I (continued)

Category	Recommendations
Highway park	(for) picnicking and to provide relaxation for the travelling public
	maintain the character and quality of the local landscape
Recreation reserve	be used for organized sports (football, horse-racing, golf etc) and informal recreation (picnicking, camping etc) as permitted by the land manager
Alpine resort	(as) alpine resort, and that development, planning and implementation in each one minimize the environmental and visual impact of facilities, consistent with the efficient planning and management of a ski resort
Hardwood (timber) production	produce hardwood timber in a manner having due regard for landscape values as seen from main roads outside the forest
	major secondary uses be to
	provide opportunities for open-space recreation and education
	conserve native plants and animals, and provide opportunities for the development of wildlife conservation techniques
	produce honey, forage, gravel, sand and other forest products as defined in the *Forests Act* 1958
	water production values be recognized and protected
	the special values located in portion of some areas be protected (by creation of reserves under section 50 of the *Forests Act*, or by the implementation of management prescriptions
State forest	supply water and protect catchments and streams
	produce hardwood timber
	conserve native plants and animals, and provide opportunities for the development of wildlife conservation techniques

Appendix I (continued)

Category	Recommendations
State forest (continued)	provide opportunities for open-space recreation and education
	produce honey, forage, gravel, sand, road-making materials, and other forest products
	provide opportunities for mineral exploration and mining
	protect the special values as described (by reservation or mangement prescriptions)
Eucalyptus oil production	produce eucalyptus oil
	provide opportunities for open-space recreation and education
Softwood production	produce softwoods
	provide other goods and services compatible with the primary use
	provide opportunities for recreation
Forest area	conserve fauna and flora, and preserve scenic values
	protect the adjacent area recommended for softwood production
	low-intensity hardwood production, recreation, education, forest grazing, honey production, and mining where these activities do not conflict with the primary use above
	supply water and protect catchments where these lie within water supply catchments
Minerals and stone	permit fossicking and prospecting under Miner's Right, involving minimal disturbance of soil or vegetation, on public land other than:
	those areas specifically excluded in the recommendations (see the chapters on reference areas and water use and regulation)
	those areas that the land manager and the Department of Industry, Technology and Resources together may determine, and

Appendix I (continued)

Category	Recommendations
Minerals and stone (continued)	that areas of public land currently exempted or excepted from occupation for mining purposes under a Miner's Right or from being leased under a mining lease, remain so excepted or exempted unless the land manager and the Department of Industry, Techology and Resources together determine that such exemption or exception should no longer apply, and that public land (other than reference areas) continue to be available for exploration under licence and for extracon of 'gold', 'minerals', and 'petroleum', subject to the previous item and the stated principles and guidelines, and that public land (other than reference areas) continue to be available for exploration for 'stone' subject to stated principles and guidelines
Coal production	(for) the production of brown coal and associated necessary developments, and where not immediately required, provide for existing uses and producion of those goods and services required by the community, including agriculture and forestry, where this can be done without seriously reducing the long-term ability of the land to meet future demands for coal production and associated developments maintain natural features of the land, where appropriate, until such time as it is required for the winning of brown coal and related activities
Hydroelectricity production	transport, store, and regulate water for the generation of electricity operate, maintain and protect hydroelectric installations provide low-intensity recreation and protect nature conservation values in parts of the area, consistent with State Electricity Commission requirements

Appendix I (continued)

Category	Recommendations
Agriculture	(for) agriculture
	(for) agricultural research purposes
Utilities and survey	provide access and services (on) existing easements, and
	that new powerlines, pipelines, communications equipment and other utilities be planned to minimize disturbance to public land
	that existing legal use and tenure continue for areas reserved for utility purposes such as airports, public buildings, municipal depots, cemeteries, schools and garbage depots, and
	that the minimum area necessary for access to and maintenance of navigations aids, communication installations and trigonometrical stations be temporarily reserved
Township land	meet future requirements (being public land in townships, other than those areas that have been specifcally reserved) - it should remain as unreserved Crown land
Uncommitted land	maintain the capability of the land to meet future demands
	produce those goods and services required by the community that can be supplied without seriously reducing the long-term ability of the land to meet future demands
	that the land be Crown land withheld from sale
Other reserves and public land	continue existing legal use and tenure (being small areas of public land not specifically mentioned in Council recommendations)
	where the land is not reserved for a specific purpose at present, such areas to be used in a way that will not preclude their reservation in the future for as-yet-unknown public purposes

Appendix I (continued)

Category	Recommendations
Revegetation area	foster the re-establishment of tree species native to the area, or tree species suitable for firewood production, and that, when revegetation is completed, the areas become State forest (or other appropriate reserves)

Notes:

1. This part-recommendation applies to all parks in the Council's system where these are within water supply catchments.

2. From the recommendation for the Yarra Valley multi-purpose park, Melbourne Area; slightly different recommendations were made for the Mt Lawson (now a State park) and Mt Pilot multi-purpose parks.

3. These uses apply to water storage areas, diversion works, associated facilities and buffer zones, where land use determinations have been made.

4. Historic areas and reserves differ in that areas are relatively large, represent a range of historical themes, and may contain interpretative centres and recreational facilities. In the small historic reserves, development of recreational facilities would be minimal, although some aids to interpretation could be provided.

Appendix II

DEFINITION OF 'INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES' CONSERVATION AREAS

Category 1 Scientific research/strict nature reserve

These areas possess some outstanding ecosystems, features, and/or species of flora and fauna of national scientific importance. They are generally closed to public access, recreation, and tourism. They often contain fragile ecosystems, life forms, or sites of important biological or geological diversity, or have particular importance for the conservation of genetic resources. Size is determined by the area required to ensure their integrity to accomplish the scientific management goal and provide for their protection.

Category 2 National park

National parks are relatively large land or water areas that contain representative samples of major regions, features, or scenery of national or international significance where plant and animals species, geomorphological sites, and habitats are of special scientific, educational, and recreational interest. They contain one or several entire ecosystems that are not materially altered by human exploitation and occupation.

Category 3 National monument/national landmark

This category normally contains one or more natural features of outstanding national significance such as a geological formation, or a unique natural site, animal or plant species, or habitat that, because of uniqueness or rarity, may be threatened and should be protected. The specific feature to be protected ideally has little or no evidence of man's activities. These features are not of the size nor do they contain a diversity of features or representative ecosystems that would justify their inclusion as a national park.

Category 4 Nature conservation reserve

Such a reserve is desirable when protection of specific sites or habitats is essential to the continued existence or well-being of individual biotic species of resident or migratory fauna with national or global significance. Although a variety of (protected) areas fall within this category, each would have as its primary purpose the protection of Nature and not the production of harvestable, renewable resources, although that may play a role in the management of a particular reserve. Its size - or in certain instances seasons in which special management is necessary - will depend upon the habitat requirement or specific characteristics of the species to be protected. These reserves may not require vast areas, but could be relatively small - consisting of nesting areas, marshes, lakes, estuaries, forest, or grassland habitats.

Category 5 Protected landscape

The scope and character of areas that fall within this category are necessarily broad because of the wide variety of semi-natural and cultural landscape that occurs within various nations. This may be reflected in two types of areas: those whose landscapes possess special aesthetic qualities resulting from the interaction of people and land; and those that are primarily natural areas managed intensively for recreation and tourism.

Category 6 Resource reserve

A category 6 reserve will normally comprise an extensive and relatively isolated and uninhabited area having difficult access, or one that is lightly populated yet may be under considerable pressure for colonization and greater utilization. In many cases, little study or evaluation has occurred, and the consequence of converting these lands to agriculture, mineral or timber extraction, or the construction of roads, etc. is unclear.

Category 7 National biotic area/anthropological reserve

Category 7 reserves are characterized by natural areas where modern technology has not significantly interfered with or been absorbed by the traditional ways of life of the inhabitants. They may be remote and isolated and their inaccessibility may be maintained for a considerable time. The societies are considered relatively unique and may have particular significance for maintaining genetic diversity and/or for research on the evolution of humans. People are an integral component of these predominantly natural areas, and depend heavily upon the natural environment for food, shelter, and other basic material to sustain life. Extensive cultivation and other major modifications of the vegetation and animal life are not permitted.

Category 8 Multiple-use management area/ Managed resource area

Each such area contains considerable territory suitable for production of wood products, water, pasture, wildlife, and outdoor recreation. Parts of it may be settled and may have been altered by humans. Generally, these forest or other wildland areas do not possess nationally unique or exceptional natural features.

Appendix III

INTERSTATE DEFINITIONS OF NATIONAL PARKS

State/Territory	Definition
Australian Capital Territory	—
External territories	Relatively large areas which contain representative samples of major natural regions, features or scenery of national or international significance where plant and animal species, geomorphological sites, or habitats are of special scientific, educa-tional, and recreational interest.
New South Wales	Relatively large areas set aside for their features of predominantly unspoiled natural landscape, flora and fauna, permanently dedicated for public enjoyment, education and inspiration and protected from all interference, other than essential management practices, so that their natural attributes are preserved.
Northern Territory	Large areas of unspoiled landscape reserved for public enjoyment, education and inspiration.
Queensland	Relatively large areas of natural landscape with a high level of diversity of flora and fauna, and which may be of historic interest. They are permanently dedicated for public enjoyment and education and are protected from all interference other than essential management practices to ensure that the natural attributes are preserved.
South Australia	Protected areas of national significance by reason of the wildlife or natural features of those lands. Generally they are contiguous areas of substantial size, preferably tens of thousands of hectares, with conrolled provision for public visitation and enjoyment. They are reserves encompassing many natural values including scenic beauty, wildlife, history and inspiration to visitors.

Appendix III (continued)

State/Territory	Definition
Tasmania	Extensive areas for the conservation of natural ecosystems, enjoyment and study of the natural environment and public recreation/tourism.
Victoria	Crown land characterized by its predominantly unspoilt landscape and its flora, fauna or other features, which is reserved and protected permanently for the benefit of the public.
Western Australia	Established to preserve for all times scenic beauty, wilderness, native wildlife, indigenous plant life and areas of scientific importance, and to provide for the appreciation and enjoyment of those things by the public in such a manner and by such means as will leave them unimpaired for the future.

Land Conservation Council, Victoria

An extensive area of public land of nation-wide significance because of its outstanding natural features and diverse land types, set aside primarily to provide public enjoyment; education, and inspiration in natural environments.

Source: Occasional Paper No.10 - 1984; Australian National Parks and Wildlife Service. The Land Conservation Council definition is appended for comparison.

Appendix IV

INTERSTATE DEFINITIONS OF MAJOR CONSERVATION RESERVES (Other than National Parks)

State/Territory	Equivalent definition	Land use[1] categories
Australian Capital Territory	**Nature reserve:** land set aside for conservation and also for compatible recreational use.	3,4,5,6,7
	Reserve: land set aside for both conservation and compatible recreational use.	
External territories	**National nature reserves:** nationally significant areas set aside primarily for nature conservation.	3
New South Wales	**Nature reserves:** areas of special scientific interest containing wildlife or natural phenomena where management practices aim at maximizing the value of the area for scientific investigation and education purposes.	4
	State recreation areas: permanent reservations in the form of large regional parks established to provide recreational opportunities in an outdoor environment.	10
	Historic sites: areas preserved as the sites of buildings, objects, monuments or landscapes of national importance.	9
Northern Territory	**Conservation reserves:** areas set aside for conservation of flora, fauna or for anthropological, natural or scientific values.	1,4
	Nature parks: land reserved primarily for its suitability for public recreation and enjoyment in a natural environment.	10
	Game reserves: set aside for maintenance of game which can be harvested under permit.	7

Appendix IV (continued)

State/Territory	Equivalent definition	Land use[1] categories
Northern Territory (continued)	**Historical reserves:** areas set aside for their historical significance even though they may be used for other purposes such as recreation.	9
Queensland	**Environmental parks:** natural areas, less outstanding in size or natural attributes than national parks, totally protected for public enjoyment.	3,4
	Fauna reserves: areas of land held permanently in their natural state. They are undisturbed other than by naturally-occurring processes and are closed to the public.	1
	Fauna refuges: land declared to preserve habitat and protect fauna.	4
South Australia	**Conservation parks:** lands that should be protected or preserved for the purpose of conserving any wildlife or the natural or historic features of those lands.	3,4
	Game reserves: lands which should be preserved for the conservation of wildlife and management of game. Game reserves may be set aside for the purpose of fishing or hunting. These areas have an important conservation role and may be declared open at prescribed times for strictly controlled hunting.	7
	Recreation parks: lands that should be conserved and managed for public recreation and enjoyment. These areas protect natural values, landscape and historic sites but may also provide facilities for public recreation in a natural setting.	10

Appendix IV (continued)

State/Territory	Equivalent definition	Land use[1] categories
Tasmania	**State reserves:** generally small reserves set aside for scenic and recreational reasons and/or to protect geological sites.	7
	Nature reserves: areas set aside because of the significance for nature conservation. Public use is not encouraged where this might be detrimental, although provision may be made for appropriate tourism and recreational activities.	3,4
	Historic Sites: areas of significance in terms of European exploration, settlement or use, with encouragement of and recreational use.	9
	Game reserves: essentially significance in nature reserves except that specific provisions are made for hunting and the maintenance of game populations.	7
	Conservation areas: large multiple-use reserves set aside primarily to protect animals and their habitats and to provide for recreation and controlled use of resources.	9,10
Victoria	**State parks:** primarily reserved for public recreation and the conservation of the natural environment.	3
	Other parks: areas with scenic, historical,archaeological, biological, geological or other features of scientific interest that are worthy of preservation but, whether by reasons of the limited size of the areas or the limited significance of the features, are not suitable for reservation as national parks; areas that demonstrate human effect on	1,3,4,7, 9,10,18

Appendix IV (continued)

State/Territory	Equivalent definition	Land use[1] categories
Victoria	**Other parks (continued)** the environment whether through agricultural or pastoral pursuits or otherwise; areas in or adjacent to urban areas of natural beauty or interest or otherwise suitable for recreational use; areas of natural beauty or interest primarily for recreational and educational purposes but parts of which may be used for primary industry, hunting, shooting, fishing or other activities appropriate to the areas; and areas in their natural state for scientific study or reference.	
	State game reserves and State nature reserves defined as land reserved primarily for management and conservation of wildlife and any recreational use providing it does not conflict with the primary aim. State game reserves are wetlands open to duck hunting in season, while State nature reserves are wetlands and drylands closed to hunting at all times.	4,7
Western Australia	**Reserves:** usually small areas set aside for recreation and the conservation of flora and fauna.	4
	Nature reserves: defined by the *Wildlife Conservation Act* as land reserved for the conservation of flora and fauna.	1

Notes:

1. From Table 11
2 The table incorporates only those areas managed by each State's equivalent to the National Parks and Wildlife Division and/or Fisheries Division.

Source: Occasional Paper No.10 - 1984; Australian National Parks and Wildlife Service.

Appendix V

ANALYSIS OF RECORDS OF THREATENED FAUNA IN VICTORIA

Species	ARI no.	Conservation reserves	Other reserves	State forest areas etc	Freehold or modified	Total
Mammals						
Tiger quoll	17	25	9	33	41	108
Ningaui	19	-	-	4	1	5
Brush-tailed phascogale	21	16	10	17	65	108
Eastern barred bandicoot	33	3	3	-	30	36
Mountain pigmy-possum	44	2	0.5	1.5	-	4
Little pygmy-possum	46	1.5	0.5	4	2	8
Leadbeaters possum	50	3	5	13	4	25
Yellow-bellied glider	51	31.5	7	19.5	21	79
Squirrel glider	53	3	7.5	5	27	42
Brush-tailed rock wallaby	72	14.5	1	4	4.5	24
Long-footed potoroo	73	1.5	0.5	4	-	6
Eastern horseshoe-bat	94	3	2	4	2	11
Yellow-bellied sheathtail-bat	96	1	0.5	0.5	2	4
Common bentwing-bat	123	11	1.5	8	9	29
Large-footed myotis	125	2.5	1.5	2.5	7.5	14
Great pipistrelle	140	11.5	4	10.5	7	33
Mitchells hopping-mouse	161	3	1	5	6.5	15
Smoky mouse	166	18.5	1	19	1.5	40
Heath mouse	169	11	2	5	13	31
Dingo	190	24	2	26.5	17.5	70
Birds						
Bush thick-knee	174	28	77	41	90	236
Brolga	177	26	41	23	52	142
Black-eared miner	967	4	1	4	3	12
Rufous-crowned emu-wren	528	8	3	14	7	32
Red-lored whistler	402	10	1	21	5	38
Superb parrot	277	2	6	3	3	14
Osprey	241	1	0.5	1	0.5	3
Malleefowl	7	15	5	23	14	57
Red-tailed black cockatoo	264	17	15	13	24	69
Orange-bellied parrot	305	5	1	2	3	11
Regent honeyeater	603	9	16	13	18	56
Little penguin	5	44	5	10	22	81
Square-tailed kite	230	12	7	8	13	40
Plains-wanderer	20	1	2	1	2	6
Sooty owl	253	22	10	14	14	60
Glossy black cockatoo	265	10	3	5	5	23
Painted snipe	170	5	7	4	6	2
Fairy tern	118	23	4	11	13	51
Ground parrot	311	26	4	6	7	43
Turquoise parrot	302	7	10	5	18	40
Hooded plover	138	53	8	6	29	96
Australian bustard	176	4	3	4	4	15
Masked owl	250	7	2	6	6	21
Little tern	117	20	4	4	14	42
Rufous bristle-bird	521	18	11	7	14	50
Magpie goose	199	4	3	2	5	14
Regent parrot	278	26	13	42	43	124
Grey-crowned babbler	443	18	38	22	32	110
Freckled duck	214	25	27	12	23	87

Appendix VI

RECOMMENDATIONS FOR WILDLIFE AND FLORA AND FAUNA RESERVES IN RELATION TO STATE WILDLIFE RESERVES

KEY:

Type of recommendation

F&F - Flora and Fauna Reserve
WMCA - Wildlife Management Cooperative Area

Manager

AWDC - Albury--Wondonga Development Corporation
CF&L - Department of Conservation, Forests and Lands
CL&S - (obs.) Department of Crown Lands & Survey
EWT - (obs.) Euroa Waterworks Trust
FCV - (obs.) Forests Commission, Victoria
FWD - (obs.) Fisheries and Wildlife Division
Min Con - (obs.) Ministry for Conservation
NPS - (obs.) National Parks Service
RWS - Rural Water Commission
SANPWS - South Australian National Parks & Wildlife Service
Sh. - Shire
SRWSC - (obs.) State Rivers & Water Supply Commission
WB - Water Board

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
NORTH-EAST 1	Wildlife	C1 (C2)	SWR 49 *	FWD
1973	Wildlife	C2 (C3)	SWR 50 *	FWD
	Wildlife	C3 (C4)	SWR 51 *	FWD
STH GIPPSLAND 1	Coastal reserve	6a	Public Purposes	Min Con
1973	Wildlife	6b(part)	SWR 27	(FWD)
	Wildlife	6b(part)	SWR 2	(FWD)
	Waste disposal	6c	-	(Now W.M.C.A)
SOUTH-WEST 1	Wildlife	C1	SWR 17 *	FWD
1973	Wildlife	C2	SWR 29 *	FWD
	Wildlife	C3	*	FWD(see A8,SW1R)
	Wildlife	C4	SWR 46	FWD
	Wildlife	C5	SWR 45 *	FWD
	Wildlife	C6	SWR 44 *	FWD
	Wildlife	C7	SWR 43 *	FWD
	Wildlife	C8	SWR 40 *	FWD
	Wildlife	C9	SWR 41 *	FWD
	Wildlife	C10	SWR 48	FWD(see B4, SW2)
	Wildlife	C11	SWR 47 *	FWD
	Wildlife	C12	-	FWD,FCV
	Wildlife	C13	-	FWD,FCV
	Wildlife	C14	SWR 38	FWD
	Wildlife	C15	SWR 42 *	FWD
NORTH-EAST 2	Wildlife	C1 (C1)	Con.Wild.,Water & Rec	FWD(in cons. with EWT)
1974	F&F	L7 (H1)	-	FCV
	F&F	L8 (H2)	-	FCV

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
EAST GIPPSLAND	Wildlife	C1	SWR 14	FWD
1977	Wildlife	C2	SWR 28 *	FWD
	Wildlife	C3	SWR 16 *	FWD
	F&F	F11	SWR 130, Pres.Nat.Plants (T)	FWD
MALLEE	Wildlife	D1	SWR 134	FWD
1977	Wildlife	D2	SWR 90 *	FWD
	Wildlife	D3	SWR 39 *	FWD
	Wildlife	D4	SWR 22	FWD
	Wildlife	D5	SWR 71	FWD
	Wildlife	D6	SWR 72 *	FWD
	Wildlife	D7	SWR 73	FWD
	Wildlife	D8	SWR 7	FWD
	Wildlife	D9	SWR 74	FWD
	Wildlife	D10	SWR 75	FWD
	Wildlife	D11	SWR 76	FWD(in cons. with SRWSC)
	Wildlife	D12	SWR 77	FWD(in cons. with SRWSC)
	Wildlife	D13	SWR 78	FWD(in cons. with FCV)
	Hardwood	E8	-	FCV(in cons. with FWD)
	Hardwood	E9	-	FCV(in cons. with FWD)
	F&F	G1	-	FCV
	F&F	G2	Pres.Nat.Plants (P)	FCV
	F&F	G3	Pres.Nat.Plants (P)	CL&S
	F&F	G4	-	FCV
	F&F	G5	-	CL&S
	F&F	G6	Pres.Nat.Plants (P)	FCV
	F&F	G7	-	FCV
	F&F	G8	-	CL&S
	F&F	G9	Con.Area.Nat.Int.(P)	CL&S
	F&F	G10	SWR 79	FWD
	F&F	G11	-	CL&S
	F&F	G12	Pres.Nat.Plants (P)	FCV
	F&F	G13	Pres.Nat.Plants (P)	FCV
	F&F	G14	-	CL&S
	F&F	G15	-	FCV
	F&F	G16	-	CL&S
	F&F	G17	Pres.Nat.Plants (T	FCV
	F&F	G18	SWR 80	FWD
	F&F	G19	SWR 81 Pres.Nat.Plants (P)	FWD
	F&F	G20	SWR 135	FWD
	F&F	G21	Pres.Nat.Plants (P)	FCV
	F&F	G22	SWR 82	FWD(rec. varied)
	F&F	G23	-	CL&S
	F&F	G24	Pres.Nat.Plants (T)	FCV
	F&F	G25	Pres.Nat.Plants (T)	FCV
	F&F	G26	SWR 83 *	FWD
	F&F	G27	SWR 84	FWD
	F&F	G28	SWR 91	FWD
	F&F	G29	SWR 85 *	FWD
	F&F	G30	SWR 86	FWD
	F&F	G31	SWR 87 *	FWD
	F&F	G32	SWR 88 *	FWD
	F&F	G33	-	CL&S

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
MALLEE	Water	018	-	SRWSC(in cons. with FWD)
(continued)		019	-	SRWSC(in cons. with FWD)
		020	-	SRWSC(in cons. with FWD)
		021	-	SRWSC(in cons. with FWD)
MELBOURNE	State park	A12	SWR 59,	FWD
1977			Public Park (T)	
	Wildlife	C1	SWR 60 *	FWD
	Wildlife	C2	SWR 12	FWD
	Wildlife	C3	SWR 61	FWD
	Wildlife	C4	SWR 37 *	FWD
	Wildlife	C5	SWR 10	FWD
	Wildlife	C6	SWR 62 *	FWD
	Wildlife	C7	SWR 63 *	FWD
	Wildlife	C8	-	FWD
	Wildlife	C9	SWR 64 *	FWD
	Wildlife	C10	SWR 65 *	FWD
	Wildlife	C11	SWR 66 *	FWD
	Wildlife	C12	-	FWD
	Wildlife	C13	SWR 23 *	FWD
	Wildlife	C14	SWR 4,5,89	FWD(rec. varied)
	Wildlife	C15	SWR 132	FWD
	Wildlife	C16	SWR 54	FWD(in cons. with P&H)
	Wildlife	C17	SWR 15	FWD
	Wildlife	C18	*	FWD
	Wildlife	C19	SWR 26	FWD
	Wildlife	C20	SWR 131	FWD
	W.M.C.A.	C21)	Harold)	
	W.M.C.A.	C22)	Holt)	
	W.M.C.A.	C23)	Marine Reserve,)	FWD
	W.M.C.A.	C24)	section 79A,)	
	W.M.C.A.	C25)	Fisheries Act)	
	W.M.C.A.	C26	-	FWD(in consultation)
	W.M.C.A.	C27	-	FWD(in consultation)
	W.M.C.A	C28	-	FWD(in consultation)
	F&F	H20	SWR 67 *	FWD
	F&F	H21	SWR 68 *	FWD
	F&F	H22	SWR 69	FWD
	F&F	H23	SWR 70	FWD
	F&F	H24	SWR 151	FWD
	F&F	H25	SWR 150	FWD
	F&F	H26	SWR 149	FWD
CORANGAMITE	Wildlife	C1	SWR 93 *	FWD
1978	Wildlife	C2	SWR 94	FWD
	Wildlife	C3	SWR 95	FWD
	Wildlife	C4	SWR 96 *	FWD
	Wildlife	C5	SWR 97 *	FWD
	Wildlife	C6	SWR 98 *	FWD
	Wildlife	C7	SWR 99 *	FWD
	Wildlife	C8	SWR 100 *	FWD
	Wildlife	C9	SWR 101 *	FWD
	Wildlife	C10	SWR 102 *	FWD
	Wildlife	C11	SWR 103 *	FWD
	Wildlife	C12	SWR 104 *	FWD
	Wildlife	C13	SWR 105 *	FWD

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
CORANGAMITE	Wildlife	C14	SWR 106 *	FWD
(continued)	Wildlife	C15	SWR 107 *	FWD
	Wildlife	C16	SWR 108 *	FWD
	Wildlife	C17	SWR 109 *	FWD
	Wildlife	C18	SWR 110 *	FWD
	Wildlife	C19	SWR 111 *	FWD
	Wildlife	C20	SWR 112 *	FWD
	Wildlife	C21	SWR 113 *	FWD
	Wildlife	C22	SWR 114 *	FWD
	Wildlife	C23	SWR 115	FWD
	Wildlife	C24	SWR 116 *	FWD
	Wildlife	C25	SWR 117 *	FWD
	Wildlife	C26	SWR 118 *	FWD
	Wildlife	C27	SWR 119 *	FWD
	Wildlife	C28	SWR 120	FWD(in cons. with SRWSC)
	Wildlife	C29	SWR 121 *	FWD
	Wildlife	C30	SWR 122	FWD(in cons. with SRWSC)
	Wildlife	C31	SWR 123 *	FWD(in cons. with SRWSC)
	Wildlife	C32	SWR 124 *	FWD
	Wildlife	C33	SWR 125	FWD(with SRWSC and Sh. Belfast)
	Wildlife	C34	SWR 126 *	FWD
	Wildlife	C35	SWR 19	FWD
	Wildlife	C36	SWR 127 *	FWD(plantation by FCV)
	Wildlife & geology	C37)	SWR 8	FWD(not implemented)
	F&F	H5	-	CL&S
	F&F	H6	Pres.Ecol.Sig.(P)	CL&S
	F&F	H7	SWR 128 *	FWD
	F&F	H8	Man. Wild. (P)	FWD
	F&F	H9	Pres. F&F (P)	CL&S
	F&F	H10	Pres.Nat.Plants (P)	FCV
	F&F	H11	-	FWD(in cons. with FWD)
	F&F	H12	Pres.Nat.Plants (P)	FCV
	F&F	H13	-	FCV(in cons. with Colac W.B.
	F&F	H14	-	FCV
	Lakes reserve	N52	SWR 153	(FWD)
	Lakes reserve	N1--51, N53--64	various[2]	CL&S(in cons. with FWD and SRWSC)
		-	SWR 129	Freehold land?
		-	SWR 52	Freehold land?
ALPINE	National park	A3 (part)	SWR 3	NPS
1979,83	F&F	K1	Pres.Nat.Plants (P)	CL&S
NORTH CENTRAL	Wildlife	C1	SWR 136	FWD
1981	Wildlife	C2	SWR 137	FWD
	Wildlife	C3	SWR 138	FWD
	Wildlife	C4	SWR 139	FWD
	Wildlife	C5	SWR 140	FWD
	Wildlife	C6	SWR 141	FWD
	Wildlife	C7	SWR 142	FWD
	Wildlife	C8	SWR 143	FWD(in cons. with SRWSC)
	Wildlife	C9	SWR 144	FWD(in cons. with SRWSC)
	Wildlife	C10	SWR 53	FWD
	Wildlife	C11	SWR 56	FWD

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
NORTH CENTRAL	Wildlife	C12	SWR 57	FWD
(continued)	Wildlife	C13	SWR 24	FWD
	Wildlife	C14	SWR 145	FWD
	Wildlife	C15	SWR 146	FWD
	Wildlife	C16	SWR 147	FWD
	Wildlife	C17	SWR 148	FWD
	Water	D50	-	SRWSC(in cons. with FWD)
	Water	D51	-	SRWSC(in cons. with FWD)
	Water	D52	Water Supply (P)	SRWSC(in cons. with FWD)
	Water	D53	-	SRWSC(in cons. with FWD)
	Water	D54	-	SRWSC(in cons. with FWD)
	F&F	H21	-	FCV(in cons. with FWD)
	F&F	H22	Pres. F&F	NPS(in cons. with FWD)
	F&F	H23	-	FCV(in cons. with FWD)
	F&F	H24	-	NPS(in cons. with FWD)
	F&F	H25	-	CL&S(in cons. with FWD)
BALLARAT	Wildlife	C1		FWD
1982	Wildlife	C2		FWD
	Wildlife	C3		FWD
	Wildlife	C4		FWD
	Wildlife	C5		FWD
	Wildlife	C6	SWR 6	FWD
	Wildlife	C7		FWD
	Wildlife	C8		FWD
	F&F	G5		FCV(in cons. with FWD)
	Lake reserve	M1-3	-	CL&S
	Lake reserve	M4,M5	Pro. of Catch	CL&S
STH GIPPSLAND 2	Marine	A6	) Marine Parks,	NPS, FWD
1982	Marine & wildlife	A7	) section 79A	NPS, FWD
	Marine & wildlife	A8	) Fisheries Act	NPS, FWD (SWR 20)
	Marine & wildlife	A9	)	NPS, FWD
	Wildlife	C1	-	FWD
	Wildlife	C2	-	FWD
	Wildlife	C3	-	FWD
	Wildlife	C4	SWR 1	FWD
	Wildlife	C5	-	FWD
	W.M.C.A.	C6	-	FWD(in consultation)
	F&F	G13	-	FCV(in cons. with FWD)
	F&F	G14	Schedule 2 N.P.A	NPS
	F&F	G15	-	FCV
	Coastal reserve	J1-4	-	CL&S(in cons. with FWD)
	Coastal reserve	J2	Protection Coastline	CL&S(in cons. with FWD)
	Coastal reserve	J3		CL&S(in cons. with FWD)
	Coastal reserve	J4	Protection Coastline	CL&S(in cons. with FWD)
SOUTH-WEST 2	State park	B4	SWR 25, 48 schedule 2 N.P.A.	NPS(in cons. with FWD)
1982	Wildlife	D1		FWD(in cons. with SANPWS)
	Wildlife	D2	-	FWD
	Wildlife	D3	-	FWD
	Wildlife	D4	-	FWD
	Wildlife	D5	-	FWD
	Wildlife	D6	-	FWD
	Wildlife	D7	-	FWD

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
SOUTH-WEST 2 (continued)	Wildlife	D8	-	FWD
	Wildlife	D9	-	FWD
	Wildlife	D10	-	FWD
	Wildlife	D11	-	FWD
	Wildlife	D12	-	FWD
	Wildlife	D13	-	FWD
	Wildlife	D14	-	FWD
	Wildlife	D15	-	FWD
	Wildlife	D16	-	FWD
	Wildlife	D17	-	FWD
	Wildlife	D18	-	FWD
	Wildlife	D19	-	FWD
	Wildlife	D20	-	FWD
	Wildlife	D21	-	FWD
	Wildlife	D22	-	FWD
	Wildlife	D23	-	FWD
	Wildlife	D24	-	FWD
	Wildlife	D25	-	FWD
	Wildlife	D26	-	FWD
	Wildlife	D27	-	FWD
	Wildlife	D28	-	FWD
	Wildlife	D29	-	FWD
	Wildlife	D30	-	FWD
	Wildlife	D31	-	FWD(in cons. with FCV)
	Wildlife	D32	-	FWD
	Wildlife	D33	-	FWD
	Wildlife	D34	-	FWD
	Wildlife	D35	-	FWD
	Wildlife	D36	-	FWD
	Wildlife	D37	-	FWD
	Wildlife	D38	-	FWD
	Wildlife	D39	-	FWD
	Wildlife	D40	-	FWD
	Wildlife	D41	-	FWD
	Wildlife	D42	-	FWD
	Wildlife	D43	-	FWD
	Wildlife	D44	-	FWD
	Wildlife	D45	-	FWD
	Wildlife	D46	-	FWD
	Wildlife	D47	-	FWD
	Wildlife	D48	-	FWD
	Wildlife	D49	-	FWD
	Wildlife	D50	-	FWD
	Wildlife	D51	-	FWD
	Wildlife	D52	-	FWD
	Wildlife	D53	-	FWD
	Wildlife	D54	-	FWD
	Wildlife	D55	-	FWD
	Wildlife	D56	-	FWD
	Wildlife	D57	-	FWD
	Wildlife	D58	-	FWD
	Wildlife	D59	-	FWD
	Wildlife	D60	-	FWD
	Wildlife	D61	-	FWD
	Wildlife	D62	-	FWD
	Wildlife	D63	-	FWD

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no	Manager/comments
SOUTH-WEST 2	Wildlife	D64	-	FWD
(continued)	Wildlife	D65	-	FWD
	Wildlife	D66	-	FWD
	Wildlife	D67	-	FWD
	Wildlife	D68	-	FWD
	Wildlife	D69	SWR 21 *	FWD
	Wildlife	D70	-	FWD
	Wildlife	D71	-	FWD
	Wildlife	D72	-	FWD
	Wildlife	D73	-	FWD
	Wildlife	D74	-	FWD
	Water	E1	-	Sh.Kowree(in cons. with FWD)
	Water	E5	-	SRWSC(in cons with FWD)
	Hardwood	F2	-	FCV(in cons. with FWD)
	Hardwood	F4	-	FCV(in cons. with FWD)
	Hardwood	F6	-	FCV(in cons. with FWD)
	Hardwood	F9	-	FCV(in cons. with FWD)
	Hardwood	F10	-	FCV(in cons. with FWD)
	Hardwood	F13	-	FCV(in cons. with FWD)
	F&F	H13	-	NPS(in cons. with FWD)
	Coastal reserve	J1	Prot. Coastline	CL&S(in cons. with FWD)
	Lakes reserve	N1--N23	-	CL&S(in cons. with SRWSC & FWD)
GIPPSLAND LAKES	Gippsland Lakes reserve	A6(part)	SWR 13 *	)
HINTERLAND	Gippsland Lakes reserve	A6(part)	SWR 32 *	) NPS & FWD
1983	Gippsland Lakes reserve	A6(part)	SWR 55 *	)
	Gippsland Lakes reserve	A6(part)	SWR 9 *	)
	F&F	H9		NPS
	F&F	H10		NPS
	F&F	H11		NPS
	F&F	H12		CL&S
	-	-	SWR 11	McLeod Morass is in the Township of Bairnsdale;
	-	-	SWR 12	Sale Common is in the Township of Sale
SOUTH-WEST 1 (R)	State park	A8	-	NPS(see C3, SW1)
1983	Wildlife	C16	SWR 92	FWD
	F&F	G8	-	FCV(in cons. with FWD)
MURRAY VALLEY	Wildlife	C1	-	CF&L
1985	Wildlife	C2	-	CF&L
	Wildlife	C3	-	CF&L
	Wildlife	C4	SWR 34	CF&L
	Wildlife	C5	-	CF&L
	Wildlife	C6	-	CF&L
	Wildlife	C7	-	CF&L
	Wildlife	C8	-	CF&L
	Wildlife	C9	SWR 36	CF&L
	Wildlife	C10	SWR 35	CF&L
	Wildlife	C11	-	CF&L
	Wildlife	C12	-	CF&L
	Wildlife	C13	-	CF&L
	Wildlife	C14	-	CF&L

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments
MURRAY VALLEY	Wildlife	C15	-	CF&L
(continued)	Wildlife	C16	SWR 133	CF&L
	Wildlife	C17	-	CF&L
	Wildlife	C18	-	CF&L
	Wildlife	C19	-	CF&L
	Wildlife	C20	-	CF&L
	Wildlife	C21	-	CF&L
	Wildlife	C22	-	CF&L
	Wildlife	C23	-	CF&L
	Wildlife	C24	-	CF&L
	Wildlife	C25	SWR 31	CF&L
	Wildlife	C26	-	CF&L
	Wildlife	C27	-	CF&L
	Wildlife	C28	-	CF&L
	Wildlife	C29	SWR 33	CF&L
	Wildlife	C30	-	CF&L
	Wildlife	C31	-	CF&L
	W.M.C.A	C32	-	FWD(in consultation)
	W.M.C.A	C33	-	FWD(in consultation)
	Water	D53	-	RWC
	Water	D56	-	RWC,FWD
	F&F	G9	-	CF&L
	F&F	G10	-	CF&L
	F&F	G11	-	CF&L
	Lake reserve	N1--3	-	CF&L
EAST GIPPSLAND	Wildlife	C4	-	CF&L
REVIEW	W.M.C.A.	C5	-	CF&L (in consultation)
1986	F&F	F12	-	CF&L
NORTH-EAST (BENALLA--UPPER MURRAY REVIEW 1986	Wildlife	C5	-	AWDC--CF&L
WIMMERA	Wildlife	C1	-	CF&L
1986	Wildlife	C2	-	CF&L
	Wildlife	C3	-	CF&L
	Wildlife	C4	-	CF&L
	Wildlife	C5	-	CF&L
	Wildlife	C6	-	CF&L
	Wildlife	C7	-	CF&L
	Wildlife	C8	-	CF&L
	Wildlife	C9	-	CF&L
	Wildlife	C10	-	CF&L
	Wildlife	C11	-	CF&L
	Wildlife	C12	-	CF&L
	Wildlife	C13	-	CF&L
	Wildlife	C14	-	CF&L
	Wildlife	C15	-	CF&L
	Wildlife	C16	-	CF&L
	Wildlife	C17	-	CF&L
	Wildlife	C18	-	CF&L
	Wildlife	C19	-	CF&L
	Wildlife	C20	-	CF&L
	Wildlife	C21	-	CF&L

Appendix VI (continued)

LCC study area	Type of recommendation	LCC rec. no.	Reserve no.[1]	Manager/comments1
WIMMERA	Wildlife	C22	-	CF&L
(continued)	Wildlife	C23	-	CF&L
	Wildlife	C24	-	CF&L
	Wildlife	C25	-	CF&L
	Wildlife	C26	-	CF&L
	Wildlife	C27	-	CF&L
	Wildlife	C28	-	CF&L
	Wildlife	C29	-	CF&L
	Wildlife	C30	-	CF&L
	Wildlife	C31	-	CF&L
	Wildlife	C32	-	CF&L
	Wildlife	C33	-	CF&L
	Wildlife	C34	-	CF&L
	Wildlife	C35	-	CF&L
	Wildlife	C36	SWR 138 (part)	(see C3, N.C.)
	Wildlife	C37	-	CF&L
	Wildlife	C38	-	CF&L
	Wildlife	C39	-	CF&L
	Wildlife	C40	-	CF&L
	Wildlife	C41	-	CF&L
	W.M.C.A.	C42	SWR 30	CF&L(in consultation)
	W.M.C.A.	C43	-	CF&L(in cons. with various groups)
	F&F	F11	-	CF&L
	F&F	F12	-	CF&L
	F&F	F13	-	CF&L
	F&F	F14	-	CF&L
	F&F	F15	-	CF&L
	F&F	F16	-	CF&L
	F&F	F17	-	CF&L
	F&F	F18	-	CF&L
	F&F	F19	-	CF&L
	F&F	F20	-	CF&L
	Lake reserve	N1--10	-	CF&L(in cons. with RWC)
MELBOURNE 1,	Marine reserve	A15	Sec. 79A	FWD
REVIEW	F&F	H3	-	CF&L
1987	F&F	H4	-	CF&L

Notes:

1. State Wildlife Reserves (SWR) marked * are also reserved under the Crown Land (Reserves) Act 1978 as reserves for the protection of wildlife (mostly permanent, some temporary). Other reserves under this Act are shown by abbreviated reserve type - e.g., Pres.Nat.Plants (P) is a permanent reserve for the preservation of native plants; con.area.nat.int (T) is a temporary reserve for the conservation of an area of natural interest.

2. Corangamite Area Lake Reserve recommendations N3--7, 9, 10, 13, 14, 17, 18, 21--25, 27--32, 35, 36, 39--43, 45--51, 54--59, 62 and 63 have been reserved under the Crown Land (Reserves) Act 1978 as reserves for the protection of the bed and banks of lakes (all temporary except N63).

Appendix VII

MAJOR DEFICIENCIES IN THE REPRESENTATION OF PLANT COMMUNITIES IN THE CONSERVATION RESERVE SYSTEM

Codes in brackets following dominance associations refer to Vegetation Provinces as shown on Map 10:

M:	Mallee
NP:	Northern Plains
LD:	Little Desert
WVP:	Western Volcanic Plains
WCP:	Western Coastal Plains
GCP:	Gippsland (Coastal) Plains
WH:	Western Highlands
EH:	Eastern Highlands
O:	Otway Ranges
SG:	South Gippsland Highlands (including Wilsons Promontory)

CATEGORY 1: VEGETATION UNITS IN URGENT NEED OF PROTECTION

1. Grasslands of lowland plains

Dominated by indigenous perennial tussock grasses, with intertussock herbs. Floristic composition varies regionally and locally with site factors.

Dominance associations:

(a) *Themeda australis* - *Stipa* spp. - *Danthonia* spp. (NP, WVP, GCP).

(b) *Poa* spp. - *Danthonia* spp. (WVP, WCP).

(c) *Enteropogon acicularis* - *Stipa* spp. - *Danthonia* spp. (NP).

(d) Various grassland--sedgeland/herbfield communities of shallow swamps and depressions (complex of communities, including saline swamps) (mostly NP, WVP, GCP).

(Total of seven vegetation units)

All these units are very poorly represented on public land. There are scattered remnants of some units on linear reserves, but adequate representation would require land purchase and restoration works.

2. Grassy woodlands of lowland plains and fertile hilly areas

Series of associations including gum, box and ironbark eucalypts, and/or she-oaks, cypress pines, silver banksia and wattles. Understorey of similar character to tussock grasslands, but grading to shrubby in some variants.

Dominance associations:

(a) *Casuarina stricta--Banksia marginata--Acacia* spp. (NP, WVP, GCP).

(b) *Eucalyptus camaldulensis* (NP, WVP and WH).

(c) *E. camaldulensis--E. tereticornis* (GCP).

(d) *E. microcarpa--E. melliodora* (including in association with one or more of *Casuarina luehmannii, Callitris columellaris, E. largiflorens, E. leucoxylon, E. behriana,* and also *E. odorata* stands) (various associations) (NP, WVP and WH).

(e) Woodlands dominated by one or more of associated species in (d) above (NP, WH, WVP).

(f) *E. viminalis--E. ovata--E. pauciflora* (WH, WVP, WCP, GCP).

(g) *E. melliodora--E. blakelyi--E. albens* (WH, EH).

(Total of 16 vegetation units)

Reservation status of these grassland types ranges from poor to nil, and woodlands moderate to nil (Scarlett and Parsons, 1982) generally totally unreserved. The indigenous grassy vegetation types of the heavier soils of the Volcanic Plains and of the Murray Valley Plains (outside riverine forests), are particularly poorly represented in both reserves and on public land. The association of *Banksia marginata* and *Casuarina stricta* is almost extinct. Grassy woodland variants occur in some forest areas, often in ecotonal sites, as remnants of the communities of more fertile soils of adjacent agricultural areas, and on alluvial soils in valleys. Isolated small blocks of public land, roadsides and railways are potentially of high significance for these communities.

3. Open forests, woodlands and grassland communities of lower altitude snowplains and cold montane plateaux

Grassy ground layers of the communities of these habitats can have affinities with lowland vegetation types. Dominant species:

E. pauciflora, E. rubida, E. stellulata, E. camphora (with *Themeda australis--Poa* spp. ground layer) (EH).

(Total of seven vegetation units)

These communities are poorly reserved and very little remains on public land. Some remnants occur on the margins of public land and road reserves.

4. Montane bog communities of lower altitude snowplains, cool air drainage lines and various montane plateau areas

Dominant species:

Sclerophyllous shrubs (eg. *Hakea microcarpa*, *Baeckia* spp., *Callistemon sieberi*, *Epacris* spp.), sphagnum and sedges (EH).

Lower altitude variants of the sub-alpine bog-heath communities are poorly reserved across their range, which extends into wet sclerophyll forest in the central highlands. These small areas can be of critical importance for restricted taxa. These communities are poorly known, with variants in the Delegate--Errinundra--Nunniong, Koetong--Lucyvale and Upper Yarra--Baw Baws areas.

5. **Mallee woodlands, grasslands and saltbush shrublands**

Lightly treed to treeless communities of the north-west, including associations of mallee eucalypts, cypress-pines and belah. Understoreys range from shrubby (sclerophyllous or saltbush dominated) to grassy or herbaceous. These grade into the box eucalypt woodlands of the Northern Plains. Clearing has been very selective of land-types.

Dominant species:

(a) Mallee communities of heavier soils including various associations of *E. gracilis*, *E. oleosa*, *E. calycogona*, *E. behriana* and *E. porosa*. ('Big mallee' and mallee--box eucalypt woodland).

(b) *Casuarina cristata*.

(c) *Callitris preissii--Casuarina luehmannii*.

(d) *Stipa* spp. - *Danthonia* spp.

(e) *Maireana* spp.

(f) *Atriplex vesicaria--Sclerolaena* spp.

(Total of 13 vegetation units)

These units are generally degraded but there is relatively extensive representation on public land in the Mallee, except for 'Big Mallee' which occupies the better quality soils that have been taken up for agriculture. Representation of these units in the reserve system, particularly of undisturbed examples, is inadequate.

6. **Other open forests and woodlands of relatively fertile soils in hilly areas and near the coast**

While they are not readily defined by existing alliance descriptions, other open forest and woodland formation of relatively fertile soils in highland areas have been depleted by clearing for agriculture. These vegetation complexes cover a wide range of eucalypt associations,

and can include species of the lowland woodlands and dry or moist forest types. Understoreys range from grassy (eg. with *Poa*, *Themeda*, *Danthonia*) to grassy-heathy or shrubby.

Dominant species of some variants:

(a) Complexes including *E. melliodora*: eg. with *E. rubida*, *E. goniocalyx* and/or *E. radiata* (WH, EH).

(b) ... and grading into *E. radiata* (or *E. obliqua*), with *E. viminalis* and *E. ovata* or *E. yarraensis* (WH, EH, GCP), with grassy to shrubby understoreys. *E. aggregata* is very localized in frost hollows near Woodend (EH). Lower strata include *Themeda* and *Poa* dominated understoreys.

(c) *E. bosistoana* woodlands and open forests of alluvial flats in Gippsland (GCP).

(Total of twelve vegetation units)

Much of the protection of the range of these communities will depend on refugia and small remnant areas. Important stands of *E. bosistoana* occur on uncommitted land in the Cann River Valley (otherwise limited reservation at Holey Plains SP and Croajingolong NP). Protection of further areas of the box-peppermint grassy forest types is required. Limited occurrences remain around the margins of agricultural districts and on small blocks of public land.

7. Wetlands and riparian communities

An extremely diverse range of plant communities occurs in wet sites of the lowland plains. Carr (1984) lists 13 swamp of lake (wetland) community types from the Wimmera alone. Riparian vegetation is also extremely difficult to characterize on the basis of dominant species.

Characterization:

(a) Various sedge, rush, reed and grassland or herbfield communities of lowland swamps (all provinces).

(b) *Muehleckbeckia cunninghamii* low shrubland (WVP, NP) (including grasslands and *E. largiflorens* woodland).

(c) Riparian scrub, sedgeland and forest communists (all provinces, particularly lowlands).

(Total of seven vegetation units)

Wetland communities have good representation in reserves of near-coastal east Victoria, but elsewhere protection is mainly in Wildlife Reserves which may not necessarily provide for the protection of the vegetation communities present. The complexity of these vegetation types means that more thorough investigation is necessary to assess

their representation. For example, swamps in close proximity can have totally different floristic composition. Some relatively undisturbed relic shallow swamps in agricultural areas are of extremely high botanical importance.

Most riparian vegetation of the lowlands has been drastically altered and, apart from the riverine forests of the Murray River system, has often been reduced to small disturbed fragments. Grazing and stream-entrenchment have led to depletion of specific habitats - eg. sedge and herbaceous communities of lowland drainage lines. Relatively intact riparian vegetation is of importance wherever it occurs.

Greater representation of riparian systems, is desirable, particularly of associations such as *Bursaria spinosa--Hymenanthera dentata* on the Volcanic Plains. Scrubs of Lignum have some reservation in the parks of the north-west but these have been disturbed by grazing kangaroos, rabbits and stock. Elsewhere lignum swamps lack reservation outside restricted areas in Wildlife Reserves on the Northern Plains and to the west of Melbourne.

CATEGORY 2: VEGETATION UNITS IN HIGH NEED OF PROTECTION

8. Melaleuca scrubs and low woodlands

Communities in which *Melaleuca* spp. are dominant occur on a range of soil types. Some of these have been extensively depleted by land clearing and swamp draining, or in the case of those dominated by species of wide ecological amplitude, at least over part of their habitat range. Commentary on depleted vegetation types follows:

(a) *M. lanceolata* low woodland: Near coastal communities (west of Westernport Bay) have been depleted by clearing. They have some reservation in the south-west (eg. Discovery Bay CP), and at Cape Schanck and potentially Point Nepean, but over most of their distribution are confined to vulnerable relics. The species occurs in a wide variety of habitats, including mallee scrub (where it is most secure), heavy soils on the drier Northern Plains (relics only), coastal limestone and dune systems (eg. Pt Lonsdale) and coastal river flats (Anglesea). Greater protection for relics is required.

(b) *M. neglecta* heath: Greatly reduced in south-west Victoria, (eg. around saline clay pans). Some reservation in Little Desert NP and Dergholm SP.

(c) *M. halmaturorum* low woodland: Has some reservation on saline flats of far west/north-west Victoria, but protection is uncertain due to stock-grazing in Pink Lakes SP. Small stands in Little Desert NP.

(d) *M. ericifolia* scrubs: Scrub of *M. ericifolia* has reservation in coastal swamps (eg. Wilsons Promontory NP, Nooramunga MWR), but variants of inland swamps and valley flats between Melbourne and South Gippsland are mostly confined to relics. Occurrences in atypical habitats (eg. isolated near Portland on limestone (WR), also formerly at You Yangs (destroyed, possibly *M. ?ternifolia*)) are also of particular interest. *M. ericifolia* has a wide further ecological amplitude, and relics require greater protection in habitats where largely cleared.

(Total of nine units)

9. Inland salt-marsh communities (NP, M, WVP)

Reserves are urgently required on the gypseous Raak Plains. Extensive areas of gypseous flats and clay plains in the northern Wimmera have also been almost totally alienated, and support a number of species of extremely restricted occurrence on public land. On public land, important saltmarsh relics also occur in small fringes around saline lakes. Inland samphire communities can be dominated by a wide range of species - it is important for future reserves to include this spectrum of zonation. Land acquisition appears to be warranted in the northern Wimmera and on the Raak Plains.

(Total of nine units)

10. Wet sclerophyll forest--cool temperate rainforest

Dominant species:

(a) *E. regnans* (and/or *E. nitens*, *E. fastigata*) (EH,SG,O).

(b) *Nothofagus cunninghamii--Atherosperma moschatum* (EH,SG,O).

(Total of two vegetation units)

Further representation of variants in the Central Highlands between Kinglake and Mt Baw Baw is required. Mature and mixed age stands are of great ecological importance. Good examples occur on public land.

11. Riverine forests

Dominant species:

E. camaldulensis; E. largiflorens

(Total of 14 vegetation units)

Further protection is required for areas of river red gum-dominated forests on the riverine plains. The differences in vegetation composition between north-west Victoria, the Grampians, and the Murray Valley plains should be appreciated.

While black box-dominated forests and woodlands are considered to have a moderate reservation status, information is inadequate, and includes overlap with the savannah vegetation of the lowland plains (e.g. at Leaghur Forest Park). More open grassy communities of black box can be of extremely high botanical importance. Veteran stands of both black box and river red gum are important wherever they occur.

CATEGORY 3: FURTHER CONSERVATION MEASURES REQUIRED

12. Forests and heathy woodlands of the ranges and coastal areas

The alliance perspective alone is adequate to assess the current conservation status of forest types. An exten-sive gap in the protection of lower altitude forests occurs west from the Gippsland Lakes to the Drouin area.

The NPS (1984) consider the various associations of both *E. obliqua* and *E. radiata* to be inadequately reserve, with major deficiencies in the Western Highlands, South Gippsland Highlands (where mostly cleared) and Gippsland Coastal Plains. These dominance groupings include a range from damp sclerophyll forest to woodlands of the coastal plains (with heathy or grassy understoreys). *E. muellerana*-dominated communities as occur at Hedley Range and Mullundung Forest are inadequately protected, differing floristically from stands in Wilsons Promontory NP.

Selection of sites most suitable for pines has the potential to be selective of particular ecological patterns (eg. sites with deep loamy soils) within the category of peppermint-stringybark forests. While structural descriptions of these forests may be available, floristic communities have yet to be surveyed for extensive areas, particularly to the north of the Dividing Range and west of Melbourne. Variants occurring near the edges of agricultural land and in valleys can be of importance in representing vegetation similar to that selectively utilized for agriculture. Reservation must seek a balance between representation of variation in a number of smaller reserves, and selection of areas of sufficient size to ensure long-term viability of populations of all faunal species.

Some noticeable gaps in the protection of representative forest types are:

(a) Mature examples of forests used for hardwood production (eg. with veteran *E. obliqua*, *E. sieberi*).

(b) Moist sclerophyll forests in general: The distribution of reserved land is far from even: Geographical gaps, or areas where reserves are of relatively small size or lower conservation ranking are apparent.

(c) *Callitris* forests: In the Beechworth district, reservation is (currently) restricted to reserves of lower conservation status (RP, MPP).

(d) Sclerophyll forests--woodlands east of Melbourne: Protection of the remnant vegetation including *E. cinerea* ssp. *cephalocarpa* is inadequate. Heathy woodlands and wet-heath/swamp scrub communities require greater protection. The variants of sclerophyll woodland in the proposed Bunyip SP are otherwise very poorly protected.

(Total of 14 vegetation units)

CATEGORY 4: ADDITIONAL FEATURES REQUIRING PARTICULAR ATTENTION

(a) Localized species, eg. small stands of *Casuarina obesa* in north-west Victoria. *Eucalyptus cyanophylla* has localized occurrences in mallee scrub formations in the far-north-west and is unreserved. *E. dealbata* is known in Victoria only from a very small roadside population in north-east Victoria.

(Total of one vegetation unit)

(b) Areas of high botanical importance which can be under-estimated by broad structural descriptions--eg. Anglesea River Catchment, Gellions Run, communities associated with near coastal limestone and 'perched' swamps of the Kanawinka fault in south-west Victoria.

(c) Relics of scrub or heath-grassland complexes in areas where clearing has been extensive (eg. west Gippsland, south-west Victoria).

Source: Based on Frood and Calder (1987).

References

National Parks Service (1984). 'The Adequacy of Reservation of Plant Communities within the Reserve System.' NPS submission on Conservation Strategy. Discussion Paper (NPS: Melbourne.)

Scarlett, N.H. and Parsons, R.F. (1982). Rare Plants of the Victorian Plains. In 'Species at Risk in Australia' (eds). R.H. Groves and W.D.L. Ride (Australian Academy of Science: Canberra.)

Appendix VIII

LAND SYSTEMS OF VICTORIA

(Available on request from the
Land Conservation Council in microfiche form)

Appendix IX

REPRESENTATION OF LAND SYSTEMS IN RESERVES

Explanation of symbols:

Land Systems - These are arranged into geomorphic units (Table 20) which are designated 1.1 to 9.3. Symbols for landform, lithology, and climate are shown in Table 21. Subscript numbers differentiate land systems according to variations in the more diverse features, soils and vegetation.

LCC Areas:

ALP	Alpine (Special Investigation)
BAL	Ballarat
COR	Corangamite
EG(R)	East Gippsland Review
GLH	Gippsland Lakes Hinterland
HE	Hill End (Special Investigation)
LV	Latrobe Valley (Special Investigation)
MAL	Mallee
M1(R)	Melbourne District 1 Review
MEL2	Melbourne (District 2 part)
MV	Murray Valley
NC	North Central
NE(R)	North-eastern (Benalla--Upper Murray) Review
NE3,5	North-eastern Districts 3, 4 and 5 (parts)
SG1	South Gippsland District 1
SG2	South Gippsland District 2
SW1(R)	South-western District 1 Review
SW2	South-western District 2
WIM	Wimmera

Land System Extent (some intermediates are also shown)

VS	Very small
S	Small
M	Moderate
E	Extensive
VE	Very extensive

Conservation Reserves

Recommendation numbers from the LCC area studies and reviews shown, for national, State and coastal parks, wilderness, reference areas, and flora, flora and fauna, and wildlife reserves.

Adequate Representation

Shown by + where considered adequate.

Freehold

Percentage of each land system occurring on freehold land.

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
CENTRAL VICTORIAN UPLANDS					
EAST VICTORIAN UPLANDS					
1.1 DISSECTED UPLANDS					
$Ss5_1$	NC	S	H18-19	+	50
$Ss6_1$	M1(R)	S	-		96
	MEL2		-		
$Ss6_2$	NE(R)	VS	-		92
$Ss6_3$	ALP	VS	A3	+	-
$Ss6_4$	EG(R)	M	A1-2, A4	+	10
$Ss7_1$	MEL2	S	B10-11	+	80
$Ss7_2$	MEL2	VE	A6, A9, H4	+	50
	NE(R)		B2		
	ALP		-		
$Ss7_3$	MEL2	M-E	A6, B8-9, H6-7		25
$Ss7_4$	MEL2	M	A6, C13	+	83
$Ss7_5$	NE3,5	S	-		75
	NE(R)				
$Ss7_6$	NE3,5	S-M	-		40
$Ss7_7$	NE3,5	S	A2	+	25
	ALP		A6		
$Ss7_8$	NE3,5	M	B6		25
	NE(R)				
$Ss7_9$	ALP	S	A3	+	13
	EG(R)		A1		
$Ss7_{10}$	ALP	S	A19, C13	+	40
$Ss7_{11}$	MEL2	VE	-		3
	SG1		-		
	GLH		A2, H4		
	EG(R)		A3, A11-12, B4, F1-3		
$Ss7_{12}$	EG(R)	S	A6-7	+	15
$Ss7_{13}$	EG(R)	E	A3, A6-7, A13, B10	+	2
$Ss7_{14}$	EG(R)	M	A13, B9	+	8
$Ss8_1$	MEL2	S	H12		83
$Ss8_2$	MEL2	M	B14-15	+	2
$Ss8_3$	MEL2	VE	A1,	+	-
	ALP		A11-15, C2, C6-8, G2		
	GLH		-		
$Ss8_4$	MEL2	VE	-	+	-
	ALP		A2, A7, A13, A16, A19-20, A23-24		
	NE3,5		A1,		
$Ss8_5$	MEL2	VE	A6-7, A9	+	3
	ALP		A1-3, A6-7, A18, A20-21		
	NE3,5		A1		
	NE(R)		A22, D18		
$Ss8_6$	ALP	M	A3, A24-25, C17	+	-

Appendix IX (continued)

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Freehold (%)
1.1 DISSECTED UPLANDS (continued)					
$Ss8_7$	ALP	VE	A1, A3, A9, A11-12, A14, B1, C7-8, D26, D32	+	2
	GLH		A2		
	MEL2		A1		
$Ss8_8$	ALP	M	A3, A25, C17	+	-
$Ss8_9$	ALP	S-M	A3	+	5
$Ss8_{10}$	ALP	S	A3, D14	+	2
$Ss8_{11}$	MEL2	E	A10, B18, E1-2	+	5
	GLH		C1		
$Ss8_{12}$	EG(R)	E	F12		-
$Ss9_1$	MEL2	M	-	+	
	ALP		A2-3, A14-16, C5, D2, D5, D31		
$Ss9_2$	ALP	S-M	A3, A21, C21	+	-
Ssv6	EG(R)	VS	-		70
Ssv7	NE3,5	VS	-		80
Ssv8	EG(R)	M	A4	+	4
$Sg6_1$	NE(R)	S-M	G1, G3		97
	MEL2				
$Sg6_2$	EG(R)	M	A1, A3	+	45
	ALP		A3		
$Sg6_3$	EG(R)	S	A2, A4	+	80
$Sg6_4$	NE(R)	S-M	-	+	55
	MV		A3, B5		
	NE(R)				
$Sg7_1$	NE(R)	E	A5, B1-3, G3, H1	+	50
	MEL2		H5, H20		
	NE(R)		A6-7, B7		
$Sg7_2$	NE(R)	S-M	B5		45
$Sg7_3$	NE(R)	S-M	-		75
$Sg7_4$	NE(R)	S	-	+	90
$Sg7_5$	ALP	S	A4	+	20
$Sg7_6$	ALP	M	A3-4, A26	+	50
$Sg7_7$	ALP	VS	C15	+	-
$Sg7_8$	EG(R)	S-M	A1, B1	+	25
	ALP		A3		
$Sg7_9$	GLH	S	-	+	20
	ALP		-		
	EG(R)		A3		
$Sg7_{10}$	ALP	S	-		70
	GLH		-		
$Sg7_{11}$	EG(R)	M	A13, B15	+	15
$Sg7_{12}$	EG(R)	E	A6-7, A13, B11 F2-3, F7	+	5
$Sg8_1$	MEL2	S	B7	+	45
$Sg8_2$	MEL2	VS	-		75
$Sg8_3$	MEL2	E	A1, A11, B17	+	5
$Sg8_4$	ALP	M-E	A2, A13	+	8
	NE(R)		A3, A19		

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Freehold (%)
1.1 DISSECTED UPLANDS (continued)					
$Sg8_5$	NE(R)	M	A8, G7		20
$Sg8_6$	NE3,5	M	A1, B4	+	4
$Sg8_7$	ALP	VS	A20	+	-
$Sg8_8$	ALP	S	A19	+	20
$Sg8_9$	ALP	M	A19-20, C12	+	8
$Sg8_{10}$	ALP	S	D25		10
$Sg8_{11}$	ALP	VS	A3	+	-
$Sg8_{12}$	ALP	S-M	A3, A27	+	3
$Sg8_{13}$	ALP	VS	A3	+	-
$Sg8_{14}$	EG(R)	E	A8, B6	+	2
$Sg8_{15}$	ALP	S	A3, D30	+	4
$Sg8_{16}$	ALP	M-E	A19, C12		55
$Sg8_{17}$	ALP	E	A1, A3, A19-20	+	15
	GLH		-		
	MEL2		-		
$Sg8_{18}$	MEL2	S	A1		10
$Sg8_{19}$	ALP	VS	A27	+	-
Sg9	ALP	M	A2-3, A7, A17, A26-27	+	-
	NE3,5		A1		
$Sgs7_1$	NE(R)	M-E	A1-2, B10, B13	+	25
$Sgs7_2$	NE(R)	E	A1, A4, A7, B10-12, G7	+	30
$Sgs8_1$	NE(R)	S	-		10
$Sgs8_2$	ALP	VS	A2	+	-
$Sv7_1$	NE(R)	E	A5, G5		70
	NE3,5		A2, B2-3		
$Sv7_2$	GLH	S	A1, D5, H6-7	+	8
	ALP		A4		
	EG(R)		A3, A5		
$Sv7_3$	MEL2	S	A24	+	73
$Sv8_1$	MEL2	S	A24, B12-13	+	20
$Sv8_2$	MEL2	E	A8, A24, B12-13, C12	+	10
$Sv8_3$	MEL2	VS	A24	+	90
$Sv8_4$	MEL2	S	A7	+	5
$Sv8_5$	ALP	S-VS	A9	+	-
$Sv9_1$					
$Svs7_1$	NE(R)	VS	-	+	90
$Svs7_2$	GLH	M	A1-2, D3		45
$Svg7_1$	NE(R)	S	A1, B9, G8	+	25
$Svg8_1$	NE(R)	S	A1, B8	+	15
$Sl7_1$	ALP	VS	-		100
$Sl7_2$	GLH	VS	-		95
Sf8	MEL2	VS	-		100
	LV				
	SG2				
$Gs4_1$	NC	M	-		45
	MV				
$Gs4_2$	NC	M	H8		70
$Gs5_1$	NC	VE	B6, H19		80
	MEL2		-		

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
1.1 DISSECTED UPLANDS (continued)					
$Gs5_1$ (cont.)	MV		B4, C22, C24, G7, G11		
$Gs5_2$	NC	VS	H18		85
$Gs6_1$	M1(R)	E	G3		99
	MEL2		-		
	NE(R)		-		
	MV		-		
	NE(R)		-		
$Gs6_2$	MV	S	B15		50
	NE(R)				
$Gs6_3$	NE(R)	VS	-		75
$Gs7_1$	MEL2	S	-		92
$Gs7_2$	MEL2	VS	-		100
$Gs7_3$	MEL2	M-E	A6, B10, C13		90
$Gs7_4$	MEL2	E	A6-7, A9, H6-7		94
$Gs7_5$	NE(R)	S	-		100
$Gs7_6$	NE3,5	M	A1-2		80
	NE(R)				
$Gs7_7$	NE3,5	VS	-		100
$Gs7_8$	MEL2	S	-		95
$Gs7_9$	ALP	M	A19-20		90
$Gs7_{10}$	ALP	S	A1, A12	+	20
	GLH		A2		
$Gs7_{11}$	GLH	M	C3	+	25
	ALP		A3		
$Gs8_1$	MEL2	M	A6	+	45
$Gs8_2$	MEL2	M	B15	+	-
	GLH		-		
	ALP		D27, D29		
$Gs8_3$	NE(R)	S	-		30
$Gs8_4$	ALP	S-M	A21, C16	+	5
$Gs8_5$	ALP	S-M	A21, C16, D25	+	65
$Gs8_6$	ALP	M	A4, A14, C8	+	-
	GLH		H6		
Gs17	ALP	VS	-		85
	GLH		H6		
Gsv6	EG(R)	M	A3-4, A8, B2 B5, B8	+	25
Gsg6	EG(R)	M	A8		85
$Gsg8_1$	EG(R)	M	A4, A8	+	8
$Gsg8_2$	EG(R)	S	B5		43
Gg5	MV	M	C26		98
Gg6	M1(R)	M	-		94
	MEL2				
	NE(R)				
	MV		G10		
$Gg7_1$	MEL2	S-M	A11		65
$Gg7_2$	MEL2	M	-		95
	NE(R)		A5, C1		
$Gg7_3$	NE3,5	M	-		60
	NE(R)				

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
1.1 DISSECTED UPLANDS (continued)					
$Gg7_4$	NE3,5	M	-		80
	NE(R)		-		
$Gg7_5$	NE(R)	M	A1, A6, B7, B12		70
$Gg7_6$	GLH	VS	-		-
$Gg7_7$	ALP	M	-		95
$Gg8_1$	MEL2	M	B8	+	16
$Gg8_2$	NE(R)	E	H1		90
	MEL2				
$Gg8_3$	NE(R)	VS	-		25
$Gg8_4$	NE(R)	M	-		85
	ALP		-		
	NE3,5		-		
$Gg8_5$	ALP	VS	-		-
$Gg8_6$	ALP	S	A23		-
$Gg8_7$	ALP	VS	-		-
$Gg8_8$	MEL2	S-M	B16		-
$Gg8_9$	MEL2	S	A1	+	-
$Gg8_{10}$	GLH	VS	-		40
$Gv7_1$					
$Gv7_2$	NE3,5	VS	-		35
$Gv7_3$	ALP	S-M	A4		92
$Gv7_4$	MEL2	S-M	-		95
$Gv7_5$					
$Gv8_1$	MEL2	VS	A24	+	65
$Gv8_2$	MEL2	S	C13		90
$Gv8_3$	ALP	S	A20	+	25
$Gv9_1$					
Gvs_4	MV	VS	-		100
Gvs5	MV	S	-		95
Gvsgf5	NC	VS	-		95
Gvsgf6	NC	VS	-		100
G17	GLH	VS	H7		82
Gf7	MEL2	VS	A10, E1-2	+	-
Gfc8	MEL2	S	B20		10
	SG2				
Pf6	MV	S	-		98
$Pf7_1$	MEL 2	S	-		97
$Pf7_2$	MEL2	VS	-		100
$Pf7_3$	MEL2	S	-		98
$Pf7_4$	MEL2	S	A11	+	90
$Pf7_5$	NE(R)	S-M	A5		98
$Pf7_6$	NE(R)	VS	-		25
$Pf7_7$	ALP	M	-		94
$Pf7_8$	GLH	VS	-		100
Pf8	NE3,5	M	A1-2		32
	ALP		A1-2, A13		
Pv7	MEL2	VS	-		100
Ffc6	MEL2	S	-		100
	M1(R)				
$Ffc7_1$	MEL2	M	G11		97
$Ffc7_2$	NE3,5	M-E	A1-2		82

Appendix IX (continued)

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
1.1 DISSECTED UPLANDS (continued)					
$Ffc7_2$ (cont.)	ALP		A3		
	NE(R)		A7, C4-5		
$Ffc7_3$	ALP	M	A1, C3	+	60
	EG(R)		-		
$Ffc8_1$	ALP	VS	-		100
1.2 DISSECTED PLATEAU (WELLINGTON UPLANDS)					
$Ss7_1$	MEL2	VS	-		75
$Ss7_2$	ALP	E	A1, A8, B1	+	15
	GLH		A2, B1		
$Ss7_3$	GLH	M	B1, D4	+	20
$Ss8_1$	NE3,5	M-E	A2	+	40
	MEL2		-		
	ALP		A1, A7-8		
$Ss8_2$	ALP	M	A1, A8, B1	+	-
$Ss8_3$	ALP	S	A1	+	-
	GLH		-		
$Ss9_1$	ALP	S-M	A1, A7-8	+	-
$Ssv8_1$	ALP	M	A1, A9	+	-
$Sv7_1$	MEL2	VS	-		100
$Sv7_2$	GLH	VS	B1	+	20
$Sv8_1$	NE3,5	M	A2, B1	+	-
	ALP		A5-6		
$Sv8_2$	ALP	VS-S	A1, A8, B1	+	-
Sf8					
$Gs7_1$	MEL2	M-E	-		99
	NE(R)		-		
$Gs7_2$	ALP	M	A1	+	35
	GLH		A2, D4		
$Gs8_1$	NE(R)	M-E	A2	+	37
	NE3,5		B1		
	ALP		A1, A5-6		
$Gs8_2$	ALP	S	A1	+	-
$Gg6^1$	GLH	VS	-		65
$Gv7_1$	NE3,5	S	A2	+	-
	NE(R)		-		
$Gv8_1$	NE(R)	VS	-		30
	NE3,5		-		
$Gv8_2$	NE(R)	S	B4	+	20
	NE3,5				
Ffc7	ALP	VS	A1	+	55
1.3 HIGH PLAINS					
$Gs9_1$	ALP	VS	A1, A6	+	-
$Gs9_2$	ALP	S	A3, A23	+	-
$Gs9_3$	ALP	S-M	A1, A3, A8-9	+	-
			A14, C1		
$Gs9_4$	ALP	VS			
$Gsg9_1$	ALP	S	A1	+	5

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
1.3 HIGH PLAINS (continued)					
$Gsv9_1$	ALP	S	A1, A9, B1	+	-
$Gg8_1$	ALP	S-M	A3	+	-
$Gg9_1$	ALP	M-E	A2-3, A14, A19, C9-11, D27	+	-
$Gg9_2$	ALP	S-M	A3, C17	+	-
$Gg9_3$					
$Gg9_4$	MEL2	S-M	A1, B19	+	-
$Gv9_1$	ALP	M	A1-2, A27, C6, D27-28	+	5
	MEL2		A8		
$Gv9_2$	ALP	S	A1	+	-
CENTRAL VICTORIAN UPLANDS					
WEST VICTORIAN UPLANDS					
2.1 DISSECTED UPLANDS					
Ss3	WIM	VS	F20	+	75
$Ss4_1$	NC	S	H21		84
	WIM		H22		
$Ss4_2$	NC	VS	H10	+	50
$Ss4_3$	NC	S	-		55
	WIM		-		
$Ss4_4$	M1(R)	VS	A1	+	35
$Ss5_1$	NC	VS	-		100
$Ss5_2$	NC	S	A1, H24	+	25
$Ss5_3$	NC	S	-		95
$Ss5_4$	NC	S	B5	+	65
$Ss5_5$	NC	S	H25		50
$Ss5_6$	M1(R)	S	A1-2, A7	+	70
$Ss6_1$	NC	S	H24	+	35
	BAL		A1, B1		
	M1(R)		H3		
$Ss6_2$	BAL	E-VE	A3, B2, G2, G5	+	55
	M1(R)		A5, B5-6		
$Ss6_3$	BAL	S	-		92
	NC				
$Ss6_4$	NC	S-M	H12, H16		40
	BAL				
	M1(R)		G15		
$Ss6_5$	NC	VS	H16		90
$Ss6_6$	NC	VS-S	-		100
	M1(R)				
$Ss6_7$	NC	M	-		98
$Ss7_1$	NC	S	-		40
	BAL				
$Ss7_2$	BAL	S	-		70
$Ss7_3$	BAL	M	G1		70
	NC				

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
2.1 DISSECTED UPLANDS (continued)					
$Ss7_4$	BAL	M	-		65
$Ss7_5$	M1(R)	VS	-		100
$Ss7_6$	M1(R)	M	A5, B4, G2, G16, G18, G19	+	30
$Ss7_7$	M1(R)	VS	-		10
Ss8	M1(R)	S	-		3
	BAL				
Sg3	WIM	VS	-		95
	NC		-		
$Sg4_1$	WIM	S	-	+	35
	NC		A2, B2		
$Sg4_2$	M1(R)	S	-		70
Sg5	NC	S	-		85
$Sg6_1$	NC	VS	-		20
$Sg6_2$	NC	S	-		100
$Sg6_3$	M1(R)	VS	-		100
$Sg6_4$	NC	VS	-		30
$Sg7_1$	BAL	M	A1-2, B1	+	50
	M1(R)				
$Sg7_2$	M1(R)	S	-		50
$Sg7_3$	M1(R)	M	-		100
$Sg7_4$	BAL	VS	-		100
$Sv7_1$	M1(R)	VS	-		55
$Sv7_2$	M1(R)	S	-		100
Gs3	NC	S	H22	+	70
$Gs4_1$	NC	S	B3, H22	+	70
$Gs4_2$	NC	E	A3, A5, H4, H14, H21		73
$Gs4_3$	NC	M	A3, A5, H10	+	60
$Gs4_4$	NC	S	-		100
$Gs4_5$	NC	S	H9		95
	MV				
$Gs4_6$	NC	S	-		50
$Gs4_7$	NC	VS	-		90
$Gs5_1$	SW2	M	H5		93
$Gs5_2$	SW2	M	-		100
	COR				
$Gs5_3$	NC	M-E	A4		60
$Gs5_4$	NC	E	A5, H6, H25		75
$Gs5_5$	NC	M	-		45
$Gs5_6$	M1(R)	S-M	A1	+	60
$Gs5_7$	NC	S	-		100
$Gs6_1$	SW2	M	-		75
	BAL		-		
	NC		-		
$Gs6_2$	M1(R)	S-M	-		85
	BAL		-		
	NC		-		
$Gs6_3$					
$Gs6_4$	NC	M	-		65
	BAL				
$Gs6_5$	BAL	VS	-		100

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
2.1 DISSECTED UPLANDS (continued)					
$Gs6_6$	NC	S	-		80
	BAL		-		
$Gs6_7$	NC	VS	-		100
$Gs7_1$	M1(R)	S	G15		75
$Gs7_2$	M1(R)	M	A6		73
$Gs7_3$	BAL	S	-		97
$Gs7_4$	BAL	VS-S	-		96
$Gs7_5$	M1(R)	S	-		80
Gs8	M1(R)	M	B1		45
	BAL				
Gg3	MV	S-M	A1, B1, G3, G9	+	82
Gg4	NC	S	A2		90
$Gg5_1$	SW2	S	-		94
	NC				
$Gg5_2$	BAL	M	-		100
	COR		-		
$Gg5_3$	NC	VS	-		50
$Gg5_4$	M1(R)	VS	-		60
$Gg5_5$	NC	M	-		97
$Gg5_6$	NC	VS	-		88
$Gg6_1$	BAL	VS	-		100
$Gg6_2$	NC	VS	-		100
$Gg6_3$	NC	S	-		88
	BAL		-		
	M1(R)		-		
$Gg6_4$	NC	S	-		100
$Gg6_5$	M1(R)	VS	-		96
$Gg7_1$	BAL	S	-		97
$Gg7_2$	BAL	S	-		97
$Gg7_3$	M1(R)	S	-		98
$Gg7_4$	M1(R)	S	-		97
$Gg7_5$					
$Gg7_6$	MEL2	VS	-		100
Gv4	NC	S	H9		99
Gv5	COR	S	-		100
Gvs4					
Gvs5					
Gvs6	SW2	VS	A1		98
Gf4	NC	S	-		100
$Pf3_1$	WIM	S	-		99
$Pf3_2$	WIM	VS	-		100
$Pf4_1$	WIM	VS	-		97
$Pf4_2$	NC	M	-		99
$Pf4_3$	NC	S	A2, B2		99
$Pf4_4$	NC	S	-		100
$Pf4_5$	NC	S	H2		94
$Pf4_6$	NC	S	-		100
$Pf4_7$	NC	S	-		95
	WIM				
$Pf4_8$	NC	M	C2, H21		94
$Pf4_9$	NC	M	-		98
$Pf4_{10}$	NC	M	-		98

Appendix IX (continued)

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
2.1 DISSECTED UPLANDS (continued)					
$Pf4_{11}$	NC	M	-		100
$Pf4_{12}$	NC	M	-		75
$Pf4_{13}$	M1(R)	S	-		98
$Pf4_{14}$	NC	VS	-		100
$Pf4_{15}$	NC	S	-		100
$Pf4_{16}$	NC	S	-		100
$Pf4_{17}$	NC	VS-S	A2		60
$Pf4_{18}$	NC	S	A2		77
$Pf5_1$	NC BAL	S-M	-		97
$Pf5_2$	NC BAL	M	H23, H34		88
$Pf5_3$	NC	S	H13	+	83
$Pf5_4$	NC	VS	-		100
$Pf5_5$	M1(R)	S	A1, B1-2, H3	+	65
$Pf5_6$					
$Pf5_7$	NC	S	A4		99
$Pf5_8$	NC	VS	-		100
$Pf5_9$	NC	S	-		97
$Pf6_1$	SW2	M	A1, D72, H5		90
$Pf6_2$	SW2 BAL	M	A1, D70-71, D73-74		95
$Pf6_3$	BAL	M	-		98
$Pf6_4$	BAL M1(R)	S	C8 -		97
$Pf6_5$	NC	S	A1	+	85
$Pf6_6$	NC BAL	M	A1 -		98
$Pf6_7$	NC BAL	VS			
$Pf7_1$	BAL	S-M	A2, G1		92
$Pf7_2$	BAL M1(R)	S	A2		97
$Pf7_3$	BAL	VS	-		95
2.2 PROMINENT RIDGES (GRAMPIANS)					
Ss4	SW2	VS	B1	+	-
Ss6	SW2	VS	-		40
Ss7	SW2	E	A1, C6	+	1
Gg7	SW2	S-M	A1, C5	+	45
Pf4	SW2	VS	B1	+	80
Pf6	SW2	S	D69, H6		99
Pfc7	SW2	S-M	A1, C3	+	3
Pc7	SW2	M	A1	+	7
2.3 DISSECTED TABLELAND (DUNDAS TABLELAND)					
Gs7	SW2	S	B2	+	25
Gf6	SW2 SW1(R)	E	-		98

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
2.3 DISSECTED TABLELAND (DUNDAS TABLELAND) (continued)					
Gf7					
Pf5	SW2	VS	-		100
Pf6	SW2 SW1(R)	E	C4, D67		95
Pf7	SW2	M	A1	+	95
Pfc7	SW2	VS	A1		5
RPc6	SW2	VS	-		75
RPc7	SW2	S	-		70
2.4 DISSECTED TABLELAND (MERINO TABLELAND)					
Gs6	SW1(R) SW2	M			100
Pf6	SW1(R) SW2	VS			100
SOUTH VICTORIAN UPLANDS					
3.1 DISSECTED FAULT BLOCKS (OTWAY RANGES)					
$Ss7_1$	COR	M-E	A1, A4-5 B4, H13	+	20
$Ss7_2$	COR	S-M	A4		20
$Ss7_3$	COR	M	A1-2, A4	+	30
$Ss7_4$	COR	S	A1, H14	+	10
$Ss7_5$	COR	VS	A5, H12		30
Gs7	COR	S	A1, A4, B4, H13	+	8
Gs8	COR	S	-		60
3.2 MODERATELY DISSECTED BLOCK (BARRABOOL HILLS)					
$Gs5_1$	M1(R)	VS	-		100
$Gs5_2$	M1(R)	S	-		100
3.3 MODERATELY DISSECTED RIDGE (MORNINGTON PENINSULA)					
Sg7	MEL2	VS-S	-		85
Gs7	MEL2	S	-		95
Gvf7	MEL2	S	-		97
Pvf7	MEL2	S	C16, C18, H15		97
$Pf7_1$	MEL2	S-M	-		99
$Pf7_2$	MEL2	VS	C18, C28, H17		98
$Pf7_3$	MEL2	VS	C14		77
$Pf7_4$	MEL2	VS	-		100
PCc7	MEL2	S	C14, H18		94
3.4 DISSECTED FAULT BLOCKS (SOUTH GIPPSLAND RANGES)					
$Ss7_1$	MEL2 SG2	E	-		100

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
3.4 DISSECTED FAULT BLOCKS (SOUTH GIPPSLAND RANGES) (continued)					
$Ss7_2$	SG2	SM	A3, G3, G12	+	65
$Ss8_1$	MEL2	VE	A2, A10, B5		65
	SG2		G5-6		
	SG1				
$Ss8_2$	MEL2	S-M	-		80
	SG2				
$Ss8_3$	MEL2	S	-		85
	SG2				
Sf8	MEL2	VS	-		90
	SG2				
Gs7	SG2	M	-		100
$Gv7_1$	SG2	M	A5		97
$Gv7_2$	SG2	S	-		100
$Gv7_3$	SG1	S-M	-		97
	SG2				
Gf7	MEL2	M-E	-		98
Pf7	MEL2	M	-		100
3.5 DISSECTED OUTLIER (WILSONS PROMONTORY)					
$Sg7_1$	SG2	M	A1, B2	+	-
$Sg7_2$	SG2	VS	A1	+	-
Pfc7	SG2	VS	A1, B2	+	-
$Pc7_1$	SG2	VS	A1	+	-
$Pc7_2$	SG2	S	A1	+	-
$Pc7_3$	SG2	S	A1	+	-
MURRAY BASIN PLAINS					
RIVERINE PLAIN					
4.1 PRESENT FLOODPLAIN (MURRAY VALLEY)					
Ffc2	MAL	M-E	D1		20
Ffc3	MAL	M-E	D9		30
	MV		C4, C14-15		
Ffc4	MV	M	A2, B2-3, C17-18, C30, C33	+	20
Ffc5	MV	S-M	G8		30
	NE(R)				
Ffc6	NE(R)	S	-		95
	NE3,5		-		
FWcf2	MAL	M	A2, C4	+	1
Lf2	MAL	VS	-		100
Lf3	MAL	VS	-		100
4.2 OLDER ALLUVIAL PLAIN (SHEPPARTON)					
Pf2	MAL	E	C2		68

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
4.2 OLDER ALLUVIAL PLAIN (SHEPPARTON) (continued)					
$Pf3_1$	MAL	VE	G30, G32-33, D8-12		96
	MV		C4-5, C11-13, C15-16		
	NC		-		
	WIM		-		
$Pf3_2$	MAL	E	-		100
	WIM		-		
$Pf3_3$	NC	S	-		100
$Pf3_4$	MV	M-E	C3, C6-7,		95
$Pf4_1$	MV	VE	C19, C29		98
	NC		C9		
$Pf4_2$	MV	E-VE	C17-18, G5		98
	NC		-		
$Pf4_3$	MV	M	-		99
$Pf4_4$	MV	M	-		99
$Pf4_5$	NC	M	C8		96
$Pf4_6$	MV	S-M	-		98
$Pf4_7$	WIM	M	-		99
$Pf4_8$	NC	S	-		100
$Pf4_9$	NC	M	-		99
$Pf5_1$	MV	M	C26-28		94
$Pf5_2$	MV	E	-		97
	NC		C16, G3		
$Pf5_3$	MV	M	C21, C23, C28		98
$Pf5_4$	MV	M	-		97
	NC		-		
$Pf5_5$	MV	M	C31		89
	NC		C14-15		
$Pf6_1$	MV	E	C24		99
	NC		-		
	M1(R)		-		
	NE(R)		G2		
$Pf6_2$	MV	S-M	-		97
$Pf6_3$	NE3,5	M-E	-		100
	MV		-		
$Pf6_4$	MV	S	C24-25		65
	NE(R)				
$Pf6_5$	NE(R)	M	-		97
$Pf7_1$	NE(R)	M	-		96
$Pf7_2$	NE(R)	S-M	-		97
Pfc4	MV	E	A2, C30		99
Pfc5	MV	S	-		93
PEfc2	MAL	S	-		50
Lf2	MAL	VS	-		20
Lf3	MAL	S	-		85
FLf3	MV	M	C1-2, C9-10	+	70
	WIM		C38-40, C43		
FLf4	MV	M	-	+	75
	NC		C10-13		
FLfc4	MV	S-M	C32	+	65
PRf4	WIM	VS	-		100

Appendix IX (continued)

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Freehold (%)
MURRAY BASIN PLAINS					
MALLEE DUNEFIELD					
5.1 LOW CALCAREOUS DUNES					
EPRcf2	MAL	VE	A2-3, C3		10
EPRcf3	MAL	M	D3		94
EPcf2	MAL	M-E	A2-3, C5		10
PEcf2	MAL	S	-	+	-
EPRfc2	MAL	E	A2, G1-2		85
EPRfc3	MAL	VE	A1, A3, D3, D5, G11, G15-16		98
EPfc2	MAL	M-E	-		60
EPfc12	MAL	M	-		-
PREfc3	WIM	VE	-		99
	MAL		A1, G22, G28		
PREfc4	WIM	S	F10		99
RPEfc2	MAL	VE	C1, C3, D1, G6-9		75
RPEfc3	MAL	S	G13-14		95
PREfc12	MAL	M-E	-		25
PEfc2	MAL	VE	RF, G4-5, G20-21		94
PEfc3	MAL	S	-		96
WPRf3	MAL	VE	AR, D8		100
PWRf3	WIM	VE	-		100
	MAL		AR, G31		
PWRf4	WIM	M	C36		98
	NC		C3		
PWRfz3	WIM	M	-		-
PWRfz4	SW2	M	D42		90
	WIM		C26, F13-F15		
Rf2	MAL	S	G1-2	+	65
Rf3	MAL	VS	G14		75
PYfz2	MAL	S-M	-		8
PYfz3	MAL	E	A3, C6, G28	+	30
PYcf2	MAL	S	-		-
Pz2	MAL	S-M	RF	+	-
Pcz2	MAL	M	RF		20
Lf3	MAL	M	G24-25		94
$Pf3_1$	MAL	M	G27, G29		97
	WIM		-		
Ffc3	WIM	S-M	F9		93
	MAL				
5.2 HIGH SILICEOUS DUNES (BIG DESERT/SUNSET)					
IPRc2	MAL	S	-		-
IPRc3	MAL	VE	A1, B1, C7	+	3
IPRc4	MAL	M	B1, C10, D6	+	25
IPc2	MAL	M-E	A2-3, C5	+	-
EPRc2	MAL	M-E	A3	+	7
EPRc3	WIM	E-VE	A1, B1, C9, D4-5	+	15
	MAL				

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Freehold (%)
5.2 HIGH SILICEOUS DUNES (BIG DESERT/SUNSET) (continued)					
EPRc4	WIM	E-VE	F11	+	84
	MAL		B1, C10, D6		
EPc2	MAL	M-E	A2-3, C5	+	-
EPc12	MAL	E	-		4
Pfc2	MAL	M-E	A3	+	-
$Pf3_1$	MAL	S	A1		88
Ffc3	MAL	M	A1, C8	+	5
MURRAY BASIN PLAINS					
WIMMERA PLAIN					
6.1 CLAY PLAINS (NHILL)					
PRf3	WIM	E	C31-32, F16, F18		97
	NC		C4		
PRf4	WIM	E	C8-11, C16-17, C27-29, C34,		98
	NC		H21		
PRf5	NC	VS	-		96
RPcf4	WIM	S	A1, C12		97
$Pf4_1$	WIM	M-E	C42, F19		96
	SW2		F12		
	NC				
$Pf4_2$	SW2	S-M	-		100
$Pf5_1$	SW2	M	D58, D63-65		90
$Pf5_2$	SW2	M	D60-D61		99
	NC				
$Pf5_3$	SW2	S	A1	+	85
$Pf5_4$	SW2	S	-		90
	NC		H23		
Pc4	SW2	VS	-		98
Pc5	SW2	S	A1		98
$Pf3_1$	WIM	S	-		98
6.2 RIDGES AND FLATS (GOROKE)					
RPc4	WIM	M	F3	+	62
	SW2		B1, C1		
RPc5	WIM	M	C18	+	30
	SW2		C2, H13		
RPc6	SW2	S	-		60
PRfc4	WIM	S-M	C22		95
	SW2				
PRfc5	WIM	M	C4-5, C18, C20		95
	SW2		D28		
PRfc6	SW2	M	D3, D5-6		98
	SW1(R)		A10		
PRfc7					
PRcf5	SW2	S			65

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
6.2 RIDGES AND FLATS (GOROKE) (continued)					
PRc7					
PRf4	SW2	S-M	D45-49		95
$PRf5_1$	WIM	S-M	C2-3		97
	SW2		-		
$PRf5_2$	SW2	S-M	D2		99
$PRf5_3$	SW2	M	D11, D24-27, D29-32, D35, D40-41, H13		92
PRf6	SW2	M	D13-16, D18-21, D36-37		95
Pf5	SW2	S	D1		98
Pfz5	SW2	S	D51, D53-57, H13	+	75
6.3 LOW SILICEOUS DUNES (LITTLE DESERT)					
EPRc4	WIM	E	A1, B2, M1	+	30
EPRc5	WIM	S	A1, B1	+	3
IPRc4	WIM	VS	A1, B2	+	10
IPRc5	WIM	VS	A1	+	-
WEST VICTORIAN VOLCANIC PLAINS					
7.1 UNDULATING PLAIN					
$Pvf4_1$	M1(R)	E	-		94
$Pvf4_2$	NC	S	-		99
$Pvf4_3$	NC	S	-		100
$Pvf5_1$	BAL	VE	-		99
	COR		-		
	M1(R)		G10, M1		
$Pvf5_2$	NC	S	-		100
$Pvf5_3$	BAL	M	C6		96
	COR				
$Pvf5_4$	M1(R)	M	-		95
$Pvf5_5$	NC	VS	-		100
$Pvf5_6$	NC	S	-		100
$Pvf5_7$	NC	S	-		100
$Pvf5_8$	NC	VS	-		100
$Pvf6_1$	SW2	M	-		100
	BAL				
$Pvf6_2$	SW2	VE	-		100
	BAL		-		
	COR		C15, C17		
$Pvf6_3$	COR	E	C3		99
	SW2				
	SW1(R)				
$Pvf6_4$	SW1(R)	M-E	-		100
	SW2				
$Pvf6_5$	M1(R)	M	-		98
	COR		-		

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
7.1 UNDULATING PLAIN (continued)					
$Pvf6_5$ (cont.)	BAL		-		
	NC		C5		
$Pvf6_6$	M1(R)	M-E	-		98
$Pvf6_7$	BAL	VS	-		100
	NC				
$Pvf6_8$					
$Pvf6_9$	BAL	VS	-		100
	NC				
$Pvf6_{10}$	BAL	VS	-		100
$Pvf7_1$	SW1(R)	E	A1, B3, C12-13		60
	SW2				
	COR				
$Pvf7_2$	COR	M	-		99
	M1(R)		G17		
$Pvf7_3$	BAL	S	-		95
	M1(R)		-		
$Pvf7_4$	M1(R)	VS	-		100
$Pvf7_5$	M1(R)	S	-		97
$Pvf7_6$	M1(R)	VS	-		98
$Pvf7_7$	M1(R)	S-M	-		99
$Pvf7_8$	M1(R)	S	-		99
$Pvf7_9$	M1(R)	S	-		99
$Pvf7_{10}$	BAL	VS	-		100
$Pvf7_{11}$	M1(R)	VS	-		100
$Pvf7_{12}$	BAL	M	G4		95
	M1(R)		-		
Pvf8	BAL	S-M	-		95
	M1(R)		-		
$Pf4_1$	M1(R)	S-M	C8		96
$Pf5_1$	M1(R)	M	H4		92
	BAL		-		
	COR		G3		
$Pf5_2$	BAL	S	-		99
	COR		C10		
$Pf5_3$	COR	M	C22, C24		80
$Pf5_4$	M1(R)	S	-		60
$Pf6_1$	COR	M	C18-19, C36		95
$Pf6_2$	COR	S	C15		98
$Pf6_3$	COR	S	C23, N52		85
$Pf7_1$	COR	S-M	-		99
$Pf7_2$	COR	S	-		100
Gv5	NC	VS	-		100
$Gv6_1$	BAL	VS	-		100
	NC		-		
$Gv6_2$	BAL	VS	-		95
Gv7	BAL	VS	-		100
Gv8	M1(R)	VS	-		
$Gs5_2$	COR	VS-S	-		100
$Gg5_2$	COR	VS	-		100
$Pv7_1$	COR	VS	-		100
$Pv4_1$	NC	VS	-		100

Appendix IX (continued)

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
7.2 STONY UNDULATING PLAIN					
$Pv5_1$	COR	M-E	C6, C8, C11-13		97
	BAL		C5		
$Pv5_2$	NC	S	-		95
$Pv5_3$					
$Pv6_1$	SW2	E	B3		89
	COR				
$Pv6_2$	NC	S	-		100
$Pv6_3$	M1(R)	M	-		98
	MEL2		-		
$Pv6_4$	NC	VS	-		85
	BAL		-		
$Pv7_1$	SW1	E	C10, G4		87
	SW2		B4, C7		
	COR		C30, C33, C37		
$Pv7_2$	M1(R)	VS	-		80
$Ss6_2$	MEL2	VS	-		100
SOUTH VICTORIAN COASTAL PLAINS					
8.1 RIDGES AND FLATS (FOLLETT)					
PCfc6	SW2	M	H4		65
	SW1(R)		-		
PCfc7	SW1(R)	S	A10	+	25
PCc6	SW1(R)	M	A10, C15, G2	+	25
$PCc7_1$	SW1(R)	E	A1-2, B2, C2, C7, G3, G5	+	50
$PCc7_2$	SW1(R)	M	B4, C15, G8	+	55
PCcf7	SW1(R)	M	A1		85
Pfcl7	SW1(R)	M	-		92
	SW2		-		
$Pf6_1$					
$Pf6_2$	SW1(R)	S	-		70
$Pf6_3$	SW1(R)	S-M	G2, G8		85
Pf7	SW1(R)	M-E	B4, C6-8, C15-16		85
Gf6	SW1(R)	S	A10		95
$Gf7_1$	SW1(R)	S	-		99
$Gf7_2$	SW1(R)	S	-		85
8.2 DISSECTED PLAIN (PORT CAMPBELL)					
Pc7	COR	S	-		40
$Pcf7_1$	COR	S	-		50
$Pcf7_2$	COR	VS	A3	+	90
$Pf5_1$	COR	S	-		85
	M1(R)		G14		
$Pf5_2$	COR	S	-		99
	M1(R)		C1		

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
8.2 DISSECTED PLAIN (PORT CAMPBELL) (continued)					
$Pf5_3$	COR	S	-		100
$Pf6_1$	COR	S	-		85
$Pf6_2$	COR	S	-		100
$Pf6_3$	COR	S	C27		99
$Pf7_1$	COR	M	-		100
$Pf7_1$	COR	S	A1-2, B2	+	35
$Pf7_2$	COR	S	-		75
$Pf7_3$	COR	M	A2-3, B8, H2		95
$Pf7_4$	COR	M	B7, H10		75
$Pfc7_1$	COR	S	H12		60
$Pfc7_2$	COR	M			94
$Pfc7_3$	COR	VS	-		100
Ff6	COR	S	-		98
$Ff7_1$	COR	S	C28-29		98
$Ff7_2$	COR	M	B6, H2		75
PGf7	COR	VS	A2, H3	+	55
PGfc7	M1(R)	VS	G14	+	85
Gf5	COR	S	A4, G13		50
$Gf6_1$	M1(R)				
$Gf6_2$	COR	S	A4, H9		40
$Gf7_1$	COR	S	A4	+	10
	M1(R)				
$Gf7_2$	COR	S	A2, H11		45
$Gf7_3$	COR	S	-		75
$Gf7_4$	COR	S	-		80
$Gfc7_1$	COR	S	A5	+	35
$Gfc7_2$	COR	S	A1		60
Gfl5	M1(R)	S	-		100
Gc7	COR	S-M	A5, B5, H11	+	15
Gcf6	COR	S-M	A4	+	5
	M1(R)				
Gcf7	COR	S	A5, B5, H11	+	5
8.3 SAND AND CLAY PLAIN (MOORABBIN)					
Pf5	M1(R)	VS-S	-		88
Pf6	M1(R)	VS	-		100
Pfc5	M1(R)	S	C2		95
Pfc6	M1(R)	S	C2		96
Pvf6	M1(R)	VS	-		100
8.4 FANS AND TERRACES (WESTERN PORT)					
PCc7	MEL2	S	A12, B21, H24	+	50
PC7					
Pcf7	MEL2	M	A12, B22	+	45
$Pf7_1$	MEL2	VS	-		100
$Pf7_2$	MEL2	VS	C28, H24	+	85
$Pf7_3$	MEL2	S			100
$Pf7_4$					

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Freehold (%)
8.5 BARRIER COMPLEXES (DISCOVERY BAY/GIPPSLAND LAKES)					
Pc7	MEL2	VS	-		100
PCc4	M1(R)	VS	C7	+	10
$PCc5_1$	M1(R)	S	-		80
$PCc5_2$	SG1	S	-		-
$PCc5_3$	GLH	VS	A6	+	60
$PCc5_4$	SG1	VS	6a	+	20
$PCc5_5$	SG1	S	6a	+	15
$PCc6_1$	M1(R)	VS	G14	+	20
$PCc6_2$	M1(R)	VS	C2-4, C6	+	35
	SG1		6a		
$PCc6_3$	SG2	VS	-		-
$PCc6_4$	SG1	VS	6a	+	70
$PCc6_5$	SG1	VS	6a	+	80
$PCc7_1$	SW1(R)	M	A5, A9	+	40
	SW2		-		
	COR		A3, H5		
$PCc7_2$	SW2	VS	-	+	20
	SW1(R)		A5		
$PCc7_3$	M1(R)	VS	A4	+	25
$PCc7_4$	COR	S-M	A2	+	40
	MEL2		C18-19		
	SG2		A1, A3, A8		
$PCc7_5$	MEL2	S-M	A27	+	85
$PCc7_6$	EG(R)	M	A6, A15-16 B12, C1	+	-
$PCc7_7$	EG(R)		A6, A16, B8	+	12
$PCc7_8$					
$PCcf5_1$	SG1	VS	6a	+	70
	GLH		6a		
$PCcf5_2$	SG1	S-M	6a	+	50
	GLH		A6		
$PCcf7_1$	EG(R)	S	A6, A16, C1-2	+	20
$PCcf7_2$	SG2	M	A1, A8, C1	+	80
PCcl7	MEL2	S-M	A27	+	86
$PClc7_1$	SW1	E	A1-2, A5, B1, C2, G4	+	40
$PClc7_2$					
$PClc7_3$					
Pf6	SG2	S	A8, C4	+	55
Pf7	SG2	S-M	A1, A3, A8	+	40
Pzfc5	M1(R)	VS			100
SOUTH VICTORIAN RIVERINE PLAINS					
9.1 PRESENT FLOODPLAINS (GIPPSLAND)					
$Ff6_1$	GLH	M	-		100
$Ff6_2$	GLH	M	-		100
$Ff7_1$	MEL2	S-M	-		100
$Ff7_2$	MEL2	S-M	-		100

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Freehold (%)
9.1 PRESENT FLOODPLAINS (GIPPSLAND) (continued)					
$Ff7_3$	MEL2	M	C14		97
$Ff7_4$	MEL2	S	-		100
$Ff7_5$	MEL2	VS	-		100
$Ff7_6$	SG2	S	-		99
$Ff7_7$	MEL2	S-M	-		98
$Ff7_8$	EG(R)	E	A16, C3, F4		55
Ffc5	GLH	S	A6	+	40
	SG1		6a, 6b		
$Ffc6_1$	SG1	S	6a, 6b	+	45
	GLH		A6		
$Ffc6_2$	GLH	S	A6	+	70
	SG1		6b		
Fc5	GLH	VS	-		100
$Fc6_1$	GLH	S	-		99
$Fc6_2$	GLH	S	H9	+	80
9.2 INTERMEDIATE TERRACES (GIPPSLAND)					
$Pf6_1$	GLH	VS	-		100
$Pf6_2$	SG1	VS	-		100
	GLH				
$Pf6_3$					
$Pf6_4$	SG1	VS	-		100
	GLH				
$Pf6_5$	SG1	S	-		100
	GLH				
$Pf6_6$	SG1	S-M	-		100
	GLH				
$Pf7_1$	SG1	S-M	-		98
$Pf7_2$	SG1	S-M	-		100
Pcf6	GLH	S	A6	+	75
Ffc7	SG2	M	-		100
$Gcf7_2$	SG2	S	-		100
$Pfc7_2$	SG2	M	-		100
$PCcf5_2$	GLH	S	-		97
9.3 HIGH TERRACES AND FANS (GIPPSLAND)					
$Pf5_1$					
$Pf5_2$					
$Pf6_1$	GLH	M	A6, H9-10		90
$Pf6_2$	GLH	S	-		96
$Pf6_3$	GLH	VS	-		90
$Pf7_1$	GLH	VS	-		100
$Pf7_2$	GLH	S	-		92
	LV				
$Pf7_3$	GLH	VS	-		100
$Pf7_4$	LV	S	-		50
$Pf7_5$					
$Pf7_6$	EG(R)	VE	A6, A11-13, A16, B12-14, F4	+	5

Appendix IX (continued)

Geomorphic units and land systems	LCC area	Land system extent	Conservation reserves	Adequate rep'n	Free-hold (%)
9.3 HIGH TERRACES AND FANS (GIPPSLAND) (continued)					
$Pf7_7$	SG1	VS-S	-		95
$Pf7_8$	SG1	VS-S	-		100
$Pf7_9$	SG2	S	-		100
$Pfc6_1$	SG2	S-M	-		99
$Pfc6_2$	SG2	M	C4		99
$Pfc7_1$	SG1	M	$B^3$1		96
$Pfc7_2$	SG2	E	A3, G7, G9, G15		57
$Pfc7_3$	SG2	M	-		96
Pcf6	SG2	S-M	G11		86
	SG1		2a		
PCcf5	SG1	M	-	+	55
	GLH		A6, H5, H10		
PCc6	SG2	M	G11		79
	SG1		-		
	GLH		H5		
$PCc7_1$	SG1	M	$B^3$1	+	35
	SG2		G13		
$Gfc7_1$	SG1	M	-	+	40
	GLH		A2, A6, D4		
$Gfc7_2$	SG2	M	-	+	45
	LV		-		
	MELB2		A10, E1		
	HE				
	SG1				
$Gfc7_3$	GLH	E	H2	+	25
	EG(R)		A2, C1, F3-4		
Gf6	GLH	M	A6		98
$Gf7_1$	GLH	M	A2		54
	EG(R)				
$Gf7_2$	SG2	M	-		75
	LV				
	MELB2				
Gcf6	GLH	M-E	-		85
$Gcf7_1$	SG1	VS	-		97
$Gcf7_2$	SG2	S	A10, G10, G15		60
Gc6	SG2	M	-	+	53
	SG1		2a		
$Gc7_1$	LV	S-M	A'1	+	55
	SG1		2a		
$Gc7_2$	SG1	S	-		75
$Gc7_3$	SG1	S	$B^3$1		5
	SG2		-		
Ff7	SG2	S-M	-		85
	LV				
Ffc6	SG2	VS	C4	+	85
$Ffc7_1$	SG2	S	-		97
$Ffc7_2$	SG2	S	-		98
$Ffc7_3$					

Note:

This table was compiled from 1:500 000 series maps. Some land systems listed in the table are too small to show at this scale. Where such land systems are included above, no information on representation is provided.

Appendix X

REFERENCE AREAS

Investigation Areas, Land Systems and Status

Investigation Area	Reference area details			
	Recommendation no	Area (ha)	Land system	Status*
South-western 1 (1973)	B1	971	8.1/PCcf7 8.5/PClc7$_1$	P
	B2	728	7.1/Pvf7$_1$ 8.1/PCc7$_1$	P
	B3	384	7.1/Pvf7$_1$	UP
	B4	2 226	8.1/Pf7 8.1/PCc7$_2$ 8.1/PCc6	P
South Gippsland 1 (1973)	NA			
North-eastern 1 (1974)	B1	1 750	1.1/Sg7$_1$ 1.1/Gg7$_5$	P
	B2	1 030	1.1/Svg8$_1$ 1.1/Gg7$_5$	UP
	B3	480	1.1/Svg7$_1$	UP
	[relocated in review]			
	B4	1 390	1.1/Sgs7$_2$ 1.1/Sgs7$_1$ 1.1/Sg8$_5$	P
	B5	540	1.1/Sgs7$_2$ 1.1/Sg8$_5$	P
	B6	850	1.1/Gg7$_5$ 1.1/Sgs7$_2$	P
	B7	1 300	1.1/Sgs7$_1$ 1.1/Ffc7$_2$	P
North-eastern 2 (1974)	B1	480	1.1/Sg7$_1$	P
	B2	390	1.1/Sg7$_1$ 1.1/Ss7$_2$	P
	B3	400	1.1/Gg8$_2$ 1.1/Sg7$_1$	P
	B4	320	1.1/Sv7$_1$ 1.2/Gv8$_2$	P
Melbourne (1977)	B1	125	2.1/Pf5$_5$	P
	B2	270	2.1/Pf5$_5$ 2.1/Ss5$_6$	P
	B3	125	2.1/Gs8	P
	B4	200	2.1/Ss7$_6$	P
	B5	440	2.1/Ss6$_2$	P
	B6	360	2.1/Ss6$_2$	P
	B7	420	1.1/Sg8$_1$ 1.1/Gg8$_1$	P

Appendix X (continued)

Investigation Area	Reference area details			
	Recommendation no	Area (ha)	Land system	Status*
Melbourne (1977) (continued)	B8	1 090	1.1/Gg8$_1$ 1.1/Ss7$_3$	P
	B9	250	1.1/Ss7$_3$ 1.1/Gs8$_1$	P
	B10	100	1.1/Ss7$_1$ 1.1/Gs7$_3$	P
	B11	300	1.1/Ss7$_1$	P
	B12	240	1.1/Sv8$_1$ 1.1/Sv8$_2$	P
	B13	720	1.1/Sv8$_1$ 1.1/Sv8$_2$	P
	B14	1 050	1.1/Ss8$_2$	UP
	B15	770	1.1/Gs8$_2$ 1.1/Ss8$_2$	UP
	B16	130	1.1/Gg8$_8$	P
	B17	330	1.1/Sg8$_3$	UP
	B18	470	1.1/Ss8$_{11}$	P
	B19	80	1.3/Gg9$_4$	P
	B20	460	1.1/Gfc$_8$ 1.1/Ss8$_{11}$	P
	B21	570	8.4/PCc7	P
	B22	290	8.4/Pcf7	P
East Gippsland (1977)	B1	590	1.1/Ss7$_9$ 1.1/Sg7$_8$	UP
	[relocated in review]			
	B2	550	1.1/Ss8$_{12}$ 1.1/Gsv6	UP
	B3	1 400	1.1/Ss8$_{12}$ 1.1/Sg7$_{11}$	UP
	B4	600	1.1/Ss7$_{11}$	UP
	B5	840	1.1/Gsv6 1.1/Gsg8$_2$	UP
	[enlarged in review]			
	B6	370	1.1/Ss8$_{12}$ 1.1/Sg8$_{19}$	UP
	B7	645	1.1/Gsv$_6$ 1.1/Sg8$_{16}$	P
	[enlarged in review]			
	B8	1 000	8.5/PCc7$_7$	UP
	B9	380	1.1/Ss7$_{14}$	UP
	B10	650	1.1/Ss7$_{13}$	UP
	B11	430	1.1/Ss7$_{11}$ 1.1/Ss7$_{12}$ 1.1/Ss7$_{13}$	P
	B12	670	8.5/PCc7$_6$ 8.5/PCc7$_7$ 9.3/Pf7$_6$	UP
	B13	1 200	9.3/Pf7$_6$	P
	B14	1 000	9.3/Pf7$_6$	P

Appendix X (continued)

Investigation Area	Reference area details			
	Recommendation no	Area (ha)	Land system	Status*
Mallee (1977)	C1	1 400	5.1/RPEfc2 5.1/PREfcl2	UP
	C2	700	4.1/Ffc2 4.2/Pf2	UP
	C3	8 400	5.1/EPRcf2 5.1/RPEfc2	P
	C4	400	4.1/FWcf2	UP
	C5	1 000	5.1/EPcf2 5.2/IPc2 5.2/EPc2	UP
	C6	1 100	5.1/PYfz3	UP
	C7	1 900	5.2/IPRc3	UP
	C8	400	5.2/Ffc3	UP
	C9	900	5.2/EPRc3	P
	C10	2 500	5.2/EPRc4 5.2/IPRc4	P
North-eastern 3,4 & 5 (1977)	B1	940	$1.2/Gv8_1$ $1.2/Sv8_1$ $1.2/Gs8_1$	P
	B2	440	$1.1/Sv7_1$	P
	B3	590	$1.2/Gs8_1$ $1.1/Sv7_1$ $1.1/Pf8$ $1.2/Ss8_1$	UP
	B4	1 120	$1.1/Sg8_6$	UP
	B5	1 130	$1.1/Sg7_2$ $1.1/Sg7_3$	P
	B6	630	$1.1/Ss7_8$ $1.1/Ffc7_2$	P
Corangamite (1978)	B1	205	$3.1/Ss7_3$ $8.2/Gfc7_2$	P
	B2	370	$8.2/Pf7_2$ $3.1/Ss7_1$ $3.1/Ss7_3$	P
	B3	155	$3.1/Ss7_1$	UP
	B4	120	$3.1/Gs7$	P
	B5	340	8.2/Gc7 8.2/Gcf7	UP
	B6	300	8.2/PGf7	UP
	B7	415	$8.2/Pfc7_1$	UP
	B8	70	$8.2/Pf7_4$	P
	B9	140	$7.1/Pvf7_1$	UP
Alpine (1979)	C1	500	$1.2/Ss8_2$ $1.3/Gsv9_1$	UP
	C2	500	$1.1/Ffc7_3$ $1.1/Ss8_7$ $1.1/Ss8_3$	UP
	C3	200	$1.1/Ss8_7$ $1.1/Ffc7_3$	UP

Appendix X (continued)

Investigation Area	Reference area details			
	Recommendation no	Area (ha)	Land system	Status*
Alpine (1979) (continued)	C4	300	$1.1/Ss8_3$	UP
	C5	680	$1.1/Ss8_3$ $1.1/Ss9_1$	UP
	C6	850	$1.3/Gv9_1$ $1.1/Ss8_3$ $1.1/Ss9_1$	UP
	C7	970	$1.1/Gs8_6$ $1.1/Ss8_3$ $1.1/Ss8_7$	P
	C8	710	$1.1/Gs8_6$ $1.1/Ss8_3$ $1.1/Ss8_7$	P
	C9	650	$1.3/Gg9_1$ $1.1/Ss8_4$	P
	C10	320	$1.3/Gg9_1$	UP
	C11	250	$1.1/Sg9_1$ $1.3/Gg9_1$	UP
	C12	1 190	$1.1/Sg8_9$ $1.1/Sg8_{16}$	P
	C13	240	$1.1/Ss7_{10}$ $1.1/Gs7_9$	P
	C14	320	$1.1/Ss8_5$	UP
	C15	550	$1.1/Sg7_7$	UP
	C16	330	$1.1/Gs8_4$ $1.1/Gs8_5$	P
	C17	940	$1.3/Gs9_2$ $1.1/Ss8_8$ $1.1/Ss8_6$	UP
	C18	360	$1.1/Ss9_2$	UP
North Central (1981)	B1	200	$2.1/Ss6_1$	UP
	B2	325	$2.1/Sg4_1$ $2.1/Pf4_3$	UP
	B3	450	$2.1/Gs4_1$	P
	B4	225	$2.1/Gs4_2$	UP
	B5	500	$2.1/Ss5_4$	UP
	B6	460	$1.1/Gs5_1$	UP
South-western 2 (1982)	C1	430	6.2/RPc4	UP
	C2	700	6.2/RPc5	UP
	C3	510	2.2/Pfc7	UP
	C4	380	2.3/Pf6	P
	C5	280	2.2/Gg7	UP
	C6	675	2.2/Ss7	UP
	C7	400	$7.2/Pv7_1$	UP
South Gippsland 2 (1982)	B1	80	-	UP
	B2	770	3.5/Pfc7 $3.5/Sg7_1$	UP
	B3	750	$8.5/PCc7_4$	UP
	B4	180	$9.3/Gcf7_2$	UP

Appendix X (continued)

Investigation Area	Reference area details			
	Recommendation no	Area (ha)	Land system	Status*
South Gippsland 2 (1982) (continued)	B5	55	9.3/Pfc7$_2$ 3.4/Ss8$_1$	UP
Ballarat (1982)	B1	70	2.1/Sg7$_1$	UP
	B2	100	2.1/Ss6$_2$	UP
Gippsland Lakes Hinterland (1983)	C1	930	1.1/Ss8$_{11}$	UP
	C2	620	1.1/Ss8$_7$ 1.1/Ss7$_2$ 1.1/Ss8$_3$	UP
	C3	490	1.1/Gs7$_{11}$ 1.1/Ss7$_{11}$	UP
Murray Valley (1985)	B1	120	2.1/Gg3	UP
	B2	160	4.1/Ffc4	UP
	B3	120	4.1/Ffc4	UP
	B4	120	1.1/Gs5$_1$	UP
	B5	170	1.1/Sg6$_4$	UP
Benalla--Upper Murray Review (1986)	B14	140	1.2/Ss8$_1$	UP
	B15	90	1.1/Gs6$_2$	UP
Wimmera (1986)	B1	2 240	6.3/EPRc5	UP
	B2	3 200	6.3/EPRc4 6.3/IPRc4	UP
East Gippsland Review (1986)	B15	1 290	1.1/Sg7$_{11}$	UP

* **P :** Proclaimed under the *Reference Areas Act* 1978
UP: Not proclaimed

Appendix XI

COUNCIL RECOMMENDATIONS FOR EACH LANDSCAPE CHARACTER TYPE

Principal landscape, character type, and frame of reference	High-scenic-quality description	Council recommendations
1. Murray Basin plains		
Mallee sub-type		
Landform:	Distinctive dune formations	Wyperfeld and Hattah--Kulkyne National Parks; Pink Lakes State Park
Vegetation:	Strongly defined, diverse vegetation	Hattah--Kulkyne and Little Desert National Parks, Pink Lakes State Park
Water-form:	Any permanent water-form	Murray River, Hattah Lakes, Pink Lakes
Wimmera sub-type		
Landform:	Isolated peaks and ridges	Mt Arapiles--Tooan State Park
Vegetation:	Strongly-defined patterns, diversity, contrast	Many wildlife, lake, bushland, and road reserves
Water-form:	Any permanent water-form	Wildlife, lake reserves
Northern District plains sub-type		
Landform:	Isolated peaks or ranges	Warby Range and Terrick Terrick State Parks

Vegetation:	Diversity of species, height and density	Echuca Regional Park, various road and streamside reserves, highway parks
Water-form:		Lakes Marmal, Boort, and Moodemere, River Murray Reserve, Echuca Regional Park
2. Western plains		
Landform:	Volcanic cones, craters, craggy peaks, ridges rising from plain with near-vertical walls	Lower Glenelg and Mount Richardson National Parks, Dergholm State Park; isolated peaks or ranges; gorges; Tower Hill Geological Monument
Vegetation:	Strongly defined patterns, eucalypt forest, scattered conifers, riparian vegetation	Carlisle State Park, various bushland reserves, road reserves
Water-form:		Various lake reserves, streamside reserves
3. Southern lowlands		
Landform:	Isolated peaks, distinctive gorges, or deep valleys with steep sides	Lake Tyers--Nowa Nowa, Mitchell River, Holey Plains State Park, various natural features zones, various natural features and scenic reserves
Vegetation:	Strongly dissected patterns; unique specimen stands	Various bushland and streamside reserves
Water-form:	Lakes, reservoirs, etc.	Gippsland Lakes Reserve, streamside reserves, various wildlife reserves

Appendix XI (continued)

Principal landscape, character type, and frame of reference	High-scenic-quality description	Council recommendations
4. West central hills		
Landform:	Isolated peaks, ranges, hills or cones; sharp peaks and/or sharply serrated ridges; rock outcrops or boulders, well-defined, steep-sided valley gorges	Kara Kara, Kooyora, Langi Ghiran, and Mt Buangor State Parks; Mt Alexander, One Tree Hill, and Eaglehawk Regional Parks; geological reserves
Vegetation:	Strongly defined patterns of combinations of eucalypt, streamside vegetation, and scattered exotics; unique stands of vegetation form, colour, texture, and spacing	Reference areas and flora reserves such as Mt Erip, Ben Major, Inverleigh and Mt Warrenheip; various bushland reserves, and roadside conservation highway parks
Water-form:	Lakes, reserves, rivers, streams, and swamps	Various streamside reserves, lake reserves such as Salt Lakes, Lakes Colac, Burrumbeet, and Learmonth; sections of Wimmera River, Avoca River, Campaspe River in streamside reserves
5. Foothills		
Landform:	Sharp peaks and/or ridges; isolat- peaks or with distinctive forms; well-defined 'V'-shaped valleys; large rock faces or rocks dominating the surrounding landscape	Part of Croajingolong National Park; Lind, Alfred, Coopracambra--Kaye, Mt Burrowa--Pine Mountain, Mt Barlow National Parks; part of Lake Tyers State Park; Mts Samaria, Granya, and Lawson; Lerderderg, Kinglake, Cathedral Range, Eildon State Parks; and You Yangs, Steiglitz, Macedon, Dandenongs and Tyers, Beechworth, and Baranduda Range Regional Parks

Vegetation:	Strongly defined patterns, resulting from combinations of eucalypt forest, open grassland, and scattered conifers	Bunyip State Park; Hepburn, Yea River, and Fraser Regional Parks; various flora reserves and bushland reserves
Water-form:	Major streams, lakes, and reservoirs	Glenmaggie Regional Park, various streamside reserves, Wodonga Regional Park, and various wildlife reserves
6. Eastern highlands		
Landform:	Peaks or plateaux with distinctive form and colour; distinctive razorbacks, ridges; sharply defined 'V' valleys, unusual in gorge, depth, etc; massive rock outcrops, boulders	Tingaringy, Snowy, Coopracambra--Kaye, Errinundra Plateau, Wonnangatta--Moroka, Bogong, and Baw Baw National Parks; Alpine Park additions, various natural features and scenic reserves
Vegetation:	Strongly defined patterns of combinations of eucalypt forest, alpine meadows, water-associated vegetation, bare soil, and rock forms; seasonal colour, distinctive vegetation unusual in density, growth, habitat, etc.	Various national parks as listed above, various flora and flora and fauna reserves
Water-form:	Major streams or portions of other streams with flow character such as falls, rapids, cascascades; bogs and lakes	Various natural features zones, various streamside reserves; sections of various national parks as listed above
7. Western highlands		
Landform:	Steep, exposed slopes over 30°, with uneven peaks and serrated ridges; deep gorges with near-vertical walls and/or irregular	Grampians National Park, Black Range State Park

Principal landscape, character type, and frame of reference	High-scenic-quality description	Council recommendations
7. Western highlands (continued)		
Landform: (continued)	configuration; massive rock outcrops or exposed cliffs; large feature landforms that are highly dominant	
Vegetation:	Strongly defined patterns resulting from combinations of patterns, eucalypt forest, conifers, and treeless areas	Grampians National Park, Black Range State Park, various flora reserves - e.g., H5 in Parish of Moyston, H6 in Parish of Ballawin
Water-form:	Streams, lakes, reservoirs, swamps	Various wildlife reserves, e.g. Mount William Swamp, Lake Muirhead, various water-production areas - e.g., Wartook Reservoir, Lake Bellfield, etc.; various public-land water frontages and stream-side reserves
8. Southern uplands		
Landform:	Large rock outcrops; isolated peaks, focal points	Cape Otway and Western Entrance National Parks and Angahook--Lorne State Park
Vegetation:	Distinctive stands of vegetation	Cape Otway National Park, Carlisle and Tarra Valley--Bulga State Parks, Mt Worth Regional Park, Cooks Gully, Yerang Park, and Mulundung Flora Reserves
Water-form	Permanent streams, lake, or reserve	Cape Otway National Park, Angahook--Lorne State Park, Mirboo and Mt Wilson Regional Parks, Barwon Forest Hardwood Production

9. Coastline

Landform:	Rock stacks, cliffs, sandy beaches, rocky islands, distinctive focal points; peaks, steep gorges, or ridges	Port Campbell, Cape Otway, Western Entrance, Wilsons Promontory, Croajingolong National Parks; Angahook--Lorne and Lake Tyers, State Parks; Discovery Bay, Bay of Islands, Point Lonsdale Wildlife Co-op Scenic, Venus Bay--Waratah Bay and Sydenham Inlet--Cape Conran Coastal Parks; Cape Schank--Arthurs Seat Regional Park; Scenic Coast-line - Warrnambool to Lorne, Lorne to Point Road-knight, Point Addis to Bells Beach, Point Nepean to West Head, Flinders to Griffith Point, Kilkunda, San Remo to Black Head, McLoughlin's Beach--Seaspray, Lakes Entrance to Lake Tyers, Corringle Creek to Pearl Point, Tamboon Inlet to Mallacoota, Cape Howe, Cape Patterson to Entrance Point; Gippsland Lakes Coastal Reserves; Lady Julia Percy Island Wildlife Reserve
Landform (continued)		
Vegetation:	Strongly defined patterns of various communities, unusual seasonal colour wind-shaped form, unusual to surrounding vegetation	Cape Otway and Wilsons Promontory National Parks; Venus Bay--Waratah Bay Coastal Park; Lake Tyers State Park
Water-form:	Unusual shoreline fresh-water flow characteristic	Port Campbell; Cape Otway; Wilsons Promontory National Park; Discovery Bay Coastal Park

Appendix XII

PROVISION FOR RECREATION ACTIVITIES IN COUNCIL RECOMMENDATIONS

Table 1 combines various recreation activities into a hierarchy of recreation groups, with descriptions of their requirements from public land. Recreation uses within each group are broadly compatible or have a similar degree of requirement for natural surroundings. Uses in higher-numbered groups can be carried out in lower-numbered locations, although the surroundings may not be as pleasant. The absence of a recreation use from a higher-numbered group indicates that it is considered incompatible with other uses in that group, or with maintenance of surroundings.

Table 1

RECREATION USES AND GROUPS

Recreation group	Description	Recreation uses (examples)
1	High-intensity formal or spectator-sport forms of recreation, requiring constructed playing-fields, runs, ranges, or tracks, with natural surroundings being secondary.	Football/cricket/soccer grounds Downhill skiing Horse-racing Caravan parks Rifle/pistol ranges Car-racing
2	Organized, active, intensive, or high-impact forms of recreation, carried out in natural surroundings but requiring or causing substantial modification to the environment. This includes all motorized recreational vehicle use and all forms of recreation that harvest or extract resources from public land.	Motorized recreation, including four-wheel-drive vehicle use, car rallies, and other recreational-vehicle use (subject to specification of areas) Hunting (firearm) of ducks, deer, and vermin Fossicking Prospecting Eductor dredging (specified streams) Youth camps Deer-stalking Horseriding Pleasure driving (on surfaced roads) Landscape appreciation Picnicking Sailing Power-boating Appreciation of natural surroundings Appreciation of historical features Extensive camping Angling Bushwalking Rogaining Bow-hunting Commercial tours
3	Informal or low-intensity recreation, with development of picnic, barbecue, camping or other facilities where appropriate. While the intensity of recreation is low, the numbers of people using the facilities are high. In larger areas the facilities would be located at points within well-accessed natural surroundings.	Landscape appreciation Informal recreation Pleasure driving (on formed roads Picnicking (designated sites) Appreciation of natural surroundings Appreciation of historical features Camping (developed sites) Angling Walking Bow-hunting
4	Passive or low-impact forms of recreation, with limited or no development of facilities, intended for use by a few people at a time.	Appreciation of flora and fauna Picnicking (natural surroundings) Camping (designated sites) Walking Bushwalking Cross-country skiing Angling Canoeing Appreciation of historical features

Table 1 (continued)

Recreation group	*Description*	*Recreation uses (examples)*
5	Recreation only where this is associated with the natural environment, such as appreciation of flora and fauna, solitude, or wilderness.	Appreciation of flora and fauna Wilderness experience Solitude Walking Bushwalking Extensive camping
6	No recreation permitted.	—

Table 2 shows the Council's land use categories, extracts relating to recreation from the wording of typical recommendations for each category, and the relevant recreation group from Table 1. As both tables illustrate, the Council has provided either specifically or broadly for the complete range of recreation activities, and has made recommendations supporting the recreational use of most public land, while guiding particular recreation types to areas where they will not conflict with other recreation forms or other recommended land uses. This table shows that in large areas of State forest or large parks, several intensities of recreation may be appropriate. In such areas the Council has recommended that the relevant land manager determine the detailed mixture of recreation opportunities through the preparation of management plans.

Table 2

COUNCIL RECOMMENDATIONS AND RECREATION GROUPS

Recommendation category	Extracts from recommendations relating to recreation	Recreation group (see Table 1)
Recreation reserves		1
Alpine resorts		1
Lake reserves	Water-based recreation	2
Wildlife reserve hunting		2
State forest	Open-space recreation (including hunting)	2,3,4 (subject to location, road closures, specification of streams, hunting season, or other limitation)
Coastal reserves		3
Scenic reserves	Opportunities for recreation	3

Table 2 (continued)

Recommendation category	Extracts from recommendations relating to recreation	Recreation group (see Table 1)
Streamside reserves	Passive recreation such as picnicking, walking, and angling	3
Multi-purpose parks	Informal recreation; able to be used by large numbers of people	3
Road reserves		3 (majority of roads, roadside picnic areas)
		4 (unused road reserves, specified roads with significant species)
Regional parks	Informal recreation; able to be used by large numbers of people	3 (bulk of park area)
		4 (areas with significant species in some parks)
Natural features and scenic reserves	Opportunities for recreation	3,4 (depending on access and occurrence of rare plants)
Public land water-frontage reserves	Low-intensity recreation	4
Historic reserves	Recreation associated with the history of a locality (development of recreational facilities would be minimal)	4
Historic areas	Recreation associated with the enjoyment and understanding of the history of an area	3,4 (depending on access, safety, and degree of interpretation provided at the site)
Bushland reserves	Passive recreation such as picnicking and walking	4

Table 2 (continued)

Recommendation category	Extracts from recommendations relating to recreation	Recreation group (see Table 1)
Flora and flora and fauna reserves	Passive recreation such as nature study picnicking	4
Wildlife reserves	Recreation only where this does not conflict with the conservation of the habitat of native animals	5 (sanctuaries, others in non-hunting period)
Coastal parks		5/3
Wilderness areas	Solitude and unconfined forms of recreation (without vehicles) in unmodified natural environments, subject to control of the numbers of people	5
National and State parks	Recreation associated with the enjoyment and understanding of natural environments	5 (bulk of park area)
		4 (designated remote camp-sites, walking tracks, cross-country ski trails)
		3 (developed camping areas, picnic areas, scenic drives)
Water production	Use for water-supply purposes	6 (buffer strips etc.)
Reference areas	Maintenance of natural ecosystems as a reference	6

Appendix XIII

RECREATION SETTINGS

The Department of Conservation, Forests and Lands has developed a recreation planning method to identify the variety of recreation 'settings' available, particularly on a regional basis. This method involves the identification of five classes of recreation-opportunity setting, based on access, facilities, level of use, and management criteria (CF&L 1985a). The settings range from 'remote' through to 'developed'.

Class I **Remote**

Essentially unmodified environments of large size where interaction between users is very low and evidence of other users is minimal. Evidence of restrictions and controls is absent. Motorized access by the public is not permitted. The recreation emphasis is on tranquility and self-reliance. Such areas offer a high degree of challenge and risk opportunity.

Class II **Semi-remote**

Predominantly natural or natural-looking environments of moderate to large size. Interaction between users is low, but there may be evidence of other users. Minimum on-site controls and restrictions are obvious. Limited vehicle tracks exist, for vehicle access if permitted. Probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance is high to moderate. Such areas offer a moderate degree of challenge and risk.

Class III **Roaded natural**

Natural-looking environments with moderate evidence of the sights and sounds of humans. Interaction between users may be low to moderate, but evidence of other users is prevalent. Opportunities for both motorized and non-motorized forms of recreation are available with a high degree of interaction with the natural environment. Impressions of nature are not dominated by modifications and recreation facilities.

Class IV **Semi-developed**

Substantially modified natural environments. Sights and sounds of humans are readily evident, and interaction between users is often moderate to high. Includes facilities designed for use by large numbers of people and those provided for special activities.

Class V Developed

Substantially urbanized environments, although the background may have natural-looking elements. Vegetative cover is often exotic and usually heavily managed. Sights and sounds of humans are predominant and large numbers of users can be expected. Opportunities for competitive and spectator sports and for passive uses are common.

Table 1 shows recreation opportunity settings for relevant recommendation categories of the Council, and indicates the probability of finding each setting on land in each category.

The Department of Conservation, Forests and Lands has recently undertaken an assessment (based on the Department's 18 administrative regions) of the availability of recreation opportunities on all public land in each region. The provisional findings of this assessment are given in Table 2, and indicate that the regions have varying percentages of each recreation opportunity class.

Table 1

RECREATION OPPORTUNITY SETTINGS IN VARIOUS *LAND USE CATEGORIES*

Recreation opportunity settings					
Land use category	Remote	Semi-remote	Roaded natural	Semi-developed	Developed
National park	****	***	**	*	n/a
State park	****	***	**	*	n/a
State forest	***	***	****	**	*
Coastal	****	***	***	**	**
Wilderness	****	n/a	n/a	n/a	n/a
Historic	n/a	***	****	***	**
Regional	n/a	**	***	****	***
Scenic	n/a	**	****	***	***
Flora/fauna wildlife	**	****	n/a	n/a	n/a
Game	n/a	**	****	**	n/a
Marine	****	***	**	**	*
Miscellaneous	n/a	**	***	***	****

Note:

Probability of finding the recreation opportunity in a particular category of park or reserve:

**** Very high
*** High
** Medium
* Low
n/a Not usually applicable

Table 2

RECREATION OPPORTUNITIES ON PUBLIC LAND
(number of parks within each CF&L region)

Region	Remote	Semi-remote	Roaded natural	Semi-developed	Developed
Alexandra	0	7	19	12	0
Bairnsdale	1	14	16	5	2
Ballarat	0	4	13	16	1
Benalla	0	2	5	6	0
Bendigo	0	4	31	18	0
Central Gippsland	3	6	18	8	3
Colac	0	4	34	11	2
Dandenong	0	3	24	29	5
Geelong	0	8	16	15	3
Horsham	1	2	8	7	0
Melbourne	0	1	5	4	7
Mildura	2	7	17	2	1
North-east	3	10	21	12	0
Orbost	4	6	13	6	1
Portland	1	9	34	13	0
Yarram	1	7	15	10	3

The estimation of different recreation settings on public land in Victoria shows that the largest proportion of the State's public land is available for recreation in 'roaded natural' settings, with quite extensive areas also providing 'semi-remote' and 'semi-developed' settings (see Figure 10, chapter 14).

It is not surprising that 'developed' settings make up only a small proportion of the State's public land. These settings require considerable investment in terms of facility provision, maintenance, and visitor infrastructure, and so facilities are usually located in townships. Since such locations are often those most heavily used and the majority of visitors wish only to travel short distances, settings of this nature are common in resort towns and other urban areas. As there is generally little need for their provision on public land, however, they are not considered in detail by Council.

Caravan parks, motels etc, located on freehold land all contribute to the total availability of developed settings for recreation in Victoria.

Appendix XIV

COUNCIL'S WATER PRODUCTION RECOMMENDATIONS

KEY:

Abbreviations for catchment status:

-	- not proclaimed
P	- proclaimed
LUN	- has a land use notice
LUD	- has a land use determination
P, LUN	- catchment proclaimed, part has a land use notice
-,P	- part catchment proclaimed, part not proclaimed

Abbreviations for investigation needs:

-	- no perceived need
P	- proclamation investigation needed
LUD	- land use determination investigation needed
LUD(R)	- review of existing LUD needed
*	- investigation in progress

These 'investigation needs' are notional, being based on one step up from the present catchment status. Appendix XV lists all the catchments shown as having an investigation need for proclamation (P), and shows their order of priority for investi-gation.

Other abbreviations used:

RWC	- Rural Water Commission
SECV	- State Electricity Commission of Victoria
LVW&SB	- Latrobe Valley Water and Sewerage Board

Appendix XIV (continued)

LCC area	LCC rec. number	Offtake name	Supply for	Catchment status	Name of catchment	Investigation needs	Number on Map 14
South Gippsland 1 1973	-	Merriman Creek	Seaspray	-	-	P	-
	-	Seaspray Bores	Seaspray	-	-	P	-
South-western 1, 1973, and Review, 1983	D1	Drajurk (Tullich) Bores	Casterton	-	-	P	-
	D2	Weecurra Bores	Merino	P	Merino	LUD	88
	-	Heywood Bore	Heywood	-	-	P	-
	-	Portland Bores	Portland	-	-	P	-
North-eastern 1 1973 and North-eastern 2 1974 - see North-eastern (Benalla--Upper Murray) Review 1986							
Mallee 1976	-	Cowangie Bore	Cowangie	-	-	P	-
	-	Murrayville Bore	Murrayville	-	-	P	-
East Gippsland 1977	D1	Rocky River	Orbost	LUD	Rocky River	-	27
	D2	Cann River	Cann River	P	Cann River	LUD	48
	D3	Betka River	Mallacoota	P	Betka River	LUD	42
Melbourne 1977	D1	Tylden Reservoirs	Kyneton	LUD	Kyneton	LUD (R)	15C
	D2	Kitty English and Bowden Rd	Macedon	LUD	Macedon	LUD (R)	14
	D3	Macedon Offtakes	Woodend	LUD	Woodend	LUD (R)	12
	D4	Turritable Creek Offtake	Mt Macedon	LUD	Mt Macedon	LUD (R)	13
	D5	Stony Reservoir	Macedon	LUD	Macedon	LUD (R)	14
	D6	Stony Creek	Mount Macedon	LUD	Mt Macedon	LUD (R)	13
	D7	Smokers and Falls Creeks	Woodend	LUD	Woodend	LUD (R)	12
	D8	Barringo Creek	Sunbury--Gisborne	LUD	Gisborne--Sunbury	LUD (R)	9
	D9	Main Creek	Riddells Creek	LUD	Riddells Creek	LUD (R)	8
	D10	Charlies Creek	Sunbury	LUD	Sunbury	LUD (R)	17
	D11	Main Creek	Sunbury	LUD	Sunbury	LUD (R)	17
	D12	Garden Hut Creek	Lancefield	LUD	Lancefield	LUD (R)	10

D13	Bolinda Creek	Romsey	LUD	Romsey	LUD (R)	11
D14	Bolinda Creek	Sunbury	LUD	Sunbury	LUD (R)	17
D15	Hazel and Harpers Creeks	Kilmore	LUD	Kilmore	LUD (R)*	20
D16	Goodmans Creek	RWC	LUD	L. Merrimu	-	34
D17	Merrimu Reservoir	RWC	LUD	L. Merrimu	-	28
D18	Djerriwarrah Reservoir	Melton	LUD	Djerriwarrh	-	18
D19	Micks Creek	Healesville	LUD	Micks Creek	-	40
D20	Bunyip River	Mornington Peninsula	LUD	Bunyip River	-	21
D21	Upper Tarago	Warragul	LUD	Tarago River	-	32
D22	Tarago Reservoir	Mornington Peninsula	LUD	Tarago River	-	32
D23	Healesville Offtake	Healesville	LUD	Healesville	LUD (R)	24
D24	McCraes Creek	Gembrook) Cockatoo) Emerald)	LUD	McCraes Ck	-	29
D25	Thomson River	1 and 2	LUD	Thomson R (1&2)	LUD (R)*	43
D26	Trigger Creek	Erica	LUD	Tyers R	-	19
D27	Moondarra Reservoir	LVW&SB	LUD	Tyers R	-	19
D28	Jim Crow Creek	Newstead	P	Cairn Curran	LUD	16
-	Trentham Bore	Trentham	-	-	P	-
D29	Wombat Reservoir	Daylesford	P	Cairn Curran	LUD*	16
D30	Bullarto Reservoir	Daylesford	P	Cairn Curran	LUD*	16
D31	Coliban River	Malmsbury	P	Eppalock	LUD	15
D32	Malmsbury Reservoir	RWC	P	Eppalock	LUD	15
D33	Lauriston Reservoir	RWC	P	Eppalock	LUD	15
D34	Upper Coliban Reservoir	RWC	P	Eppalock	LUD	15
-	Newham Parish	-	LUD	Eppalock	LUD (R)	15A
D35	Rosslynne Reservoir	RWC	LUD	Rosslynne Res.	-	37
-	Woodend Bore	Woodend	-	-	P	-
D36	Mollison Creek	Pyalong	P	Mollison Creek	LUD	89
D37	Goulburn River	Seymour	-	-	P	-
D38	Falls Creek	Seymour, Trawool	-	-	P	-
D39	Sunday Creek	Broadford	P	Sunday Creek	LUD*	85
D40	Hellhole Creek	MMBW	-	-	P	-
D41	Mud Creek	MMBW	-	-	P	-

Appendix XIV (continued)

LCC area	LCC rec. number	Offtake name	Supply for	Catchment status	Name of catchment	Investigation needs	Number on Map 14
Melbourne 1977 (continued)	D42	Stony Creek	MMBW	-	-	P	-
	D43	Silver Creek	MMBW	-	-	P	-
	D44	Wallaby Creek	MMBW	-	-	P	-
	D45	Yea River	Yea	-	-	P	-
	D46	Goulburn River	Alexandra	-, P	-, Upper Goulburn	P	-
	D47	Rubicon River	Thornton	-	-	P	-
	D48	Lake Eildon	RWC	LUD, P	Upper Goulburn	LUD	4A, 4
	D49	Delatite River	Mansfield	LUD	Upper Delatite	-	48
	D50	Moorabool River	Bannockburn	P	Moorabool R.	LUD	50
	D51	Stony Creek	Geelong	LUD	Stony Creek	-	51
	D52	Bostock Reservoir	Geelong	P	Moorabool R.	LUD	50
	D53	Korweinguboora Reservoir	Geelong	P	Moorabool R.	LUD	50
	-	Gordon Bore	Gordon, Mt. Egerton	-	-	P	-
	D54	Colbrook Reservoir	Ballan	-	Pykes Creek	P	-
	-	Ballan Bore	Ballan	-	-	P	-
	D55	Pykes Creek Reservoir	RWC	-	-	P	-
	D56	Lerderderg River	RWC	P	L. Merrimu	LUD	44
	D57	Melton Reservoir	RWC	-, P	(Various)	P	-
	-	Parwan Creek	-	P	Parwan	LUD	3
	D58	Yan Yean Reservoir	MMBW	-	-	P	-
	D59	Running Creek	Hurstbridge	P	Running Creek	LUD	49
	D60	Toorourrong Reservoir	MMBW	-	-	P	-
	D61	Yering Weir	MMBW	-	Lower Yarra	P	-
	-	Steavenson River	Buxton	-	-	P	-
	D62	Beauty Spot	Marysville	-	-	P	-
	D63	Steavenson River	Marysville	-	-	P	-
	D64	Labertouche Creek	Drouin	P	Drouin	LUD	31
	D65	Beaconsfield Reservoir	RWC	-	-	P	-
	D66	Lysterfield Reservoir	NP&WD	-	-	-	-
	D67	Donnellys Creek	MMBW	-	-	P	-
	D68	Sawpit Creek	MMBW	-	-	P	-

D69	Maroondah Reservoir	MMBW	-	-	P	-
D70	Grace Burn Creek	MMBW	-	-	P	-
D71	Coranderrk Creek	MMBW	-	-	P	-
D72	Don River	Woori Yallock/ Launching Place	-	-	P	-
D73	Yannanthan Creek	Warburton	-	-	P	-
D74	Cement Creek	MMBW	-	-	P	-
D75	O'Shannassy Reservoir	MMBW	-	-	P	-
D76	Armstrong Ck (West)	MMBW	-	-	P	-
D77	Armstrong Ck (East)	MMBW	-	-	P	-
D78	Upper Yarra Reservoir	MMBW	-	-	P	-
D79	McMahons Creek	MMBW	-	-	P	-
D80	Starvation Creek	MMBW	-	-	P	-
D81	Four Mile Creek	Warburton	-	-	P	-
D82	Britannia Creek	Yarra Junction	P	Britannia Creek	LUD	64
D83	Deep Creek	Noojee	-	-	P	-
D84	Brewery Creek	Woods Point	P	Upper Goulburn	LUD	4
D85	Thomson (Stage 3)	MMBW	P	Thomson (Stage 3)	LUD*	76
-	Blue Rock Reservoir	RWC	LUD	Tanjil	-	62
-	Tanjil R (Moe)	Moe	LUD	Tanjil	-	62
D86	Bunyip River	Koo-wee-rup	-	-	P	-
-	Lang Lang Bore	Lang Lang	-	-	P	-
D87	Tennent Creek Reservoir	RWC	P	Tennent Creek	LUD	54
D88	Lance Creek Reservoir	RWC	P	Lance Creek	LUD	53
D89	Bellview and Ness Creeks	Korumburra	P	Bellview Creek etc	LUD	93
-	Little Bass River	Poowong--Loch	P	Little Bass R.	LUD	92
D90	Ruby Creek	Leongatha	P	Ruby Creek	LUD	94
D91	Rollo Creek	Yarragon	P	Rollo Creek	LUD	71
-	Yarragon Bore	Yarragon	-	-	P	-
D92	Sunny Creek	Trafalgar	P	Sunny Creek	LUD	68
-	Trafalgar Bore	Trafalgar	-	-	P	-
D93	Narracan Creek	Moe	P	Narracan Creek	LUD	66
D94	Little Narracan Creek	Thorpdale	P	Narracan Creek	LUD	66
D95	Yallourn Storage	SECV	-	-	-	-

Appendix XIV (continued)

LCC area	LCC rec. number	Offtake name	Supply for	Catchment status	Name of catchment	Investigation needs	Number on Map 14
North-eastern, 3, 4, and 5 1977	D1	Fifteen Mile Creek	Glenrowan	P	15 Mile Creek	LUD	8†
	D2	King River	Moyhu	P	Ovens R. (Wang)	LUD	98
	D3	Jessies Creek	Whitfield	P	Ovens R. (Wang)	LUD	98
	D4	Lake William Hovell	RWC	P	King R (L.W.H.)	LUD	58
	D6	Buffalo Creek	Myrtleford	-	-	P	-
	D7	Lake Buffalo	RWC	P	Buffalo River	LUD	86
	-	Buckland River	Porepunkah	P	Buckland River	LUD	59
	-	Harrietville Offtake	Harrietville	P	Ovens R. (Bright)	LUD	83
	D8	Bakers Creek	Bright	P	Bakers Gully	LUD	56
	D9	Ovens River	Bright	P	Ovens R. (Bright)	LUD	83
Corangamite 1978	D1	Upper Barwon	Geelong	LUD	Upper Barwon	LUD (R)*	2
	D2	South Otway Pump 2	Warrnambool etc	LUD	Gellibrand (SO)	-	61
	D3	South Otway Pump 1	Warrnambool etc	LUD	Gellibrand (SO)	-	61
	D4	Gellibrand Pump	Warrnambool etc	LUD	Gellibrand	-	35
	D5	Gellibrand Pump	Warrnambool etc	LUD	Gellibrand	-	35
	D6	Arkins Creek	Warrnambool etc	LUD	Gellibrand	-	35
	D7	West Gellibrand Dam	Colac	LUD	Gellibrand	-	35
	D8	Olangolah Weir	Colac	LUD	Gellibrand	-	35
	D9	West Barham River	Apollo Bay	P	West Barham	LUD	73
	D11	Skenes Creek	Skenes Creek	LUD	Skenes Creek	-	69
	D12	Allen Reservoir	Lorne	P	Lorne	LUD	23
	D13	Erskine River	Lorne	P	Lorne	LUD	23
	D14	Barramunga Creek Pump	Geelong	LUD	Gellibrand	-	35
	D15	Lardner Creek	Gellibrand	LUD	Gellibrand	-	35
	D16	Goslings Creek		)	Pennyroyal,	)	
	D17	Matthews Creek	Geelong	P)	Matthews, and	) LUD*	67
	D18	Pennyroyal Creek		)	Goslings Creeks	)	
	-	Mortlake Spring and Bore	Mortlake	-	-	P	-
	-	Port Campbell Bore	Pt. Campbell, Timboon	-	-	P	-
	-	Port Fairy Bores	Port Fairy	-	-	P	-

	-	Penshurst Spring and Bore	Penshurst	-	-	P	-
	-	Eureka Creek	Glenthompson	-	-	P	-
	-	Peterborough Bore	Peterborough	-	-	P	-
	-	Caramut Spring and Bore	Caramut	-	-	P	-
		Koroit Bore	Koroit	-	-	P	-
	D23	Barwon Downs Bore	Geelong etc.	-	-	P*	-
Alpine 1979, 1983	E1	Mount Tabor Creek	Dartmouth	LUN	Hume	LUD	1A
	E2	Dartmouth Reservoir	RWC	LUN, P	Hume	LUD	1A, 1
	-	E. Kiewa system	SECV	LUD, P	Upper Kiewa	LUD	25A, 25
	E3	W. Kiewa	Mt Beauty	P	Upper Kiewa	LUD	25
	E3	Simmonds Creek	Mt Beauty	P	Upper Kiewa	LUD	25
	E4	Livingstone Creek	Omeo	P	Hume	LUD	1
	E5	Tambo River	Swifts Creek	P	Tambo	LUD	77
North Central Area 1981	D1	Lake Eppalock	RWC	LUD, P	Eppalock	LUD	15B
	D2	Sugarloaf Reservoir	Avoca	LUD	Avoca	-	46
	D3	Lead Reservoir	Avoca	LUD	Avoca	-	46
	-	Avoca Bore	Avoca	-	-	P	-
	D4	Landsborough Reservoir	Landsborough	LUD	Wimmera (Malakoff)	-	7A
	-	Forest Creek	Amphitheatre	-	-	P	-
	D5	Redbank Reservoir	Redbank	-	-	P	-
	-	Teddington Reservoir	Stuart Mill	-	-	P	-
	D6	Bealiba Reservoir	Bealiba	P	Bealiba	LUD	72
	D7	Evansford Reservoir	Maryborough	P	McCallums Creek	LUD	74
	D8	Mosquito Flat Reservoir	Tullaroop	P	Tullaroop Res.	LUD	65
	D9	Tullaroop Reservoir	RWC	P	Tullaroop Res.	LUD	65
	D10	Cairn Curran Reservoir	RWC	LUN, P	Cairn Curran	LUD	16A
	D11	Laanecoorie Reservoir	RWC, Dunolly	P	Laanecoorie	LUD	87
	D12	Loddon River Pump	Korong	P, -	Laanecoorie	P	-
	D13	Campaspe River Pump	Axedale	P, -	Eppalock	P	-
	D14	Caledonia Reservoir	Heathcote	P	Eppalock	LUD	15
	D15	Tooborac Reservoir	Tooborac	P	Eppalock	LUD	15
	D16	Campaspe River Pump	Goornong	P, -	Eppalock	LUD	15
	D17	Goulburn River Pump	Murchison	P, -	Upper Goulburn	P	-

Appendix XIV (continued)

LCC area	LCC rec. number	Offtake name	Supply for	Catchment status	Name of catchment	Investigation needs	Number on Map 14
North Central Area 1981 (continued)	D18	Loddon Weir	RWC	P, -	Laanecoorie	P	-
	D19	Spring Gully Reservoir	Bendigo	-	-	P	-
	D20	Crusoe, No 7 and Big Hill Reservoirs	Bendigo	-	-	P	-
	D21	Sandhurst Storage	Bendigo	-	-	P	-
	D47	Elmore Bores	Elmore	-	-	P	-
Ballarat 1982	D1	Langi Ghiran Reservoir	Ararat	-	-	P*	-
	D2	Hickmans Creek	Elmhurst	P	Wimmera	LUD	7
	D3	Mt Cole Reservoir	Ararat	P	Wimmera	LUD	7
	D4	Fiery Creek	Beaufort	-	-	P*	-
	-	McLeod Creek	Buangor	P	Wimmera	LUD	7
	D5	Doctors Creek Reservoir	Lexton	P	Laanecoorie	LUD	87
	D6	Talbot Reservoir	Talbot	P	McCallum Creek	LUD	74
	D7	Evansford	Maryborough	P	McCallum Creek	LUD	74
	D8	Musical Gully Reservoir	Beaufort	-	-	P*	-
	D9	Troys Reservoir	Beaufort	-	-	P*	-
	D10	Waterloo Reservoir	-	P	Trawalla Creek	LUD	-
	D11	Hepburn Lagoon	RWC	P	Cairn Curran	LUD	16
	D12	Newlyn Reservoir	RWC	P	Tullaroop	LUD	65
	D13	Cosgrave Reservoir	Creswick	P	Creswick	LUD	57
	D14	Russells Reservoir	Creswick	P	Creswick	LUD	57
	D15	Dean Reservoir	Creswick	P	Creswick	LUD	57
	D16	White Swan Reservoir	Ballarat	P	Ballarat	LUD	63
	D17	Gong Gong Reservoir	Ballarat	P	Ballarat	LUD	63
	D18	Kirks Reservoir	Ballarat	P	Ballarat	LUD	63
	D19	Pincotts Reservoir	Ballarat	P	Ballarat	LUD	63
	D20	Beales Reservoir	Ballarat	P	Ballarat	LUD	63
	D21	Wilsons Reservoir	Ballarat	P	Ballarat	LUD	63
	D22	Moorabool Reservoir	Ballarat	P	Ballarat	LUD	63
	D23	Korweinguboora	Geelong	P	Moorabool	LUD	50

	D24	St. Enochs Spring	Skipton	-	-	P	-
	D25	Lal Lal Reservoir	Ballarat,	P, LUN	Lal Lal	LUD	41, 41A
			Geelong	P, LUN	Lal Lal	LUD	41, 41A
	D28	Waubra Bore	Waubra	-	-	P	-
	D30	Learmonth Bores	Learmonth	-	-	P	-
	-	Mininera Bore	Mininera	-	-	P	-
	D53	Streatham Bore	Streatham	-	-	P	-
South Gippsland 2 1982							
	D1	Little Morwell River	Mirboo North	LUD	Mirboo North	-	26
	D2	Billy Creek	Morwell	LUD	Billy Creek	-	30
	D3	Tarra River	Yarram	LUD	Tarra River	-	38
	D4	Ruby Creek	Leongatha	P	Ruby Creek	LUD	94
	D5	Tarwin River	Meeniyan	-	-	P	-
	D6	Tarwin River	Dumbalk	-	-	P	-
	-	Dumbalk Bore	Dumbalk	-	-	P	-
	D7	Battery Creek	Fish Creek	P	Battery Creek	LUD	95
	D8	Deep Creek	Foster	P	Deep Creek	LUD	96
	D9	Agnes River	Toora	P	Agnes River	LUD	97
	D17	Boolarra Offtake	Boolarra	P	Walkley Creek	LUD	75
	-	Hazelwood Pondage	Churchill	-	-	P	-
South-western 2 1982	E1	Lake Wallace	Edenhope	-	-	P	-
	E2	Rocklands Reservoir	RWC	LUD, P	Rocklands	LUD (R)	6A
	E3	Mackenzie River Diversion	Horsham	P	Wimmera	LUD	7
	E4	Wartook Reservoir	RWC	P	Wimmera	LUD	7
	E5	Lake Lonsdale	RWC	P	Wimmera	LUD	7
	E6	Glenorchy Weir	Glenorchy	P	Wimmera	LUD	7
	E7	Lake Fyans	RWC, Stawell, Ararat	P	Wimmera	LUD	7
	E8	Panrock Creek Reservoir	Great Western	P	Wimmera	LUD	7
	E9	Dairy Creek Diversion	Halls Gap	P	Wimmera	LUD	7
	E10	Lake Bellfield	RWC	P	Wimmera	LUD	7
	E11	Moora Moora Reservoir	RWC	P	Rocklands	LUD	6

Appendix XIV (continued)

LCC area	LCC rec. number	Offtake name	Supply for	Catchment status	Name of catchment	Investigation needs	Number on Map 14
South-western 2 1982 (continued)	E12	Stawell Weir	Stawell	P	Wimmera	LUD	7
	E13	Wannon Diversions	RWC	-	-	P	-
	E14	Stony Ck., Willaura Res.	Willaura etc	P	Wimmera	LUD	7
	-	Willaura Bore	Willaura etc	-	-	P	-
	E15	Mason Creek Weir	Lake Bolac	-	-	P	-
	E15A	Picnic Road	Ararat	-	-	P*	-
	-	Olivers Gully	Ararat	-	-	P	-
	E16	Four Diversions	Hamilton	P	Rocklands	LUD	6
	E17	Gap Creek	Hamilton	-	-	P	-
	E18	Waterworks Creek	Hamilton	-	-	P	-
	E19	Brown Creek	Hamilton	-	-	P	-
	-	Hamilton Bore	Hamilton	-	-	P	-
	E20	Waterfall Gully	Dunkeld	-	-	P	-
	-	Dunkeld Bore	Dunkeld	-	-	P	-
	E21	Konong Wootong Reservoir	Coleraine/ Casterton	-	-	P	-
	E22	Groundwater Bores	Goroke	-	-	P	-
	E31	Groundwater Bores	Apsley	-	-	P	-
	E32	Groundwater Bores	Harrow	-	-	P	-
	E37	Groundwater Bores	Pomonal	-	-	P	-
Gippsland Lakes Hinterland 1983	E1	Lake Glenmaggie	RWC	P	Glenmaggie	LUD	5
	E2	Thomson River	Heyfield	-, P	-	P	-
	E3	Macalister River	Maffra	-, P	-	P	-
	-	Briagolong Bore	Briagolong	-	-	P	-
	-	Boisdale Bore	Boisdale	-	-	P	-
	E4	Mitchell River	Bairnsdale	P	Mitchell River	LUD	70
	E5	Mitchell River	Bairnsdale	-, P	-	P	-
	E6	Mitchell River	Lindenow	-, P	-	P	-
	E7	Nicholson River	Lakes Entrance	P	Nicholson River	LUD*	45
	E8	Tambo River	Bruthen	P	Tambo River	LUD	77

	E9	Buchan River	Buchan	P	Buchan River	LUD	79
	E10	Boggy Creek	Lakes Entrance	P	Boggy Creek	LUD	78
Murray Valley 1985	D28	Strathmerton Bore	Strathmerton	-	-	P	-
	D29	Katunga Bore	Katunga	-	-	P	-
East Gippsland Review 1986	D4	Brodribb River	Orbost	P	Brodribb	LUD	91
	D5	Bemm River	Orbost	P	Bemm River	LUD	90
	-	Mallacoota Bore	Mallacoota	-	-	P	-
North-eastern (Benalla-- Upper Murray) Review 1986	D1	Lake McCall-Say	Benalla	LUD	Ryans Creek	-	36
	D2	Loombah Weir	Benalla	LUD	Ryans Creek	-	36
	-	Nine Mile Creek	Longwood	-	-	P	-
	D3	Mountain Hut Creek)					
	D4	Waterhouse Reservoir)	Euroa	P	Seven Creeks etc	LUD	80
	D5	Gooram Diversion Weir)					
	D6	Polly McQuinns Reservoir)					
	D7	Honeysuckle Creek	Violet Town	P	Honeysuckle Creek	LUD	47
	D8	Lake Eildon	RWC	LUD, P	Lake Eildon	LUD(R)	4A
	D9	Lake Nillahcootie	RWC	P	Lake Nillahcootie	LUD	33
	D10	Ovens River	Wangaratta	P	Ovens R. (Wang.)	LUD	98
	D11	Diddah Diddah Creek	Springhurst	P	Diddah Diddah Creek	LUD	82
	-	Springhurst Bore	Springhurst	-	-	P	-
	D12	Barambogie Reservoir	Chiltern	-	-	P	-
	D13	Barambogie Springs	Chiltern	-	-	P	-
	-	Barnawartha Bore	Barnawartha	-	-	P	-
	D14	Lake Kerferd	Beechworth	P	Nine Mile Creek	LUD	55
	D15	Nine Mile Creek	Beechworth	P	Nine Mile Creek	LUD	55
	D16	Nine Mile Creek	Yackandandah	P	Nine Mile Creek	LUD	55
	D17	Clear Creek Storage	Yackandandah	P	Nine Mile Creek	LUD	55
	D18	Wodonga Creek	Wodonga	P, -	-	P	-
	D19	Kiewa River	Lower Kiewa	P, -	-	P	-

Appendix XIV (continued)

LCC area	LCC rec. number	Offtake name	Supply for	Catchment status	Name of catchment	Investigation needs	Number on Map 14
North-eastern (Benalla--Upper Murray) Review 1986 (continued)	D20	Lake Hume	RWC	LUN, P	Lake Hume	LUD*	1A
	D21	Bellbridge Offtake	Tallangatta	LUN, P	Lake Hume	LUD*	1A
	D22	Tallangatta Offtake	Tallangatta	LUN, P	Lake Hume	LUD*	1A
	D23	Murray River Offtake	Walwa	LUN, P	Lake Hume	LUD*	1A
	D24	Cudgewa Creek Offtake	Cudgewa	LUN, P	Lake Hume	LUD*	1A
	D25	Corryong Creek Offtake	Corryong	LUN, P	Lake Hume	LUD*	1A
Wimmera, 1986	-	Kaniva Bores	Kaniva	-	-	P	-
	-	Kiata Bore	Kiata	-	-	P	-
	-	Lillimur Bore	Lillimur	-	-	P	-
	-	Miram Bore	Miram	-	-	P	-
	-	Nhill Bores	Nhill	-	-	P	-
	-	Serviceton Bore	Serviceton	-	-	P	-
Melbourne 1, Review 1987	D97	Bolwarrah Weir	Geelong	P	Moorabool R.	LUD	50
	D98	Moorabool (Sheoaks)	Geelong	P	Moorabool R.	LUD	50
	D98A	Monument Creek	Lancefield	P	Monument Creek	LUD	60
	-	Lancefield Bore	Lancefield	-	-	P	-
	D99	Painkalac Creek	Aireys Inlet	LUD	Painkalac Creek	-	52

Appendix XV

WATER CATCHMENTS NOT YET PROCLAIMED
Priority for Investigation

KEY:

Codes for Supply System Type

	Code
Urban use:	
. offtake from headwater tributaries or springs	OTH
. offtake from unregulated (flows) river	OTU
. offtake from regulated (flow) stream	OTR
. storage - catchment reservoir	SC
. storage - service or terminal reservoirs with catchment	SS
. storage - irrigation	SI
. storage - natural or modified lakes	SL
. groundwater - bore/well (local or shallow aquifer)	GL
. groundwater - bore/well (regional or deep aquifer)	GR
. groundwater - bore/well (recharge area unknown)	G
Irrigation or stock and domestic use:	
. storage - catchment reservoir	ISC
. storage - off-stream reservoir with catchment	ISO

Priority of Investigation for Proclamation

	Priority
Scores of 14--17	1
Scores of 10--13	2
Scores of 6--9	3

AWRC drainage basin	Description			Assessment	
	Catchment name	Townships supplied or authority	Type	Score	Priority
2 Kiewa	Kiewa River	Kiewa	OTU	13	2
	Wodonga Creek	Wodonga	OTR	11	2
3 Ovens	Barambogie Creek	Chiltern	SC	17	1
	Murray River	Wahgunyah	OTR	10	2
	Murray River	Yarrawonga	OTR	10	2
	Borefield	Chiltern	GL	13	2
	Borefield	Barnawartha	GL	11	2
	Springhurst Well	Springhurst	GL	12	2
4 Broken	Broken Creek	Numurkah	OTR	11	2
	Broken Creek	Nathalia	OTR	11	2
	Boosey Creek	Tungamah	OTR	10	2
	Back Creek	Devenish/ St. James	OTR	12	2
	Lake Mokoan	Various	ISO	13	2
	Murray River	Cobram	OTR	11	2
	Murray River	Barmah	OTR	12	2
	Broken Creek	Goorambat	OTR	12	2
	Broken Creek	Tungamah	OTR	10	2
	Borefield	Katunga	GL	10	2
	Borefield	Strathmerton	GR	8	3

Appendix XV (continued)

AWRC drainage basin	Description			Assessment	
	Catchment name	Townships supplied or authority	Type	Score	Priority
5 Goulburn	Goulburn River	Alexandra	OTR	11	2
	Goulburn River	Molesworth	OTR	10	2
	Goulburn River	Seymour	OTR	10	2
	Goulburn River	Murchison	OTR	10	2
	Goulburn River	Shepparton	OTR	11	2
	Goulburn River	Toolamba	OTR	11	2
	Goulburn River	Mooroopna	OTR	11	2
	Rubicon River	Thornton	OTH	13	2
	Falls Creek	Trawool	SC	10	2
	Nine Mile Creek	Longwood	SC	14	1
	Yea River	Yea	OTU	12	2
	Steavenson River	Marysville	OTH	13	2
	Steavenson River	Buxton	OTU	11	2
	Wallaby/Silver Creeks	MMBW	OTH	12	2
	Goulburn Weir	Nagambie; various	ISC	12	2
	Greens Lake	Various	ISO	11	2
	Waranga Basin	Various	ISO	11	2
6 Campaspe	Campaspe River	Axedale	OTR	11	2
	Campaspe River	Goornong	OTR	12	2
	Campaspe River	Rochester	OTR	11	2
	Murray River	Echuca	OTR	11	2
	Borefield	Elmore	GL	12	2
7 Loddon	Loddon River	Kerang	OTR	11	2
	Loddon River	Bridgewater	OTR	12	2
	Serpentine Creek	Serpentine	OTR	12	2
	Gunbower Creek	Cohuna	OTR	11	2
	Taylors Creek	Gunbower	OTR	11	2
	Spring Gully Reservoir	Bendigo	SS	16	1
	Cockatoo Hill Reservoir	Bendigo	SS	15	1
	Green Gully Reservoir	Lockwood	ISO	7	3
	Lockwood/Marong Reservoir	RWC	ISO	6	3
	Kerang Lakes	RWC	ISO	6	3
	Kow Swamp	RWC	ISO	6	3
	Gunbower Creek (Koondrook Weir)	Koondrook	OTR	11	2
	Tandarra Storage	RWC	ISO	6	3
	Murray River	Swan Hill	OTR	11	2
	Murray River (Torumbarry Weir)	Various	OTR	12	2
8 Avoca	Teddington Reservoir	Stuart Mill	SC	15	1
	Redbank Reservoir	Redbank	SC	15	1
	Forest Creek	Amphitheatre	SC	13	2
	Borefield	Avoca	GL	14	1
14 Mallee	Murray River	Mildura	OTR	11	2
	Murray River	Red Cliffs	OTR	11	2
	Murray River	Robinvale	OTR	11	2
	Borefield	Murrayville	GR	10	2

Appendix XV (continued)

AWRC drainage basin	Description			Assessment	
	Catchment name	Townships supplied or authority	Type	Score	Priority
14 Mallee (cont'd)	Borefield	Cowangie	GR	10	2
	Lake Cululleraine	Meringur	ISC	12	2
15 Wimmera	Richardson River	Donald	OTR	12	2
	Borefield	Kiata	GR	12	2
	Borefield	Nhill	GR	12	2
	Taylors Lake	Wimmera/Mallee	ISO	13	2
	Pine Lake	Wimmera/Mallee	ISO	8	3
21 East Gippsland	Borefield	Mallacoota	GL	15	1
24 Mitchell	Mitchell River	Lindenow	OTU	12	2
25 Thomson	Macalister River	Maffra	OTR	11	2
	Thomson River	Heyfield	OTR	11	2
	Thomson River (Cowarr Weir)	Toongabbie	OTR	10	2
	Borefield	Boisdale	GL	12	2
	Borefield	Briagolong	GL	12	2
	Borefield	Sale	GL	10	2
26 La Trobe	Loch River	Noojee	OTH	13	2
	Deep Creek	Noojee	SC	14	1
	Borefield	Yarragon	GR	12	2
	Borefield	Trafalgar	GR	8	3
27 South Gippsland	Tarwin River (East branch)	Dumbalk	OTH	14	1
	Tarwin River	Meeniyan	OTU	13	2
	Tennent Creek (Candowie No. 2)	Phillip Island	SC	14	1
	Merrimans Creek	Seaspray	OTU	13	2
	Borefield	Seaspray	GL	14	1
	Borefield	Dumbalk	GL	13	2
28 Bunyip	Borefield	Lang Lang	GR	9	3
29 Yarra	Plenty River (Toorourrong)	MMBW	SC	13	2
	Yan Yean Reservoir	MMBW	SC	13	2
	Upper Yarra Reservoir	MMBW	SC	12	2
	Armstrong Creek	MMBW	OTH	12	2
	O'Shannassy River	MMBW	SC	12	2
	Cement Creek	MMBW	OTH	12	2
	McMahons Creek	MMBW	OTH	12	2
	Starvation Creek	MMBW	OTH	12	2
	Maroondah Reservoir	MMBW	SC	13	2
	Coranderrk (Badger) Creek	MMBW	OTH	12	2
	Silvan Reservoir	MMBW	SS	12	2

Appendix XV (continued)

AWRC drainage basin	Description			Assessment	
	Catchment name	Townships supplied or authority	Type	Score	Priority
29 Yarra (cont'd)	Sugarloaf Reservoir	MMBW	SS	12	2
	Lower Yarra (Yering Gorge)	MMBW	OTU	12	2
30 Maribyrnong	Borefield	Lancefield	GL	13	2
31 Werribee	Korweinguboora Creek	Ballan	SC	15	1
	Pykes Creek Reservoir	Myrniong	SI	13	2
	Borefield	Ballan	GL	12	2
	Melton Reservoir	RWC	ISC	8	3
32 Moorabool	Borefield	Gordon	GL	14	1
33 Barwon	Borefield	Geelong	GR	15	1
35 Otway	Borefield	Peterborough	GR	9	3
	Borefield	Port Campbell	GR	9	3
36 Hopkins	Langi Ghiran Reservoir	Ararat	SC	17	1
	Picnic Road Reservoir	Ararat	SS	17	1
	Fiery Creek	Beaufort	OTH	17	1
	Musical Gully Reservoir	Beaufort	SS	16	1
	Troys Reservoir	Beaufort	SS	16	1
	Eureka Creek	Glenthompson	SC	14	1
	Masons Creek	Willaura	OTH	15	1
	St Enochs Spring	Skipton	OTH	15	1
	McLeods Creek	Buangor	OTH	15	1
	Spring	Mortlake	OTH	15	1
	Spring	Caramut	OTH	12	2
	Borefield	Caramut	GL	12	2
	Borefield	Learmonth	GL	14	1
	Borefield	Mininera	GL	14	1
	Borefield	Mortlake	GL	14	1
	Borefield	Streatham	GL	14	1
	Borefield	Willaura	GL	15	1
	Wannon River (Lake Bellfield)	Wimmera/Mallee	OTH	15	1
37 Portland	Borefield (proposed)	Macarthur	GR		
	Borefield	Heywood	GR	11	2
	Borefield	Koroit	GL	13	2
	Borefield	Port Fairy	GR	10	2
	Borefield	Portland	GR	11	2
38 Glenelg	Konong Wootong Res.	Coleraine	SC	16	1
	Wannon River Tribs.	Hamilton	OTH	15	1
	Waterfall Creek	Dunkeld	OTH	15	1
	Spring	Penshurst	OTH	12	2
	Borefield	Casterton	GL	12	2
	Borefield	Dunkeld	GL	14	1
	Borefield	Hamilton	GL	13	2

Appendix XV (continued)

AWRC drainage basin	Description			Assessment	
	Catchment name	Townships supplied or authority	Type	Score	Priority
38 Genelg (cont'd)	Borefield	Penshurst	GL	12	2
	Borefield	Harrow	GR	11	2
	Borefield (proposed)	Branxholme	GR		
	Borefield (proposed)	Dartmoor	G		
39 Millicent Coast	Lake Wallace	Edenhope	SL	13	2
	Borefield	Apsley	GR	11	2
	Borefield	Kaniva	GR	11	2
	Borefield	Lillimur	GR	11	2
	Borefield	Goroke	GR	11	2
	Borefield	Miram	GR	11	2
	Borefield	Serviceton	GR	11	2

Appendix XVI

WATER SUPPLY CATCHMENT LAND USE CONTROLS

Catchments Considered by the Land Conservation Council[1]; with Land Use Determinations or Land Use Notices

Name of catchment	Year of gazettal of determination or notice	Area (sq.km)	Study area
Rocklands (Parishes of Tyar, Daahl, Yat Nat)	1959	160	South-western 2
Riddells Creek	1960	5	Melbourne
Lancefield	1961	19	Melbourne
Romsey	1961	9	Melbourne
Gisborne-Sunbury	1961	6	Melbourne
Woodend	1961	4	Melbourne
Eppalock (Shire of Newham/Woodend)	1962	14	Melbourne
Upper Barwon	1963	145	Corangamite
Macedon and Mount Macedon	1964	5	Melbourne
Sunbury	1964	18	Melbourne
Djerriwarrh Reservoir	1964	26	Melbourne
Kilmore	1965	5	Melbourne
Healesville	1966	3	Melbourne
Eppalock (Kyneton Water Supply)	1966	12	Melbourne
Eppalock (northern section) (see note 2)	1966	258	North Central
McCraes Creek	1966	5	Melbourne
Lake Merrimu	1966	85	Melbourne
Billys Creek	1966	21	South Gippsland 2
Rocky River	1967	23	East Gippsland
Bunyip River	1968	39	Melbourne
Lake Merrimu (Goodmans Creek)	1969	39	Melbourne
Tarra River	1971	28	South Gippsland 2
Lake Cairn Curran (land use notice)	1972	55	North Central

Tarago Reservoir	1973	114	Melbourne
Micks Creek	1973	5	Melbourne
Lal Lal Reservoir (land use notice)	1973	18	Ballarat
Thomson River (Stages 1, 1(a), and 2) (see note 3)	1974	332	Melbourne
Ryans Creek	1974	78	North-East
Mirboo North	1974	8	South Gippsland 2
Tyers River	1975	317	Melbourne
Avoca Town Water Supply	1975	10	North-Central
Upper Goulburn (Eildon)	1977	868	Melbourne/North-eastern 2
Rosslynne Reservoir (Jackson Creek)	1977	85	Melbourne
Stony Creek	1978	26	Melbourne
Painkalac Creek	1981	34	Melbourne/Corangamite
Gellibrand River	1983	669	Corangamite
East Kiewa U2	1984	18	Alpine
Lake Hume (land use notice)	1984	5 350	
Skenes Creek	1984	8	Corangamite
Lake Eppalock environs (see note 2)	1985	258	North Central
Malakoff Creek	1985	29	North Central
Tanjil River	1985	510	Melbourne
Upper Delatite River (Mansfield)	1985	240	Alpine/Melbourne
Nicholson River	See note 4	451	Gippsland Lakes Hinterland
Thomson Reservoir (see note 3)	See note 4	487	Melbourne
Total: 43 land use determinations		10 899	

Notes:

1. The Land Utilization Advisory Council considered draft land use determinations prior to establishment of the Land Conservation Council.
2. The 1985 determination reviewed and superseded the 1966 determination for the same area.
3 The current determination reviews and supersedes the 1974 determination, and extends it to the Thomson (Stage 3) Catchment.
4. Not yet approved.

Appendix XVII

CONSULTANCIES COMMISSIONED BY THE LAND CONSERVATION COUNCIL

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- Mallee Area (1973)
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Appendix XVIII

RESEARCH AREAS IDENTIFIED OR RECOMMENDED BY COUNCIL

Study area	Recommendations	Rec. No.	Subject	Implementation
South Gippsland 1	Final 1973	6(a)	Gippsland Lakes: following a review of existing data, it will be necessary to improve the collection of information about trends in the quality and nature of the lake environment and the management and care of this environment	Various research programs
		6(c)	Effluent and industrial-waste disposal: full investigation into effects of effluent and industrial waste on the environment, and alternative methods of disposal	Limited studies
North-eastern 2	Final 1974	B1-B4	Reference area: scientific study related to the impact of man's activities on soil or ecosystems	This recommendation applies to all reference areas; some studies are under way (see chapter 10)
East Gippsland	Final 1977	N4	Tostaree Pilot Farm: continuation recommended, but East Gippsland Review noted that the farm was no longer required	
Mallee	Final 1977	(F1)	Grazing management: that the responsible departments should expand research, and extend activities as a matter of urgency, into researching the systems of grazing management best suited to the public land in the Mallee, or effects of grazing on natural ecosystems	No specific research studies; limited investigations of altered management
		(F3)	Agricultural research: that the Mallee Research Farm and Irymple Technical School Farm continue to be used for agricultural research and education	Areas still available and used for teaching and research

Melbourne	Final 1977	A29(3.0)	Recreational use of catchments: support for the proposal by MMBW to investigate the effects that low-intensity recreational use could have on water quality	Limited studies
		A29(4.9)	Hydrological research area: to investigate different types of silviculture and timber utilization techniques on the volume and timing of water yield	Extensive research by MMBW (and CFL at Reefton) into various effects of different methods of timber utilization; findings documented and available
		Q3 to Q7	Agricultural research: that the various research farms and institutes continue to be used for agricultural research	These areas are still available and used for research
North-eastern 3,4,&5	Final 1977	Q2	Agricultural research: that the Tobacco Research Station should be used for agricultural research	Area still available and used for research
Alpine	Proposed 1978	A23(g)	Experimental logging: streamflow and water quality resulting from logging	Calibration, roading, and logging completed, project currently being written up
		(J1)	Wildlife: further research into the ecological requirements of species necessary to determine effects of various land management practices	Ongoing research at Arthur Rylah Institute for Environmental Research.
Corangamite	Final 1978	Q5	Agricultural college: that the Glenormiston Agricultural College continue in its present usage	Area still available and used for teaching and research
Alpine	Final 1979	(Q20)	Grazing impact: research necessary to monitor the effects of grazing on catchment hydrology and nature conservation values	Various detailed studies have investigated grazing; results include that, where flora conservation is important, grazing is inappropriate

Appendix XVIII (continued)

Study area	Recommendations	Rec. No.	Subject	Implementation
Alpine (continued)		U2(e)	Experimental logging: continued use of two catchments for sediment and turbidity research	See A23(g) (above)
North Central	Final 1981	(G1-G4)	Eucalyptus oil production: research regarding production of eucalyptus oil: effects due to frequency and methods of harvesting	No specific activity
Ballarat	Final 1982	(F1)	Softwood production: that the demonstration forest of the Victorian School of Forestry continue to be available for research	Remains available for research
South Gippsland 2	Final 1982	M1(c)(d)	Education areas: (c) observe and practice methods of environmental analysis and the techniques of the natural sciences (d) conclude simple long-term experiments	This recommendation applies to all education areas; limited activity is taking place in some areas set aside for education
South-western 2	Final 1982	(U1)	Uncommitted land: includes areas on which further study is required to determine the capability of the land to satisfy particular present or future demands	No specific activity - new information will be considered when this area is reviewed
Alpine (Special Investigation)	Final 1983	A17(a)(b)	Experimental logging: hydrological research be allowed in East Kiewa catchment	See A23(g) (above
		(E1-E5)	Water production: Council recognizes the need for research to provide additional information for formulating management guidelines	No specific activity; various relevant studies have been carried out or are in progress

Alpine (Special Investigation) (continued)		(O6-O9)	Alpine resort development: detailed studies required to determine likely effects of development on the environment at Cobungra Gap and Mount Fainter before these are further considered	No studies have been carried out
South-western 1, Review	Final 1983	L2	School plantations: that areas set aside for school plantations be primarily used as a teaching resource	Remain available as a teaching resource in many places; some are being reviewed
Murray Valley	Final 1985	(I1)	Pest species control: finance and staff are required to research and implement methods for control of pest species	Contining research at Keith Turnbull Research Institute: CFL Regions have ongoing programs for pest control
		D61	Agroforestry and pasture research: government to encourage research into tree-growing assistance schemes, agroforestry, cropping and grazing techniques, and the use of deep-rooting pastures as methods of alleviating dryland salting	Salinity research is a major ongoing government initiative, involving research teams from DITR, DARA, CF&L, and RWC
		Q1-Q4	Agricultural research and education: that areas listed be used for Agricultural research by continuing with present tenure and use	Areas available and used for research
		(U2-U51)	Revegetation of areas	Several regions of CF&L including Benalla are involved in revegetation programs to combat salinity
East Gippsland - Review	Final 1986	E6,E7	Waygara, Cann River - salting risk: applicability of results from studies into salting, to land clearing in these areas, needs to be investigated	No studies to date

Appendix XVIII (continued)

Study area	Recommendations	Rec. No.	Subject	Implementation
East Gippsland - Review (continued)		E8,E9	Forestry education and research: West Errinundra and Lower Snowy River areas be used for education and research associated with forestry management operations	No studies to date
		(I5)	Eductor dredging: further studies are required into effects of eductor dredging on stream ecology, siltation, etc.	No further studies have been conducted; limited analysis of the effects already completed by EPA and DITR
		L8	Bemm River--Cape Conran road: to investigate whether a tourist road would compromise or degrade significant values	No study to date
		L9	Catchment management: that further research be undertaken to identify the extent of habitat degradation of Mallacoota Inlet and its catchment and that appropriate measures be taken to minimize or eliminate further deterioration	No specific actvity
		L10	Fish catch decline: that further studies be undertaken to identify the causes of the decline in fish catches in the Inlet and that appropriate action be taken to rectify this situation	No specific activity
Wimmera	Final 1986	A1(d)	Introduced bees: studies should be commenced to investigate how South Australia findings on the effects of bees/bee colonies on honeyeaters, flora and insects apply to the Little Desert	No activity to date
		(A1)	Fire effects: research into optimum fire intervals etc. in fuel-reduction burns in the Little Desert.	No activity to date

C43(a)	Lake Buloke: research program for Lake Buloke, etc., to investigate processes, particularly effects of salinity, inundation, levees; notes (i): Lake Buloke research to be given high priority	No activity to date
(K2)	Wimmera River: methods of control of excess aquatic weed growths need to be investigated	Various related studies

Notes:

1. Recommendation numbers in brackets indicate that, while not expressed explicitly in the recommendations, the research need is embraced by that recommendation.
2. Research needs shown as General Recommendations occur in many sets of recommendations and are only described once.