

**A REVIEW OF RECOMMENDATIONS FOR RESERVES
IN THE SOUTHWEST AND SOUTH COASTAL AREAS
OF WESTERN AUSTRALIA**

FORESTS DEPARTMENT
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PERTH, W.A.

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**Department of
CONSERVATION and ENVIRONMENT**

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re RESERVES - SOUTH WEST

1. Attached for your information is a document entitled "A review of Recommendations for Reserves in the South West and South Coastal Areas of WA".

This document has been prepared by a Special Committee convened by the EPA to review certain aspects of the CTRC Report as it pertains to Systems 1 and 2 (See enclosed maps).

2. As indicated in the Introduction, the Special Committee under the Chairmanship of Dr M.J. Mulcahy, then with CSIRO, was convened to review technical and management proposals contained in the CTRC report (popularly known as the "Green Book").
3. As you are aware, the CTRC proposals were made public early in 1975 after that committee had carried out a three-year investigation of the required and desired National Parks and Nature Reserves in W.A.

Despite the fact that public comment had been sought as early as 1972 on this matter, we found that a great deal of new comment was generated once the CTRC report was made public. In order to respond to this public comment and indeed to see that the public, professional and local government groups were kept fully informed, not only were there public displays placed on tour and several hundred copies of the report made public, but a series of public meetings was also held. We found, particularly in the South West of W.A., that the public and general interest in the CTRC recommendations on System 1 and 2 was so intense that it was not enough for the EPA merely to review together the CTRC report and a precis of the public comments.

4. Instead we decided that a Special Committee had to be formed to review both the CTRC recommendations and public comments therein on Systems 1 and 2. It was given broad terms of reference as outlined in the enclosed. We selected committee members who

.../2



would be knowledgeable of major land usage in the area. Furthermore of course, as indicated in the report, the Committee invited and accepted special submissions from a wide variety of interested parties.

I wish to record here the very great appreciation of the EPA for the very considerable work by all participants involved.

5. Consistent with the EPA approach to matters of such major importance to the Community we now make public a report of that Special Committee and invite your comments thereon.

Because of the very considerable public involvement to date, I would request that you provide us with your comments on or before the 3rd May, 1976. Any technical or other questions you may have can be addressed to Mr L. Goodridge, Department of Conservation and Environment, B.P. House, 1-3 Mount Street, Perth, Telephone 22 2477.

Your early cooperation would be appreciated.

6. One final point should be made and that is that Systems 1 and 2 represent only part of the total appraisal of National Parks and Nature Reserves throughout the State. You will have no doubt seen advertisements and have already been personally invited to comment for example on System 6. For your information the EPA recommendations on Systems 4, 8, 9, 10, 11 and 12, over 140 recommendations in all, were endorsed by State Cabinet on the 9th February, 1976.
7. It would be my intention following receipt of your comments, to have the EPA deliberations and recommendations on Systems 1 and 2 available to Hon. P. Jones, Minister for Conservation and the Environment in mid May or early June, 1976.

Brian J. O'Brien
DIRECTOR

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OF WESTERN AUSTRALIA

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I. INTRODUCTION

A Special Committee was established by the Environmental Protection Authority in September 1975 to review proposals for reservation in the southwest and south coastal areas of Western Australia made by the Conservation Through Reserves Committee (CTRC). These proposals are embodied in a Report by CTRC to the Environmental Protection Authority in 1974.

Membership of the Committee was as follows:

Dr. M.J. Mulcahy (Chairman), Senior Principal Research Scientist, CSIRO, Division of Land Resources Management.
Mr. A.J. Clarke, Research Officer, Soils Division, Department of Agriculture.
Mr. A.S. George, Botanist, W.A. Herbarium.
Mr. J. Havel, Superintendent of Research, Forests Department.
Mr. P.C. Kimber, Senior Silviculturist, Forests Department.
Dr. F.H. McKinnell, Plantation Inspector, Forests Department.
Mr. R. Sprivulis, Acting Senior Agronomist, Department of Agriculture.
Mr. B.J. White, Senior Silviculturist, Forests Department.
Mr. L.G. Goodridge (Secretary).

The Special Committee (hereafter referred to as the Committee) had the following Terms of Reference:

"to review technical and management recommendations made by the Conservation Through Reserves Committee to the Environmental Protection Authority and submissions and comments made by State Government Departments, Local Government Authorities, and organisations and members of the public on the text of the Conservation Through Reserves Committee's Report in regard to Systems 1 and 2, and to advise the Environmental Protection Authority on those two systems."

The Committee established the following aims:

1. to review the basis of the CTRC recommendations;
2. to review public and other comments on the CTRC Report;
3. to make additional recommendations where they seemed necessary.

In general, the Committee agrees with the principles expressed in the Introduction to the CTRC Report. However, we have felt the need to outline some additional relevant general considerations. These are given in Chapter III of this Report, preceding the results of our detailed review of CTRC's recommendations in succeeding chapters.

The Committee endorses the majority of CTRC's recommendations, with one important exception. This refers to their recommendation that clear felling should be excluded from the Shannon River Basin for the fifteen years of the first license period of the Wood Chipping Industry Agreement Act, 1969-1973. Instead we propose an alternative, presented

under our review of System 2 (Chapter V), which provides for representation of the range of Karri ecotypes to a greater extent than is possible within the area of the Shannon Basin.

Further, our proposal for conservation in Karri forest is an essential component of the integrated system of reserves outlined in Map 1 (System 1) and Map 2 (System 2). If all or most of these reserves are established they will represent most of the important ecosystems. Those intended primarily for conservation purposes are in most cases surrounded by a buffer zone of State Forest or Vacant Crown Land, which may be managed for their protection.

II. PUBLIC COMMENTS ON THE CTCR REPORT

The number of submissions on the CTCR proposals for Systems 1 and 2 is so large, and the range of topics covered by them so wide, that we can only concentrate on those of greatest apparent importance, or at least on those which recur most frequently. Certain broad generalisations can be made. The recommendations by residents outside System 1 and 2 are overwhelmingly in favour of the proposals, while the comments of residents within the two Systems vary.

Those who own land affected by the proposals are overwhelmingly against compulsory resumption and governmental control of private land, though some owners were willing to sell their land to the State.

The geographical influence is seen even if the comments are considered more narrowly. Certain areas have been the object of a relatively homogeneous group of comments, which differ markedly from the comments relating to other areas. For instance, those relating to the Wonnerup-Vasse estuary and Broadwater (Area 1.1 of the CTCR Report) are primarily objections to resumption of private land and the placing of highly productive agricultural land in reserves. They are balanced by advice as to how the aims of wildfowl conservation could be achieved through cooperation with private landholders, rather than through resumption and centralised management. A second major topic is the mining of sands for heavy minerals, which has generated comments favouring total prevention of mining in existing and proposed reserves on the one hand, and vigorous objections to any likely constraints on the mining, on the other.

In the Cape Leeuwin-Cape Naturaliste area, the main objections are against acquisition of private land and against imposition of governmental control over private property. Many have protested against what they thought was a recommendation to allow public access to freehold land, though CTCR in fact made no such recommendation. Associated with this are objections to the proposed replacement of local control of reserves by centralised management, supported by claims that existing reserves and national parks are inadequately managed and utilised. The objections to resumption of land are frequently associated with demands for the right of appeal against compulsory resumptions, or alternatively, for adequate compensation.

Other comments relating to management of the Cape Leeuwin-Cape Naturaliste region deal with the undesirability of providing too much access for vehicles and with the need for the control of recreational activity. The desirability of restricting residential development to existing settlements so as to prevent their proliferation along the coast is also strongly stressed. Opposition to this has come from real estate developers, especially in System 1. Apart from conflicting recommendations on the control and management of the Whicher Range, no comments have been received for the remainder of the System.

Within System 2, the comments are centred on the proposed South Coast Park and on the exclusion of the timber industry from the Shannon River Basin. The strongest protest on the South Coast Park has come from the cattlemen, who resent the possible loss of their leases, considered essential to their economic survival. Another protest comes from local inhabitants who already use the area for recreation, especially for fishing trips or for weekend residence at the most attractive spots, such as Windy Harbour and the mouth of the Donnelly River. These people are apprehensive about the likely impact of the creation of a National Park on their activities.

The cattlemen request retention of their long-term leases until expiry in 2015, adequate prior notice of cancellation of short-term leases, and a representation on any management Board. The owners of weekenders request legalisation of their squatter rights in the form of leases, and representation on the board of management.

In the case of the Shannon River Basin, the enthusiastic support of conservation bodies and individual conservationists from outside the System is equally vigorously opposed by the local timber industry, the timber workers' union and individual workers who viewed the proposed exclusion of the timber industry from the catchment as a threat to their economic survival. They question the necessity for a reservation of such magnitude, and consider that existing National Parks in the region are adequate. They claim that no proof has been presented that the timber industry has in the past damaged those values whose protection was sought in the reserves, such as flora, fauna and recreational opportunity. The Department of Public Works stresses the need to consider the water supply potential of the South Coast rivers, including the Shannon, in any planning in order to avoid future conflicts.

In contrast to the numerous comments on System 1 and the western portion of System 2, there are hardly any comments on proposals covering the eastern part of System 2. Enlargement of existing or proposed reserves is recommended in several instances, but the Town Planning Department warns against excessive locking up of land in reserves without adequate prior investigation of their potential. Objections have been submitted by local authorities to takeover of reserves controlled by them, and the Public Works Department once more draws attention to the need for conservation of water supply catchments. No objections are made to other areas indicating either that the reserves proposed are generally acceptable, or that no conflict has been generated by the limited proposals of the CTRC for this region. The Kings Park Board drew attention to the relative absence of reserves in the eastern part of System 2. This is to some extent answered by the fact that the catchments of the Kent and Denmark rivers lie there, and most of their extent is State Forest or Vacant Crown Land. No further land is to be alienated there so as to protect the water resource.

Many objections are based on mis-interpretation of the Report or lack of proper reading of it. Statements that it contained inaccuracies are sometimes unsubstantiated. There is also criticism of the manner of the Report's preparation and its presentation to the public. Again, many people possibly did not realise that a request for public submissions had been made at the commencement of writing the Report.

Some of the statements made in response to the Report may be valid, especially those pointing out the need for adequate management of reserved areas. Nevertheless the CTRC was clearly aware of relevant social and economic factors, including the problems of owners of freehold land containing important conservation sites, or where the pressures of recreational use by the public are increasing.

Support for the CTRC recommendations in general has come from individuals, organisations, Government Departments, and the press, recognising the need for adequate conservation of flora and fauna, the preservation of natural areas for recreation, and expressing opposition to commercial development and mining in areas of over-riding scientific and recreational importance.

III. GENERAL CONSIDERATIONS

1. CONSERVATION IN SOUTH WESTERN AUSTRALIA

Conservation should satisfy the scientific, physical, aesthetic and spiritual needs of the community. The final choice of areas must be determined by these needs in the long term. Since reservation for conservation or recreation competes with other forms of land use, the problems of selection, acquisition or control, and subsequent management are difficult in the absence of effective environmental surveys and land use planning and management machinery.

The justification for conservation may be based on:

- (1) the need to retain biological diversity and scientific benchmarks;
- (2) the need for recreation and relaxation;
- (3) the uniqueness of a particular environment.

Benchmark Areas are needed as a basis against which changes brought about by Man can be measured. Preservation of as great a degree of diversity as possible is essential to provide a gene pool for future breeding programmes. The preservation of natural areas shows what the country was like before Man altered it.

Recreation and Relaxation. The need for this is accepted in today's society. Most people live in cities, and need the opportunity of access to natural areas. The same competing pressures on the natural resources of the northern Darling Range are also present to a degree in Systems 1 and 2, and are likely to intensify. Demands on the land resource for recreation and relaxation, especially in coastal areas, are already considerable and will increase. However, it should be recognised that man-made landscapes can make an important contribution to areas of recreational and aesthetic importance. Western Australia has a relatively mobile population and a climate favouring outdoor recreation.

Uniqueness. The landscape of south-western Australia is unique in many respects, and is not to be matched elsewhere, even in Australia. The combination of great age of landform, sluggish drainage (Johnstone *et al.* 1973), highly infertile soils and a landscape with considerable storages of soluble salts even in high rainfall areas (Mulcahy 1973) is, not surprisingly, characterised by plant and animal associations which are also unique. This is widely documented and internationally recognised.

2. WATER RESOURCES AND RIVER SYSTEMS

An inventory of the water resources of south Western Australia by Sadler (1974) shows that an area comprising all of System 1 and approximately

the western two thirds of System 2 contains approximately 51% of the total useable and potable regional water resources, and that 40% of the useable resource is marginal, brackish or saline due to destruction of the perennial native vegetation. A considerable proportion of this resource lies in the groundwaters within System 1.

Several major rivers rise within the area of Systems 1 and 2, including the Donnelly, Shannon, Denmark, Kent and Deep Rivers, which, because of limited clearing for agriculture in their catchments, are still relatively fresh. The largest rivers, the Blackwood, Warren and Frankland-Gordon rise further inland, tapping the salt lake systems of the interior. Thus their water supply potential is low because of salinity, and distribution of aquatic fauna in them has been modified following hydrologic changes due to agricultural development (Morrissey, 1974).

All rivers have broad, flat floored valleys upstream, becoming more sharply incised, with steeper gradients, downstream where suitable damsites may be located.

3. WETLANDS

The northern part of System 1 lies on the Swan Coastal Plain, where conservation of wetlands poses special problems, since the natural drainage has been much modified by artificial schemes, thus considerably restricting the extent of this type of habitat. In System 2, the Lake Muir wetlands (area 2.6) have also been modified as salinity has increased following clearing for agriculture in surrounding areas.

Wetlands in general may require intensive management for conservation, due to their rapid responses to unpredictable rains. Their management may not be readily compatible with the unrestricted exercise of the rights of private ownership, not only in the reserved area itself, but in the catchments supplying water to it.

Since most areas in private hands are likely to remain so in the near future, management possibilities are limited to what can be achieved by agreement with the landholder. The Committee considers that greater use could be made of the Fauna Conservation Act (1950-1970 Section 13), which relates to voluntary dedication of freehold land as wildlife sanctuaries (see p.13, Conservation on Freehold Land).

4. COASTAL ACCESS AND DUNE CONSERVATION

The use of all-terrain vehicles (4-wheel drive, beach buggies and trail bikes) for recreation and access to the coast presents a problem in the conservation of sand dunes, one of the most highly vulnerable features of the landscape. Constraints on their use are the source of some of the most bitter public opposition to coastal reserves and parks. However these vehicles can cause severe damage and they are now used in sufficient numbers to warrant some degree of regulation.

The purely sporting or competitive use of all-terrain vehicles can best be accommodated by setting aside areas specifically for them, but as a form of personal transport for access to the coast they present greater difficulties in control. The simple banning of their use would close access to many of the popular fishing spots on the south coast and would also be largely ineffective due to the difficulty of policing such a ban.

The most effective short-term action is, perhaps, to construct all-weather roads to the more popular south coast locations which will then be accessible by conventional two-wheel drive vehicles. Tracks could terminate short of the foredune, leaving access over it to the coast only on foot; close policing would be needed as the temptation to travel over the foredune by vehicle remains. Alternatively, the track could continue through the foredune to the beach. In this case there is less need for policing because damage to the beach sands by all-terrain vehicles is minimal.

Location of the tracks would be subject to overall park and reserve planning, in particular with respect to wilderness areas and to flora and fauna conservation when these demand the control of public access.

The overall effect of improving ease of access will be an increase in usage. However, activity will be largely confined to zones adjacent to the tracks and policing will be a more realistic proposition. Vigilance will be necessary to prevent the tracks being used as a base from which to run all-terrain vehicles over wider areas.

5. FAUNA CONSERVATION

The present approach to fauna conservation is one of reservation and management of existing populations. While this aspect of conservation is essential, it can do little more than maintain the precarious position of some species. A logical further step is their re-introduction to suitable habitats in their former range, thereby reducing the risk of loss of an entire population by catastrophic fire or weather. Prerequisites for such an operation are a knowledge of the former range, a thorough understanding of the ecology of the subject species, and a proven technique of re-establishment.

A note on Karri forest faunas is relevant here, since public misunderstanding of the nature of these populations is fairly general in terms of species representation. In common with wet forest formations throughout the world, the species diversity in Karri is considerably less than in adjacent drier forest formations. However, numbers of individuals of a particular species may sometimes be higher; this applies particularly to birds.

Of the known mammals, birds, reptiles and amphibians occurring in the Karri forest, none is confined to it. The common large macropods shun the dense understorey; the Black-gloved Wallaby (*Macropus irma*) is consequently absent and the Western Grey Kangaroo (*M. fuliginosus*) is sparse. The Quokka (*Setonix brachyurus*) exists in far lower numbers than in the swamps of adjacent Jarrah forest.

Two specialised species of frog and fish discussed by CTRC have been found over a wider range since their Report was written, and neither is confined to Karri forest. The frog Metacrinia nichollsi has been collected from the Whicher Range and the mud minnow (Lepidogalaxias salamandroides) is found on flats to the south east of the Karri forest.

The lack of endemism and the degree of successful recolonisation following Karri logging and regeneration, of the range of species studied by the Forests Department indicates that no special fauna conservation measures are necessary in the Karri forest under present management policies.

6. MANAGEMENT PROBLEMS WITHIN EXISTING AND PROPOSED RESERVES

A frequent criticism in public submissions concerning Systems 1 and 2 was that existing reserves receive inadequate management and are regarded as sources of bushfires, vermin and weeds. The Committee recognises that these comments may be valid, and that any recommendation for creation of further reserves, or transference of control from local organisations to the National Parks Board or the Wildlife Authority will continue to be opposed by some of the public until it can be demonstrated that they will receive adequate management. Although management problems were not part of the brief of the CTRC, we agree with them that recommendation for reservations and proposals for management are indivisible.

We strongly support the view of CTRC (page 0-17) that reorganisation and rationalisation of the management of the State's conservation reserves and National Parks is an urgent necessity. An adequate staffing with the appropriate professional training is clearly required.

The Committee considers it most important that the objective of adequate management of current reserves be vigorously pursued. The realities of the situation are such, however, that neither the National Parks Board nor the Wildlife Authority can do this at present, very largely due to inadequate staffing. We suggest that one way in which effective action can be taken in the short term is for the Forests Department, where it has the necessary local organisation, to assume temporary responsibility for management under guidelines laid down by the Board or the Authority.

The proper authority in which reserved areas should be vested is not always clear, particularly when they form an enclave within State Forest. Our recommendations as to vesting have been based on the assumption of the following roles for the three management authorities listed in the CTRC report, namely the Wildlife Authority, Forests Department and National Parks Board.

Wildlife Authority

Management of areas reserved primarily for conservation of flora and fauna and where recreation has a low priority.

National Parks Board

Management of relatively large reserves for conservation of flora and fauna where there is also a major scenic attraction and hence recreational demand, in general where State Forest is not involved, or where State Forest is a lesser component of a larger scene.

Forests Department

Management of forested land for wood and water production, recreation, preservation of scenery and conservation of flora and fauna, recognising that any of these values may have priority in a particular area. The CTRC correctly drew attention to the lack of legislative backing for some of these activities, and this Committee endorses the CTRC recommendation for revision of the Forests Act.

In drawing up these suggested roles, we have been mindful of the fact that there is an obligation to perform the various tasks in the most economical way possible. We see no point in the Wildlife Authority and Forests Department duplicating their field organisations, though we emphasise the desirability of co-operation and exchange of information in developing management techniques. From the State's point of view, the best value for money seems likely to come from some area-based demarcation of responsibilities, and this is the basis of our revised recommendations in regard to vesting of reserves in Systems 1 and 2.

It is most important that local groups, whether interested in conservation for its own sake, or in the encouragement of tourism, should be encouraged to participate in the formulation of management policies for reserves in their own area. This could be done through the establishment of local Advisory Boards, representative of Shire Councils, National Parks Board, Forests Department, the Wildlife Authority and local interested groups. Such Boards would give the people an avenue through which to communicate with and influence the National Parks Board, the Wildlife Authority or the local managing agency.

7. FOREST PARKS

The CTRC recommended that areas described as Forest Parks be set aside within State Forests for the purpose of conservation of fauna, flora and/or public recreation, and that the Forests Act be amended to enable the Conservator of Forests to do so.

We strongly support and endorse this recommendation, and in Appendix I we list and describe the forest areas under consideration by the W.A. Forests Department for reservation in this way. (Specific recommendations are given in Chapters IV and V).

If all or most of the areas listed, and also shown on Maps 1 and 2, do in fact become Forest Parks, then together with other recommended areas they will provide a most satisfactory representation of the ecosystems of

Systems 1 and 2. The fact that most of them, as the maps show, are surrounded by extensive areas of State Forest or Vacant Crown Land, means that it will be possible to protect them to an extent from fire and disease, and to control public access.

Recommendation

that the CTRC recommendation on the amendment of the Forests Act to permit the establishment of Forest Parks be implemented as soon as possible.

8. MINING

The Committee was much concerned with the place of mining in systems 1 and 2. While we do not feel that mining should be excluded from all reserves, we are strongly of the opinion that each case should be considered on its merits and that no mining take place in reserves or sites of outstanding scenery unless it can be demonstrated to the Environmental Protection Authority that the proposed mining will not affect the purpose of the reserve.

The situation will, of course, be affected by the provisions of the new W.A. Mining Act which is currently under revision, but we propose that the following guidelines should apply:

- (1) where scenic values or an ecosystem are unique and irreplaceable, then mining activities which would destroy them should not be permitted.
- (2) where mining would cause only slight or temporary disturbance to scenic values, mining activity may be permitted, subject always to appropriate guarantees for rehabilitation.

In the first category we place the Tuart forest, scientific reference areas such as Milyeannup Block and the important waterfowl habitats around the Vasse-Wonnerup estuaries. The existing limestone mining project at Windy Harbour we place in the second category.

We agree with the CTRC Report in drawing attention to the importance of the Ludlow Tuart forest. Apart from its outstanding scenic beauty, which is not available elsewhere, it is the only worthwhile seed source for this species in W.A. Tuart (Eucalyptus gomphocephala) is a tree widely planted overseas and it is important that its gene source is preserved. If the forest is mined it is most unlikely that it can ever be restored. Even if it were technically feasible it would take a minimum of 100 years to do so. For at least 100 years one would have to forego a scenic attraction which is a vital component of the tourist attractions of the district.

Scientific reference areas by their nature must be protected from any unnatural influences. Open-cast mining in particular would be completely incompatible with preservation and should be excluded.

On the other hand, mining on a moderate scale in the Vasse-Wonnerup estuaries may well be acceptable so long as the important waterfowl breeding sites are not disturbed. It would appear that spoil

could be replaced after mining operations so that the original contours of the land would be largely restored. The scenic values are unlikely to be significantly altered by such a process except for a short period, perhaps as short as five years. It may also be possible that such mining could be sited away from public view and so be compatible with the aim of preservation of the existing scenic values.

On the Leeuwin-Naturaliste Ridge the Committee concurred with the view of the CTCRC that mining operations should not be permitted without the approval of the Environmental Protection Authority. Over much of the Ridge mining is likely to have minimal impact on the coastal chain of reserves, but any consideration of an application to mine there should take account of the protective function of the vegetation on the western slopes exposed to winds from the sea.

The effects of extending the peat-cutting operation near Lake Muir are not fully understood. Such extension is being deferred until further investigation of the hydrology of this wetland area has been made.

9. CONSERVATION OUTSIDE RESERVES

It is obvious that in certain landscape types, conservation and provision of recreational opportunities will have to be achieved within the existing framework of economic and cultural patterns, as no large areas of Crown Land are available for reservation. In these areas it is important to determine how the often-conflicting aims of economic activity, outdoor recreation and conservation of natural features can be reconciled. A first step in this direction is the identification of conflicts in terms of both mode and location.

The main potential conflicts in land use are those between agriculture and conservation, agriculture and recreation, recreation and conservation, and urban development and landscape conservation. They are most intense in System 1, particularly on the Leeuwin-Naturaliste Ridge.

The conflict between agriculture and other forms of land use is aggravated as farmers attempting to make a living under strained economic conditions see themselves either further handicapped by externally imposed constraints and interference, or displaced by what they see as unwarranted locking up of productive land in reserves. Many of the objections to the CTCRC report were based on erroneous and exaggerated interpretations of the CTCRC's recommendations, for example, CTCRC did not recommend large-scale resumption of land. Nevertheless, such objections are an expression of local feeling that cannot be ignored. They indicate that any large-scale resumption of land or imposition of management from outside would be very strongly opposed. Any proposed conservation system must have public support for acceptance and subsequent implementation.

Conservation on Freehold Land

Among the CTRC recommendations in Systems 1 and 2 were several concerning the purchase of freehold land for protection of rare habitats or ecosystems. Specific properties were not listed, but were given in confidential appendices in order of priority.

While CTRC was asked to recommend areas considered necessary for reservation regardless of their tenure, it nevertheless kept this aspect in mind. Freehold land was recommended only where it was considered essential to the purpose and viability of the reserve, and where alternative areas were lacking.

However, there are other avenues than acquisition which should be explored in order to achieve the recommended conservation aims, and resumption should be regarded as a last resort which may be necessary only where essential land is concerned.

An alternative to purchase is exchange of land. In this way the owner is not deprived of the opportunity to pursue his interests or livelihood, and important tracts of land are retained for conservation. This approach is already practised by the Forests Department in acquiring areas to be added to State Forest.

It may also be possible to protect sites on freehold land which the State does not wish to acquire but which have a conservation value worth protecting. An owner may, under Section 13 of the Fauna Conservation Act (1950-1970), enter into an agreement with the Minister for Fisheries and Wildlife to have his land or part thereof declared a wildlife sanctuary. Regulations in respect of that land can then be set up with the agreement of the owner. Legally this arrangement gives the Minister a caveatable interest in the land, and the right to negotiate with the new owner should the property be inherited or sold. Whether such an arrangement is sufficient legal protection for an area to be conserved in perpetuity is beyond our competence to decide, but certainly such dedication schemes are operated in other countries.

Recommendations

that where the owner is in voluntary agreement the land be purchased at an acceptable price;

that exchange of land be made where a mutually acceptable alternative area can be found;

that, if purchase or exchange is unacceptable, negotiations proceed, on the understanding that the owner retain the land, leading to its management for the purpose of the proposed reserve, where necessary assisted and subsidised by the State under some form of satisfactory legal agreement;

that, in the case of the previous recommendation, the State endeavour to purchase if the land should be offered for sale;

Trespassing and vandalism are obviously real problems now, and can be expected to intensify in the future. This has to be considered in proposing development of tourist facilities. Education of the recreating visiting public would be a first priority, followed by policing of regulations relating to recreation. To fit recreation within the agricultural landscape, it is not proposed that unrestricted public access should be sought through private land. There is no established prior right of way as in England. Rather it is proposed that use be made of existing reserves within the agricultural landscape, which though not sufficiently large for long term conservation, nevertheless lend themselves to development as viable walking tracks, viewing points, picnic and resting spots, and camping areas. Numerous small roadside reserves for gravel, scattered water reserves and reserves for settler's timber requirements and several medium-size blocks of State Forest, could be connected by road reserves and the former Busselton-Augusta railway reserve to form an integrated recreational system without undue interference with private farming.

It may be anticipated that the relatively minor and localised conflict between recreation and conservation will intensify in future. It will no doubt be most noticeable in areas of outstanding beauty particularly attractive to visitors. The chief means of protection and control will be careful selection of access routes and parking areas, and zonation of activity to ensure that the most valuable or the most vulnerable areas are subject to least recreational pressure. Such problems should receive the early attention of the National Parks Board.

Proliferation of coastal settlements is probably the greatest threat to landscape stability and beauty, and the recommendation of the CTCRC can be fully endorsed, namely that future development as far as possible be confined to existing town sites.

Recommendation

that the National Parks Board consider ways and means of establishing a network of walking trails in the Leeuwin-Naturaliste area, based on existing road, railway and other reserves.

10. EDUCATIONAL ASPECTS

There are now many people who recognise, for various reasons, the need for conservation reserves. Many more use them and need them without realising how important they are. Others are ignorant of reserves and their purpose. One of the immediate requirements is education at all levels. Those already involved realise how much still has to be learnt. Others must be brought to understand and appreciate the need

Education of the public is a job for all those involved in conservation. High on the list must come the managers - in W.A., the National Parks Board, the Western Australian Wildlife Authority and the Forests Department.

A start in this direction has already been made by the Department of Fisheries and Wildlife and the Forests Department, for example through their publications "Swans" and "Forest Focus" respectively. The concept of involvement at all levels should be actively promoted. Above all it must be accepted that local people should be invited and encouraged to become voluntarily involved in the management of their local reserves. With the expansion of this concept should come a better appreciation of their role as part of a State-wide system. Furthermore, it is doubtful if the controlling bodies, even in favourable economic periods, will have sufficient funds and staff for adequate management, making voluntary assistance and public co-operation essential.

IV. REVIEW OF SYSTEM 1

ADEQUACY OF RESERVES PROPOSED BY CTRC

Within System 1, the Committee reviewed the CTRC recommendations in respect of adequate representation of geomorphic features, flora and fauna to be protected, and provision of adequate opportunities for outdoor recreation. Whenever possible, these were considered concurrently, but certain proposals were more concerned with one aspect or the other. The delineation of Systems was influenced more by administrative boundaries than natural features, so that they cannot be considered entirely separately.

Only one of the main geographical subdivisions of System 1, the Leeuwin-Naturaliste Ridge, is wholly confined to it. Within the Leeuwin-Naturaliste Ridge, there is a marked difference in adequacy of representation. Whereas the western edge, with its coastal limestone, recent dunes and outcrops of igneous rocks is covered by an almost continuous chain of reserves, most of which are as yet subject to low level human impact, the predominantly lateritic uplands have been largely alienated and what Crown Land remains has been strongly affected by roading, logging, gravel extraction, and dieback disease.

Thus the coastal heaths and Karri forest of the western edge are much better represented within reserves than the Jarrah-Marri forests of the uplands, though the latter is of course, well represented in State Forest. The coastal plain north of the Whicher Range is poorly represented within existing and proposed reserves, but this may be rectified in System 6. The only portion adequately provided for now is the Spearwood Dune System, covered by the Tuart forest, forming the bulk of the Ludlow State Forest. Even this is strongly disturbed by human activity, particularly in respect of the shrub understorey. Inclusion of the Minnip Block, a northern outlier from Ludlow State Forest, would overcome this deficiency.

Most of the remaining geomorphic surfaces of the coastal plain, the Bassendean Dune System and the Pinjarra Plain, are virtually unrepresented in System 1, except in very small reserves such as the Ruabon townsite, and the latter is probably too small to be a viable reserve. All of these land surfaces are alienated and either partially or fully cleared. There is therefore little prospect of adequate reservation of flora on these types in System 1, and priority must be given to them when System 6 is examined.

The Reserve proposed for the Whicher Range covers not only the Whicher Range proper, but also the margin of the coastal plain to the north and the low plateau to the south. However, while the Whicher escarpment is fairly well covered within the proposed reserve, the other two features are not. The coastal plain margin, which has the greatest floristic diversity, is represented only along the periphery, and is threatened by gravel extraction, mining and dieback disease. The portion of the Sunkland plateau included within the proposed reserve (McGregor Block) is now known to be strongly affected by dieback, and has therefore little value as a permanent flora reserve.

Additional reserves to be managed as Forest Parks, i.e., as though they were National Parks, within System 1 have recently been established or proposed by the Forests Department, and are listed in Appendix I. If these are taken as supplementary to those proposed by CTCRC then there appears to be acceptable representation of most habitats, with the exception of those of the central upland of the Leeuwin-Naturaliste Ridge. In view of the lack of knowledge of this area, its remaining Vacant Crown Land should be retained until its conservation value can be assessed.

ADDITIONAL RESERVES PROPOSED AS FOREST PARKS

Under a Statement of Intent relating to the establishment of pine plantations in the Donnybrook Sunkland, the Forests Department has proposed the setting up of several reserves of virgin or near-virgin forests which between them cover the full range of topographic, edaphic and floristic variation on the low Plateau. These reserves greatly exceed the area of the McGregor reserve. Some of the proposed reserves lie along the border between Systems 1 and 2. Their location is indicated in Map 1 and some details of their nature and purpose are given in Appendix I. From a conservation viewpoint, the most important of these proposed forest reserves in System 1 is Milyeannup Block (about 6,000 hectares), a virtually undisturbed area containing a large number of vegetation types, which should be kept as a scientific reference area. Ideally, there should be a similar reference area north of the Blackwood River, and Layman Block is proposed for this, although it has had some sawmill cutting and is less easily protected against dieback disease and further field investigation is required.

In addition to these large resources a number of smaller reserves are proposed to conserve samples of special vegetation types, such as an outlier of Karri in Chester Block. Recreation areas are planned along the major watercourses.

CONSERVATION OF FAUNA

The provision for the conservation of fauna on the coastal plain has, in the original proposal, been confined largely to wild fowl, and in particular, Black Swans (Cygnus atratus). The proposed reserves would, if established, cover the most important breeding areas that now remain in System 1. However, since only a small portion of Ludlow State Forest actually touches on to the Wonnerup-Vasse estuary, the bulk of the wetlands and wetland margins are in private hands.

In respect of conservation of fauna other than waterfowl, the presence of a large tract of State Forest south of the Whicher Range ensures the maintenance of a representative range of Jarrah forest fauna and avifauna (see Forests Department, Statement of Intent, 1975). The fauna is unlikely to be seriously affected by the Donnybrook Sunkland pine plantation project, but in the long term, there is cause for concern that some of the more specialised small marsupials will be adversely affected by the destruction of their habitat by dieback disease (Phytophthora cinnamomi).

RECREATION RESERVES

Areas for outdoor recreation appear to be adequate in System 1. The coastal reserves provide for such water-based sports as swimming, boating, fishing, skin diving and surfing. The more extensive reserves along the coast have as yet undeveloped potential for hiking. The same is also true of the Whicher Range Reserve and the adjacent State Forests.

BLACKWOOD AND MARGARET RIVERS

The Blackwood River, along the south eastern margin of the System, and to a lesser degree the Margaret River, provide excellent opportunities for boating, canoeing and fishing. It is desirable that scenic values along the Blackwood River in particular be preserved and that the River itself be disturbed as little as possible. Recent clearing activities on parts of the river banks, pushing spoil, tree trunks and other debris into the river are highly undesirable.

REVIEW OF CTRC RECOMMENDATIONS¹

1.1 LUDLOW-WONNERUP AREA

The historical value of this area is described in the CTRC Report. The estuaries and surrounding farmland provide variety and beauty of scenery in conjunction with the adjoining forests. To retain these features which comprise a particularly rich environment for recreation close to urban centres, some form of management will be necessary. It is important to maintain the present agricultural landscape, and to some extent this may be achieved by control of subdivision and other measures previously discussed (Chapter III, 9, Conservation outside Reserves).

It is expected that there will be conflicts with mining interests in this area. Proposals for mining should be referred to the EPA for review and local interests should be involved in consideration of the proposals. Monitoring of the mining activity to ensure minimal disturbance to the environment and satisfactory rehabilitation is essential.

The CTRC proposed a Committee of Management to manage the area as a National Park. We believe that there should be effective local representation on this body as support from the people is essential.

Such a committee would need to consider action required for conservation of the wetlands and any compensation due to adjoining landholders as a result. It should consider the maintenance of the scenic and historical qualities of the area and be involved in any proposals for works - e.g. mining, roadworks or drainage - that might affect the area.

Submissions from the public pointed out inaccuracies in the CTRC report concerning the population and location of the Black Swans and the hydrology of the Wonnerup estuary. This estuary is itself not drained, but suffers from sudden excessive rises in winter water levels caused by rapid runoff from areas on the coastal plain that originally had slow surface run-off, but have had drains installed. High water levels can flood nests and cause destruction of eggs and death of the cygnets.

During summer, the natural tidal encroachment of sea-water is prevented by lock-gates. This has resulted in the estuary changing from a very saline tidal zone to a more brackish environment. The lock-gates at present require adjustment during flash floods to allow the water to pass more readily into the ocean and thus reduce the danger of rising water levels.

¹ In order to facilitate cross reference to the original CTRC Report, our specific comments on their recommendations will be set out under the same headings in similar format.

It appears that the main Black Swan nesting colony is situated at the northern and north-western end of Wonnerup estuary and is one of the most important breeding grounds in W.A. Here the swans utilise samphire for nesting material and the important nesting colony is confined to the samphire flats. This zone provides no grazing, but cattle have access to part of it, and flatten nests in summer. It is important to maintain the nesting mounds at a good height to minimise the problem of flash floods in winter. Re-location of the fence line to the high water mark would involve only a small area and no loss of real grazing land, but would protect the nesting area from stock.

We suggest that the Department of Fisheries and Wildlife seek the cooperation of the land owners to ensure the conservation and enhancement of this important wildlife habitat.

Where any inconvenience or cost is incurred by the landholder, suitable compensation should be available to maintain cooperation. This would need to be assessed and monitored by a suitable body involving representatives of the Department of Agriculture and Department of Fisheries and Wildlife.

Tuart Forest

No management problems are foreseen since the management objectives of the Forests Department are compatible with the aims of conservation in this area. There is, however, concern at the threat posed to the survival of this forest by mining. In the near future there could also be pressure for urban development and widening of the Bussell Highway. The latter is undesirable unless there is no feasible alternative.

The existing pine plantation at Ludlow can be phased out and returned to Tuart. There is already a low stocking of Tuart among the pines and it has been demonstrated that conversion back to a full stocking of Tuart either by planting or natural regeneration is technically feasible. It is desirable that the Forests Department follow a long term policy to phase out the pine plantations.

Geographe Bay Coast

A small reserve No. 31188, C class for recreation, but not vested, is located along the southern margin of the Vasse estuary. In practice this has no value for recreation but does have potential for improvement of the wetland habitat. It should therefore be regazetted as a C-class reserve for conservation of fauna, and be vested in the Department of Fisheries and Wildlife.

Three small reserves along the coast near Wonnerup within the boundaries of Busselton, Nos. 385, 5217 and 22952, A or C class for Camping and Recreation, were recommended by the CTCRC for proclamation as National Park and revesting in the National Parks Board. No case was made for this by the CTCRC, apart from the implicit need to consolidate any Crown land in the area into a National Park for the preservation of existing scenery. We believe this aim can be equally well achieved if the reserves remain under the control of the Busselton Shire Council, but the Council be requested not to permit any further development in the area.

Recommendations

(a) General

that the Ludlow-Wonnerup area, as delineated in Figure 1.3 of the CTRC Report be managed for three main purposes:

- (i) preservation of the existing scenic, recreational and tourism values
- (ii) improvement of wetland habitats
- (iii) conservation of the Tuart (Eucalyptus gomphocephala) ecosystem;

that guidelines for management of the delineated area to achieve the above aims be evolved by a local advisory committee consisting of representatives of Forests Department, the Wildlife Authority, National Parks Board, Busselton Shire Council and the individual landholders concerned;

(b) Ludlow Tuart Forest

that Ludlow Tuart forest remain State Forest under the control of the Forests Department and be managed under a new Working Plan for multiple use, priority being given to recreation and conservation of the ecosystem;

that the existing pine plantations within the defined Tuart forest be progressively phased out and replaced by tuart;

that due to the unique character of this remnant of a once more extensive ecosystem, mining be excluded from the forest;

that Bussell Highway from Ludlow to the Sabina River should not be widened as this is a unique scenic drive;

that the inclusion of the Minnipup Block in the Ludlow State Forest to improve the representation of the shrub understorey of the Tuart forest as recommended by the Forests Department be implemented;

(c) Vasse and Wonnerup Estuaries

that the Committee of Management proposed by CTRC seek the voluntary cooperation of landholders in the area in achieving the aims outlined above, with technical advice from the Wildlife Authority. If voluntary cooperation of landowners is not possible, then the State should purchase private property involved if and when it is offered for sale;

that where conservation of wetlands can be shown to reduce the productive potential of farmland, the State provide monetary compensation. Such compensation should, however, be contingent on an owner's consent to a legally binding agreement protecting the State's investment;

that no mineral claims be granted in the delineated area without the approval of the Environmental Protection Authority;

that no subdivision of existing properties, nor change in rural zoning be permitted;

that the Wildlife Authority confer with the Department of Lands and Surveys to ensure that the conditions of lease of Crown Land at the mouth of Malbup Creek are compatible with the above aims and to determine whether the continuation of this lease is desirable.

(d) Geographe Bay Coast

that Reserves 385, 5217 and 22952, all A class reserves for Camping and Recreation remain vested in the Busselton Shire Council. The Council should avoid any more intensive development than exists at present;

Reserve 31188 (C class for Recreation) be regazetted as a fauna reserve and vested in the Wildlife Authority.

1.2 THE BROADWATER

Since the CTCRC study of this area, considerable work has been carried out by Department of Fisheries and Wildlife personnel and other scientific workers to improve the conditions for Black Swans (Cygnus atratus) on the Broadwater. The surrounding landholders have been brought into their discussions and their cooperation has been gained. It is hoped to relocate fences to allow regeneration of the flora of the swamp and thus provide encouragement for the variety of wildlife that normally uses the area. It is suggested that cooperation with the landholders is the most suitable approach and that Department of Fisheries and Wildlife continue with this in order to enhance and conserve the Broadwater system. They should consider whether it is feasible and worthwhile to enlarge the reserve and reclassify it as an 'A' class reserve. This may be possible by repurchasing the swamp land not at present contained within the present 'C' Class reserve, if and when the owners are agreeable. Present landholders appear to be sympathetic to the aims of wetland conservation and could well find such a proposition acceptable.

Recommendations

that the Department of Fisheries and Wildlife approach landholders in this area to gain their voluntary agreement to manage the appropriate areas for the protection and improvement of wetland habitats;

that the Department provide technical advice for this purpose;

that the State provide monetary compensation for loss of agricultural productivity where necessary (refer to Vasse-Wonnerup proposals).

1.3 WHICHER RANGE

While the CTRC Report was in preparation, the Forests Department was completing a land use plan for the Donnybrook Sunkland which proposed setting aside a very similar reserve in the Whicher Range. The area involved has been managed as State Forest for about 40 years and much the same procedures would continue under the proposed land use plan.

Conservation of native flora on road reserves is a difficult problem. The progressive invasion of reserves by pasture plants and the farmers' understandable concern for efficient fire protection mean that in the long term native flora will be much reduced. Where a case can be made for special management of an area (eg the occurrence of Dampiera linearis) much can be achieved by local arrangements between the farmers concerned, the Shire Council and the government body responsible for administration of the Flora Protection Act.

Recommendations

that Whicher and part of Bovell forest blocks in State Forest 33 (See map 1 and Appendix 1) be managed by the Forests Department primarily for recreation and flora and fauna conservation as a Forest Park;

that a more complete survey be carried out to determine whether several rare or new species of plants in the area are adequately represented either in the above reserve or elsewhere in nearby Crown land.

1.4 LEEUWIN-NATURALISTE RIDGE

The principal immediate problem in this area is the lack of active management of the existing reserves. As a short term solution, the Forests Department could well assume this responsibility according to management guidelines approved by the National Parks Board.

Some of the reserves recommended for inclusion in the new National Park by the CTRC (and endorsed by the Committee) are vested in local organisations. From a practical viewpoint the transfer of these reserves should be progressive and it would be facilitated by a consultative process between the relevant organisations, the National Parks Board, the Western Australian Wildlife Authority and the Forests Department. It could well be, for example, that the best interests of all, in the case of a gravel reserve, would be served by retention of the reserve by the Shire Council until the gravel has been extracted. Subsequently, the National Parks Board might take over the reserve to rehabilitate it for a picnic site, lookout point etc.

Boranup State Forest is severely damaged by fire, and management procedures are intended to restore it to its former condition as soon as possible. In some parts this is being done by a silvicultural thinning of the worst-affected stems, but other parts are so badly damaged that regeneration is necessary. The W.A. Museum has been actively involved in research in the caves within Boranup for some years and there has been continuing liaison between the Museum staff and local foresters to ensure forest operations do not have an adverse effect on the caves.

Recommendations

that all reserves in the delineated area (Figures 1.9 to 1.12 of the CTRC Report) be transferred to a single A Class reserve to be managed by the National Parks Board;

that all vacant Crown Land as delineated in Figures 1.9 to 1.12 of the CTRC Report be incorporated in the proposed park;

that there be no further alienation of other vacant Crown Land on the Leeuwin-Naturaliste Ridge until an overall land use study for the area has been carried out;

that the Forests Department continue to manage State Forest No. 45 (Boranup) as a Forest Park so that priority is given to maintenance of the Karri forest ecosystem, and for recreation and scenery preservation rather than production forestry. The existing liaison with the W.A. Museum in respect of protection of caves should continue;

that the National Parks Board be assisted to evolve management procedures for the proposed National Park by an advisory committee composed of representatives of the Busselton and Augusta-Margaret River Shire Councils, Forests Department and the Wildlife Authority;

that there be limited purchase by the State of freehold land to consolidate the proposed park and to preserve certain historical sites. Such purchase should take place if and when the properties listed in the Confidential Appendix are offered for sale;

that should the integrated public-private land National Park be considered feasible, it first be tried on Cape Naturaliste. Once any problems have been resolved it should be extended to the whole of the Leeuwin-Naturaliste Ridge.

1.5 DONNYBROOK SUNKLAND

The CTCRC Report made no recommendation concerning the Sunkland area, but the forest management proposals already referred to make it essential that a comprehensive series of reserves of various types be set aside.

The size of the area of forest involved makes it possible to consider the use of the ideal arrangement of reserves for scientific reference purposes surrounded by an extensive area of "buffer" forest which can be managed for normal multiple use purposes. Milyeannup Block, as mentioned previously, is the logical area for such a reserve. It is desirable that one further similar area, preferably north of the Blackwood River, be set aside for similar purposes and the Forests Department should evaluate the feasibility of doing this.

In addition to biological reserves, it is desirable to have a series of smaller areas set aside to conserve examples of the various vegetation types on the Sunkland. The Forests Department Statement of Intent appears to make adequate provision in this respect but the matter should be kept under review by the Department.

Recreation in this area is largely confined to the waterways, and by far the most important of these is the Blackwood River from Nannup to Augusta. It is the largest river in the South West and this stretch of it is coming under increasing recreational pressure. The Committee considers that it should remain relatively undisturbed as there is no similar stretch which is available for recreation during most of the year. In practice this amounts to preserving existing scenic values as far as possible. Where the river is within State Forest existing forest management procedures will ensure this, but where it flows past private property the voluntary cooperation of landholders must be relied on.

Recommendations

that the Blackwood River between Nannup and Augusta be maintained in its present largely undisturbed state, and the scenery along the river be preserved essentially as it is now;

that Milyeannup Block be managed by the Forests Department as a Forest Park, that is, as a "benchmark" scientific reference area. The Department should carry out investigations to determine whether Layman Block is suitable for management in a similar way;

the Committee endorses the Forests Department proposals for Forest Parks for recreation and conservation purposes in Rapids, Cambray, Oasis and Chester Blocks.

IV. REVIEW OF SYSTEM 2

ADEQUACY OF RESERVES PROPOSED BY CTRC

The proposed reservation of coastal areas for National Parks will ensure the continuity of some exceptional landscapes and a potential for increasing recreation demands. However declaration of Walpole-Nornalup Inlet as a reserve, in addition to Broke Inlet, is desirable. Neither is in a completely natural or virgin condition, due to a variety of activities in the catchments of the rivers feeding them, and to the effects of commercial fisheries. Standards of management should be such that commercial exploitation does not deplete fish populations to the point where recreational angling is precluded.

RESERVATION OF KARRI FOREST

The CTRC proposed the reservation of an area of natural Karri forest, which it defined as "an area of commercially undeveloped forest large enough to conserve as a single unit representative stands of Karri and Karri-Marri associations and their faunas, substantially as these existed at the time of first European settlement". Reasons cited in support of this contention were:

- (1) Public disquiet that forest operations, in particular with the addition of the proposed Marri woodchipping scheme, will irreversibly alter the character of the wet sclerophyll forest;
- (2) the paucity of the forest resource;
- (3) the inadequacy of existing reserves;
- (4) the destruction of the understorey by forest operations;
- (5) doubts on the existing measures to conserve fauna;
- (6) the need to preserve the aesthetic appeal of virgin forest;
- (7) the need to exclude cutting from a relatively large contiguous area as a control against forest operations;
- (8) modifications to stream and ground water hydrology by forest operations.

It argued that an entire river system was an obvious natural unit to consider, and that the Shannon River Basin was best suited to the purpose, for the following reasons:-

- (1) A substantial area of wet sclerophyll forest should be set aside as a major conservation reserve. Most of the Shannon catchment is undeveloped State Forest;

- (2) It represents a benchmark area for comparison with cut-over areas in respect of "biological, hydrological, pedological and sedimentological parameters".
- (3) It flows into Broke Inlet, one of the largest estuaries in W.A., which is in a relatively undisturbed state and contains "a delta of classic form" at the mouth of the Shannon River. CTRC stated that hydrological and sedimentological regimes should remain effectively stabilised if no commercial cutting takes place in the Shannon Drainage Basin;
- (4) It would provide an incomparable reserve for the conservation of the natural wet sclerophyll forest and for controlled public recreation, and would in time become a national and international tourist asset.

The Committee agrees with the need to conserve representative areas of Karri and Karri-Marri forest, but questions the suitability of the Shannon Basin on the grounds listed above and furthermore questions the need and the wisdom of concentrating all the reserves in one contiguous area.

The Shannon is much more disturbed than the CTRC report suggests, due to townsite development, clearing on private property, dam construction and road-rail construction. The scale of forest operations to which 20% of the forested area has to date been subject, is larger than that suggested, and there is a large area of fire damaged forest in the central part of the catchment. (See Appendix III) The impression gained by the public that the Shannon Basin is an extensive area of virgin Karri forest is therefore erroneous. For the past 25 years the Shannon Basin has been the home of a substantial sawmilling venture, including for most of that time the sawmill itself, a townsite, and the associated engineering activity. The "commercially undeveloped" criterion initially stipulated by CTRC for its Karri reserve is therefore not met. By comparison, the Deep River catchment is relatively less disturbed but it too would not meet this criterion, particularly regarding agricultural clearing and forest operations.

The degree of diversity and duration of past disturbance in the Shannon River basin is appreciable. Though small in comparison to the whole area, agricultural clearing (700 ha), township and industrial development (100 ha), and railway construction along the river bank (12 km) are activities which have a great potential to cause adverse hydrological and sedimentological change. It could be argued that their potential for damage is greater than that of the much more extensive area which to date has been subject to wood harvest and regeneration operations (6000 ha). Irrespective of what may eventually be demonstrated in this regard and despite the fact that the degree of change may be quite minor, the fact remains that the stream flow of the Shannon River is now the result of a complex of interrelated factors, many of them man-caused. The Committee therefore submits that the concept of using the Shannon Basin as a benchmark for cut over areas elsewhere with respect to biological, hydrological, pedological and sedimentological parameters is unsound. It considers that the approach adopted by the Kelsall Interdepartmental Committee on the environmental effects of wood chipping, which uses small catchments where the various factors under study can be identified, isolated and controlled is preferable.

Broke Inlet is given only second priority for reservation as an aquatic reserve in the submission to CTRC by the Australian Marine Sciences Association. The low diversity of species, due to the seasonally closed nature of the inlet is the reason given, and the Walpole-Nornalup Inlet was preferred. While the Committee supports the creation of an aquatic reserve in Broke Inlet, it doubts the validity of the CTRC contention that hydrological and sedimentological regimes would remain effectively stabilised if no commercial cutting takes place in the Shannon River Basin. If the amount of disturbance which has already occurred has left the Broke Inlet in a relatively undisturbed state then planned future operations are unlikely to alter this situation. The Committee does not believe that the combined Sawmill-Woodchip operation will cause widespread soil erosion or significantly change stream salinity; neither did the CTRC find any evidence to support such a contention (page 2-22, paragraph 2). The Committee submits that neither the importance of the Broke Inlet as an aquatic reserve, nor the fears of stream flow change, justify the exclusion of wood harvest operations from the Shannon River Basin. However, there is a body of relevant experience to be drawn on here. The State's water supply authorities should be consulted, since they must be aware of any adverse effects of forest operations in the catchments already developed for water supplies in the Darling Range to the north.

Differences occur in the Karri forest from north to south and from east to west. For instance the dominant shrub layer in the Donnelly Valley is Nettic (Bossiaea laidlawiana), whereas in the Shannon it is Karri Wattle (Acacia pentadenia). Zamia Palm (Macrozamia riedleii) is the dominant species in the ground flora in some stands found in the lower reaches of the Warren River. Acacia urophylla becomes an impenetrable thicket in certain limited localities, almost to the exclusion of other species. Karri Hazel (Trymalium spathulatum) tends to dominate where Karri reaches the height of its development. Tree Hovea (Hovea elliptica) appears to be a strong component of the ground flora in mixed stands, particularly along the northern periphery of the Karri. The Tingles, in particular Red Tingle (Eucalyptus jacksoni), mixes with Karri only in the wettest part of its range, near Walpole. It has been suggested (Main 1975 pers. comm.) that this represents a further successional stage to the normal fire climax Karri forest. In the absence of fire for a prolonged period, the tolerant long-lived Tingles will eventually outlive the Karri and become dominant, much in the same way as Nothofagus dominates eventually in the ash forests of Tasmania and Victoria. Karri stands of outstanding height can be found in the Donnelly, Warren, Shannon and Deep River basins. Such a stand in Mattaband Block in the Deep River basin is peculiar in that it is on the dry inland edge of the Karri occurrence. Log quality, in terms of freedom from decay, appears to be better in the islands of Karri surrounding granitic outcrops in the Chudalup System (McArthur and Clifton 1975) than further inland in the main Karri forest area. In stands of apparently equivalent fire damage, the probability of recovering saleable timber is higher in the coastal stands. Karri typically is confined to soils derived from the weathering of the granite-gneiss country rock, but important exceptions occur. Soils derived from coastal limestone support Karri on the Leeuwin-Naturaliste ridge and along the south coast as far east as Mount Manypeaks, and one small patch occurs in the Donnybrook sunklands (Chester Block) in soil apparently derived from sediments. Closer study is bound to uncover further differences. To concentrate reservation into one big area at the expense of other areas will mean incomplete sampling of the diversity of ecological associations and the genetic resource. The concept that the Shannon is a "representative" sample is therefore questioned.

It should be noted that the practical application of knowledge of the basic ecology of Karri is a requirement for today, not for the future. Experiment has shown that Karri, far from being the delicate moisture dependent mesophyte it was assumed to be, is in fact a hardy, disease and damage resistant plant with a strong capacity to resist drought, even at an early age. It can be handled open rooted in planting operations and, in sites considerably drier and harsher than its normal habitat, survives and adapts better than other eucalypts of known drought resistance. Being tolerant to the root pathogen Phytophthora cinnamomi, the possibility of its use to replace the very susceptible Jarrah deserves consideration. However, there must be some reason why Karri is confined to its present boundaries; perhaps it lacks the capacity to survive repeated firing. Before planting off-site can be undertaken with confidence, more needs to be known about its basic ecological requirements. It is more likely that valuable information can be gained from the study of stands under stress at the limits of its range than of stands at the height of development. Hence reservation of the small outlier stands is of immediate importance.

The CTRC stated on page 2-22 that "very little is really known of faunal recolonization in Karri-Marri forest that has been subject to clear felling on the proposed scale" and that "strong doubt has been expressed that the proposed system of forest verges along streams and main roads and of refuge areas, is extensive enough to provide an adequate reservoir of native fauna and non-commercial flora to re-establish themselves in regenerating cut-over areas". This can now be viewed in the light of later information which was not available to the CTRC.

Six years of fire ecology work and twelve months study of flora recovery following clear felling suggest that the flora is not dependent on an adjacent reserve population for its recovery following destruction by fire or other forest operations (Christensen and Kimber 1975). Outstanding characteristics of the wet sclerophyll flora are :

- (1) their sensitivity to fire and consequent mortality;
- (2) the regeneration and recovery from soil-stored seed that may be decades old.

The Forests Department has conducted research into fauna recolonisation after clear-felling since the CTRC report was written (Pentony K and Kimber P.C., priv. comm). The results have demonstrated;

- (1) no elimination of any species of mammal or bird;
- (2) a marked change in species composition during the various structural changes associated with developing regrowth Karri;
- (3) the original precutting population conformation in terms of species representation and numbers is restored at 40 years after cutting (and possibly in a lesser period - no study areas were available between the ages of 10 and 40 years).

The studies in 40 year old regrowth were conducted in an area of 3200 ha which was all regenerated in one year.

The Committee considers that the evidence suggests temporary disruption and transient changes in flora and fauna populations following clear felling and regeneration in wet sclerophyll forest; there is no evidence of failure to recolonise the 3200 ha regeneration area by mammals and birds.

While there is no doubt that large reserves favour the conservation of fauna, the Committee holds that the available evidence suggests only minor conflict between wood harvest operations and the long term conservation of the Karri fauna, which is neither unique, threatened, nor rich in species diversity. Very large reserves are therefore not justified for the conservation of fauna alone. Regarding flora, the Committee submits that genetic, species and ecological diversity could be lost by concentrating reserves in one area rather than spreading them throughout the entire Karri range.

The value of wet sclerophyll forest, and Karri forest in particular, for recreation needs clarification. The forest has a scenic beauty and people like to see it. The shrub layer is very dense, access is consequently difficult and people are reluctant to leave tracks and roads by more than a few paces. The main recreation localities away from tracks and roads are sites where the shrub layer has been cleared. Public access could be increased by further development of these facilities and along the waterways where access by prepared track is possible. These requirements do not call for an area the size of the Shannon Basin for their accommodation, indeed more easily accessible and widespread areas are better suited to recreation demands. The Shannon itself is a small river of limited recreation value, and is outclassed by the Frankland, Donnelly and Warren Rivers in this respect.

If our views outlined above are accepted, it follows that the cost of reservation, in terms of social and industrial dislocation can be considered too great for the benefits gained.

A better approach to the question of conservation by reservations within the Karri forest zone is considered to be a series of smaller areas of uncut forest which cover the extent of the Karri occurrence. In particular, the valleys of the Donnelly, Warren, Shannon and Deep Rivers should be sampled. In each case, the reserve should be considered a "core", surrounded by a "buffer" of State forest, which though managed for timber production is still the same basic ecosystem but at a variety of seral stages. This concept is widely accepted (e.g. Slatyer, 1975). The benefits to be gained from this approach are:

- (1) better sampling of the genetic resource;
- (2) greater potential scientific benefits through having samples over a range of conditions, particularly at the extremes of the natural range;
- (3) selection of areas will be less influenced by commitment to production in the near future;
- (4) the risk of loss of the forest component by fire or other agency is lessened by spreading reservation over a number of areas.

We therefore propose in the following chapter an alternative system of reservations in Karri forest based on the Forests Department's proposed "Priority Use Areas", i.e. areas managed for purposes other than timber production as first priority.

FAUNA

Two reserves supported by CTCRC especially for fauna protection are the Tone-Perup River Area involving the Numbat (Myrmecobius fasciatus), Woylie (Bettongia penicillata) and Tammar (Macropus eugenii), and the Two Peoples Bay Wildlife Sanctuary involving a wide range of mammal and bird species, particularly the Noisy Scrub Bird (Atrichornis clamosus).

The Tone-Perup River area provides adequate sanctuary for its three main species. It is to be noted that all three species extend some miles west of the reserved area in State Forest, but their status is regarded as safe under present forest management practises.

The Two Peoples Bay Wildlife Sanctuary carries a viable population of the Noisy Scrub Bird. However, its particular requirement of vegetation long protected from fire makes it vulnerable as an isolated population in one restricted locality. The CSIRO Division of Wildlife has determined the habitat requirements, which are of two types; wet rushy vegetation for breeding, and dense eucalypt litter for feeding purposes. Both habitats can develop to a satisfactory density level only with the complete absence of fire for a long period. The CSIRO is also doing basic research into breeding which will eventually enable the "re-seeding" of the species into other suitable areas. The value of this approach in spreading the population to a number of centres, and in reducing the risk of total loss by wildfire is beyond question.

Areas being considered for reseeded are quoted as:

- (1) Hoffman's Mill (in System 6)
- (2) between Albany and Nornalup National Park (West Cape Howe Area)
- (3) Waychinicup River and Mt. Many Peaks.

The Committee consider that the selection of suitable areas for reseeding between Albany and Nornalup is of the greatest importance. Early selection and reservation will provide an opportunity for early fire protection, and the development of the reserves to a suitable density condition for reseeding. Suitable areas may be found among the reserves listed on page 2-44 of the CTCRC report and in the Kent River and Denmark River Drainage Basins.

REPRESENTATION OF OTHER ECOSYSTEMS

In the eastern portion of System 2, existing reserves are largely confined to the coastal zone. As a consequence, the coastal vegetation is adequately represented within reserves. Inland reserves are confined to the Porongurup Range National Park and the Millbrook Reserve. The former is a unique feature, the latter representative of the area but containing rare plants as well; its reclassification to A class is strongly supported. The vegetation and fauna are also conserved in three areas reserved for the protection of Water Catchments, namely the catchments of Kent and Denmark Rivers west of Albany, and Reserve No. 13802 east of Albany.

The catchment of Kent River is reserve No. 29660, vested in the Public Works Department; the catchment of the Denmark River is State Forest No. 64. The two river catchments give adequate representation of country underlain by shield rocks and of the overlying lateritic soil, whereas the Millbrook Reserve is the only reserve on the Plantagenet sediments, characteristic of the landscape north of Albany. Reserve No. 13802 overlies sandy deposits. Whilst the Water Supply Catchment reserves provide adequate protection against alienation, it is considered desirable to inform the authorities responsible for their administration of their value for flora and fauna conservation, and to obtain an undertaking from them that these values will be preserved.

Despite the adequate coverage of the coastal zone by the proposed South Coast National Park two of the submissions (CSIRO Wildlife Division and H. Butler), stressed the desirability of creation of an additional A class reserve near Mt. Manypeaks, presumably reserve No. 25865 (Recreation and Public Enjoyment), 29883 (Catchment area), 27502 (Recreation and Camping) and the apparently Vacant Crown land between Waychinicup River and the Whaling Station, covering the mainland opposite Bald Island.

REVIEW OF CTRC RECOMMENDATIONS

2.1 SCOTT NATIONAL PARK

The Committee endorses the recommendations of the CTRC with respect to the Scott National Park. However, two further additions to the Park should now be considered. The first is an area between Scott River and the northern boundary of the proposed addition of Vacant Crown Land. The area is designated reserve 25856 for Mining purposes and was specifically created as an obligation of the State under the provisions of the Iron Ore (Scott River) Agreement Act, 1961. It was apparently excised from the Scott River National Park (reserve No. A.25373) in 1962.

In answer to a parliamentary question on 11/9/75, the Minister for Lands stated that "the Lands and Surveys Department will negotiate with the Mines Department to ascertain whether reserve 25856 may not be cancelled to allow the land to be included in class 'A' reserve 25373".

Inclusion of reserve 25856 in Scott National Park will greatly facilitate management of the area and ensure that a full range of habitats of the Scott coastal plain is preserved.

The second area to be considered for inclusion in the National Park is Reserve 18644, Timber for Road Board and Settlers Requirements (not vested). It is located opposite Augusta townsite on the shores of Hardy Inlet and is a valuable component of a scenically attractive landscape.

Recommendation

that the Department of Lands and Surveys proceed with negotiations in respect of reserve 25856, that if it is no longer required for mining purposes, it be cancelled and its area added to reserve A25373;

that if a decision not to mine in reserve 18644 is made, then it be gazetted as a National Park.

2.2 PEMBERTON NATIONAL PARKS

The Committee endorses the two recommendations of CTRC with regard to the Pemberton National Parks. However, we recognise the value and importance of locally based management of the parks in the past, and we consider that there should be a continuing local involvement in planning and management in the future.

Recommendations

that there be a local advisory committee involved in the planning and management of the Pemberton National Parks;

that minimum representation on the advisory committee be Local Government, the Pemberton Tourist Bureau, the Forests Department, and the National Parks Board.

2.3 PROPOSED SOUTH COAST NATIONAL PARK

The Committee is strongly in agreement with the principle that a large National Park be established along the south coast between Scott River and Nornalup. The original proposal sponsored by the Institute of Foresters of Australia did not propose that the whole 116,000 ha be set aside as a wilderness area as implied by the CTRC. Rather it is a comprehensive land use proposal aimed at "guided development" along several lines, of which wilderness was one.

There has been considerable local opposition to this National Park proposal, largely due to a misapprehension as to the role of a National Park, and in particular to the belief that such areas would be "locked up" forever.

The Committee draws attention to the definition used by the W.A. National Parks Board and quoted by the CTRC on pages 0-4 and 0-5 of the Report.

We consider the CTRC recommendations on page 2-16 are an oversimplification of the situation and require modification. We are in agreement with the external boundary as shown in Figures 2.2 and 2.3 of the CTRC Report. Within the proposed Park boundary, we propose some modifications, the reasons for which are set out below.

Private Property within the Proposal

We agree that freehold land within the park should be acquired and incorporated in the park. The implementation of this proposal will be subject to the constraint of availability of finance, and we consider that public opposition to acquisition should be considered. In line with the approach we have suggested for System 1, freehold land should be purchased by negotiation or on the open market as properties are offered for sale.

As an interim measure to prevent undesirable development of these properties some form of land use restrictions, along the lines of the environmental control suggested by CTRC (page 0-18) should be considered. This might take place through some form of land dedication, possibly with a financial inducement in compensation for loss of profitability.

Three freehold blocks should have high priority for acquisition, Locs. 153 and 3869 (Malimup Springs) and Loc 1234 bordering the southern edge of Lake Maringup. We suggest that powers of resumption should be exercised if any threat arises in the form of uncontrollable and undesirable development on these locations.

Pastoral and Grazing Leases

We agree that pastoral and grazing leases should ultimately be terminated or reduced in number and area. However, we recognise that the lessees exercise a form of land management that has some protective value in fire hazard reduction and that to terminate the leases immediately could create a management vacuum potentially more damaging to the environment than the present grazing and regular burning procedures.

On the assumption that a management authority is not immediately able to take responsibility for the reserve, we suggest the following controls be incorporated in the leases pending their termination. Some may already exist in the lease agreements.

- (a) Control of animal stocking rates
- (b) Cattle-proof boundary fences to be maintained
- (c) No land clearing
- (d) No introduction of exotic pasture species and no use of fertilizers.
- (e) A burning plan to be submitted to the park authority for approval each year.
- (f) Public access should be permitted only on nominated and approved tracks.

We consider the practice of annual cattle droving and agistment on the south coast to have some historical significance and probably tourist appeal. Complete elimination of the leases may be undesirable for this reason and we suggest that an area of the park could be used for this purpose permanently. Such an area would be selected in vegetation communities that are adequately represented elsewhere in the park.

Water Resources

The six major rivers flowing through the proposed park represent more than 40% of the usable, potable surface water resource in the south west, the Shannon basin contributing approximately 6% of the total resource. Recognition must be given to the possible national need to use this resource in the future.

Existing long term proposals place most damsites outside the proposed Park except those on the Frankland River and the eastern branch of the Gardner River. Changes in water resource planning may result in relocation of damsites to within the Park.

We can see little objection to this in most cases as the dams will increase habitat diversity. However, a dam on the Shannon might cause large changes in flow patterns which could change the character of the seasonally closed Broke Inlet. It is desirable that the Shannon be not dammed if alternative resources are available.

Aquatic Reserves

Two types of estuary are represented within the proposed National Park and we are of the opinion both should be declared aquatic reserves as they are representative of two entirely different types of ecosystem, namely:

- (a) Permanently open to the sea (Walpole-Nornalup Inlet),
- (b) Seasonally closed (Broke Inlet)

It is understood that the term "aquatic reserve" in this instance would mean that existing recreational usage of the inlets would not be affected.

Existing Reserves for Recreation and Mining

We have considered carefully the submissions from various local groups representing cottage owners and lessees. Their claim to be a somewhat underprivileged section of the community has some validity, which we have attempted to take into account.

At Windy Harbour, Reserve 12439 (Recreation and Camping) is vested in the Manjimup Shire Council. This is a well run, tight settlement and we see no need to change the vesting in the short term, so long as the Council continues to administer it in a way compatible with the aims of the National Parks Board.

Reserve 17495, (Recreation and Camping) is presently used for the extraction of limestone. This is undesirable but there appears to be a real local need for it at present. If the company concerned has no alternative source of limestone the operation should continue at the present site only. When this is exhausted or the company ceases operations, the purpose of the reserve should be altered to that of a National Park.

A squatter settlement has developed on the banks of the Donnelly River in the following reserves: 28478, 28479, 12873, 12874 (Recreation and Camping). An extension of the reserves to cover existing and proposed developments, and vesting of the enlarged reserves in local shires for subleasing has been proposed.

Unlike the Windy Harbour settlement, the Donnelly settlement has no legal basis and is neither orderly nor compact, occupying most of the river banks suitable for landing of boats and camping. The existence of a settlement at the mouth of the Donnelly River is not opposed, nor is the suggestion that no road be constructed into it and that access be only by boat. However, should any permanent settlement be contemplated, it should be planned on an orderly basis away from the river banks. The design of such a settlement should be subject to the normal constraints of town planning procedure and practice. A precedent has been established for the approval of subdivisions without road access on Molloy Island in the Hardy Inlet. In the case of the Donnelly River mouth, leasehold subdivision similar to that at Windy Harbour is desirable. Vesting in the National Parks Board would not be inconsistent with this. Public access to beach and foreshore should be retained.

Recommendations

that a new National Park should be proclaimed between the Scott River area and Nornalup. The Park should extend to the low water mark;

that the external boundaries of the new Park be as shown in the CTRC Report in Figures 2.2 and 2.3;

that freehold land within the Park boundary be purchased by the State as it is offered for sale, then added to the Park;

that pastoral and grazing leases within the proposed Park eventually be terminated unless a closer study of the place of grazing in the area leads to future modification of this policy;

that the Department of Lands and Surveys incorporate more stringent specifications in the leases;

that both Broke and Walpole-Nornalup Inlets be made aquatic reserves;

that all other reserves (except those shown below) and Vacant Crown Land within the Park boundary be included in the National Park;

that reserves 17495 and 18717 remain vested in the Majimup Shire Council.

2.4 AN ALTERNATIVE SCHEME OF RESERVATION TO THE SHANNON RIVER DRAINAGE BASIN PROPOSAL

The Committee is aware of the public support for the reservation of the Shannon Basin. However this support is interpreted as being more for the reservation of Karri forest rather than for the area of the Basin itself. The Committee believes that the concern for the reservation of Karri is a real and proper one.

However, reservation within the Karri forest must recognize two realities:- first, that a large scale wood using industry exists and is a principal support of the communities in the region, and second, that the forest resource upon which it depends is heavily committed. A heavy demand for Karri timber will continue until exotic pine plantations reach an age where their timber production capacity can relieve the demand on native forests.

Withdrawal of large tracts of forest from the timber producing zone cannot but have serious consequences, especially in the short term, for the dependent communities and for housing construction which uses most of the timber produced. Most of the Karri forest remaining today occurs within the Marri Woodchip Licence Area. That occurring outside it is limited in extent and is mostly reserved in one form or another. The problem of reservation of Karri therefore centres on the Licence Area.

Though popular demand is for reservation of mature Karri forest, the Committee is aware that many other systems and associations exist which require reservation. A sound scheme of reservation must take account of the whole range of variation, and has already been discussed.

Forests Department Priority Use Areas

The multiple use policy adopted by the Forests Department is a rational way of accommodating the diverse and increasing pressures being exerted on the fixed and limited forest resource. It aims to accommodate as many uses on the one area as are possible without irreconcilable conflict. In practice this means that where the characteristics of an area favour a particular use it is allocated to that use, which then has a priority over all others.

The Forests Department has allocated use priorities other than wood production in many areas of State Forest, including the Woodchip Licence Area. Priorities may be for the conservation of certain plant associations (e.g. virgin Jarrah, Karri, Blackbutt), for the conservation of rich or rare fauna populations (e.g., Perup fauna priority area), for water catchment protection, for amenity and recreation, for the preservation of items of historical interest, or for specific scientific study purposes. These form a useful set of reserves, and those in Systems 1 and 2 are shown in Appendix 1 and Maps 1 and 2. Not shown on the plan is a system of road and stream reserves within the Woodchip Licence Area, because their addition tends to make the plan incomprehensible.

The CTRC recognised the value of State Forest for conservation and recreation as well as the deficiencies of the present Forests Act in this regard. It recommended that "Forest Parks" be recognised within State Forest as areas to be managed like National Parks for uses such as the conservation of flora and fauna and recreation to the exclusion, if necessary, of wood production. The Committee supports this CTRC recommendation and believes that the Forest Park concept can be considered as part of the multiple use concept for forest land.

Most of the areas given priority for recreation were selected because of their existing popularity. Attention is drawn to the fact that many of these areas occur in forest cut-over in the past by either the selection or the clear falling method. The Committee sees no difficulty in giving these areas recreation priority, and believes that they are as important in a scheme of reservation as virgin areas which may be reserved primarily for ecological purposes. Attention is also drawn to the dynamic nature of forest and to the likelihood that, with time, the focus of recreation demand is likely to change from place to place. The ability to change use priority is therefore important, particularly with regard to recreation.

The Degree of Reservation

Within the woodchip licence area the degree of reservation of Karri relative to the whole is about 15%. Reservation in this context includes areas given recreation priority irrespective of whether they are virgin or cut over. Relevant data is tabulated below:

EXISTING RESERVATION:

	Approx area of Karri and Karri-Marri	Percentage of total area of Karri and Karri-Marri in licence area (146,050 ha)	
National Parks:			
Walpole-Nornalup (mostly virgin)	3169 ha		
Warren (mostly virgin)	1320 ha		
Beedelup (virgin)	830 ha		
Pemberton (some cutover)	320 ha		
Sir James Mitchell (some cutover)	420 ha		
	<u>6050</u> ha	4.2%)
)
Priority Areas within State Forest			
)
Brockman (cut-over)	620 ha)
Warren (cut-over)	240 ha)
Johnston-O'Donnell (virgin)	1930 ha)
Gordon (virgin and cut-over)	630 ha)
Iffley (cut-over)	110 ha)
Solai (cut-over)	480 ha) 15.4
Dombacup (virgin)	120 ha)
	<u>4130</u> ha	2.9%)
)
Road and Stream Reserves:			
)
)
Estimated total area -	52,000 ha)
Estimated proportion of Karri and Karri-Marri (part virgin, part cut-over)	12,000 ha	8.3%) 25.7%
)
RESERVATION PROPOSED BY CTRC			
)
Shannon Catchment			
Area of Karri			
(approx 1/3 cut-over)	19,000 ha		10.3%)
Less	<u>4,000</u> ha	(included above)	
	15,000 ha		

If the existing reservation is added to the proposed Shannon Catchment the proportion of Karri forest reserved exceeds 25%. This is high considering the situation of the wood-using industry, and far beyond the 10% minimum sometimes quoted. There can be little doubt that the CTRC's Shannon Basin proposal must therefore be considered as alternative rather than complementary to the State Forest priority use areas. Though the CTRC did not propose that the entire Shannon Basin need be reserved, this Committee takes the view that their advocacy of entire catchment concept means that the entire catchment should be considered.

The Committee also queries the need to reserve a quarter-mile wide strip on either side of all the roads proposed by the Forests Department. Topography, changing forest type and quality, and past treatment history, must all have a bearing on what width and degree of reservation along roads is desirable, and it should be varied in accordance with these factors.

Security of Reservation

Concern has been expressed that the areas of priority use within State Forest have too uncertain a future for reservation. A change in administration, or a change in use pressure, could too easily cause a change in the allocated priority. The Committee realizes that this is possible, even if not probable, and therefore supports the CTRC recommendation on the creation of Forest Parks (page 0-22) and the necessary amendment of the Forests Act. In the meantime, greater security for the priority use of a reserve can be given by incorporating the objectives of management of a delineated area in the General Working Plan of the Forests Department. They would then receive government recognition and would require Cabinet approval before changes could be made.

The Alternative

The Committee believes that neither the existing system nor the CTRC proposals satisfy the conservation requirements as well as they should. So far, insufficient weight has been given to the value of forest managed for wood production as a conservation reserve, (Slatyer, 1975). The problem then is to integrate three types of reservation; viz. National Park, the Forests Departments 'priority use areas' or Forest Parks, and State Forest managed for wood production, into a system of reserves which avoids irreconcilable conflicts. The Committee considers that what is required is a series of reserves of uncut Karri selected across the broad span of the species occurrence. Around each such reserve, which becomes a "core" area with maximum protection from outside influence, is a "buffer" area of greater extent consisting of forest which can be managed for wood production, and the intensity of utilisation can vary with distance from the core boundary. This approach has both scientific and practical management justification. The Maps show that the buffering concept is realised to a considerable extent through the relative distributions of National Parks, Forests Department Reserves or Forest Parks, and State Forest.

Basic ecological studies of Karri forest are needed as a basis for rational management whether in State Forest, National Park or Reserve. Differences in the tree itself and the composition of the understorey are evident across the extent of its range. Core areas as proposed sample stands in each of the major river systems (Donnelly, Warren, Gardner, Shannon, Deep and Frankland) and preserve small outlier stands at the extremity of its range in all directions. Thus the maximum diversity of gene resource and ecological condition will be preserved, making the reserves more valuable for ecological study, seed provenance, selection, and as benchmarks offering the possibility of assessing change over a long period of time. Adjustments of populations in response to climatic change will most likely occur first at the extremities of the natural range.

Relatively small-sized core areas allow greater freedom in their selection. Areas uncommitted for sawmilling can be more easily chosen as can areas too steep for safe logging. Where possible entire small catchments should be preferred.

As well as their use as protective buffers for reserves, State Forest may also be used to round out existing National Parks, which in this case become the core areas. Amenity values would thus be retained should the mature core stand become fire-damaged or degenerate to the stage where its replacement becomes imperative. Areas suggested for this purpose are shown on Map 2 and listed in Appendix 1.

It is suggested that improved reservation of the wide variety of other plant associations could be gained by allocating to Forest Parks further areas having limited commercial value, but high diversity of vegetation and landscape. The lower catchment of the Shannon River and the area of flats interspersed with timbered islands between the Soho and Johnston-O'Donnell areas are suggested for this purpose, and are shown on Map 2.

What the Committee proposes is essentially a reorganization of existing proposals into a preferred conformation. The Forests Department Reserves and the Committee's suggestions can therefore be viewed as a list of alternatives from which a final selection might be made. Thus the impact of reservation on the community dependent upon the wood industry may be minimised.

Recommendations

that the Forests Department make a selection of reserves from those listed in Appendix 1, to be managed as Forest Parks;

that the Department seek the advice of the W.A. Herbarium, the Department of Fisheries and Wildlife, and the CSIRO before making final decisions;

that these decisions be incorporated in the General Working Plan of the Forests Department at the next revision (1976)

2.6 LAKE MUIR

The Committee acknowledges the value of the Lake Muir wetland complex as a waterfowl habitat and refuge, and endorses the recommendations of CTCRC regarding reclassification and vesting of reserves in the complex.

The Committee is impressed by the lack of detailed knowledge of both the general hydrology and the extent of the catchment feeding the area. It is concerned by the comment of CTCRC regarding the likelihood of salinity developing progressively in this wetland complex "at least partly the result of clearing surrounding bushland". However, we have not recommended further reservation or control of clearing to protect the CTCRC proposed reserves. This is partly because of the difficulty in identifying areas whose clearing may have affected the wetlands, and partly because of the considerably reduced rate of clearing for agriculture in recent years. Nevertheless, the risk remains, and the Committee recommends that hydrological investigations be made of the wetland complex and its catchment. The following factors must be known before any control measures can be attempted:

- (1) the extent of the catchments;
- (2) the lines of drainage and the interdependence of the various lakes and swamps along them;
- (3) the importance of peat deposits as a reservoir of water which is not subject to intense evaporation and which is released slowly, so possibly maintaining open water in lakes in the summer.

Land use outside the reserves in addition to agricultural clearing is likely to influence water flows and water levels in the wetland complex. In particular, the drainage of agricultural lands and drainage for peat cutting are involved, and the Committee recommends that these practices be curtailed pending investigation of their effects. In the case of peat cutting, the operation should be restricted to its present site (location 12811 under lease).

Some control over agricultural drainage may be possible through the PWD who are generally directly involved in such schemes.

Recommendations

that the hydrology of the area be investigated;

that further drainage for agriculture and extension of peat cutting operations be delayed until the hydrology of the wetland complex is better known;

that the situation be kept under review by the Wildlife Authority.

2.10 TORNDIRRUP NATIONAL PARK

The Committee endorses the principle behind the CTCRC recommendations. The submission from the Shire of Albany indicates that:

1. the only access to Reserve No. 30360 (Quaranup Youth Camp) is through reserve A25295.
2. Reserve No. 30360 is inadequate for the full development of the Quaranup Youth Camp.

It should be noted that reserve No. 28232 contains underground water resources that may be required for the Albany Water Supply, but exploitation of these resources need not necessarily have a significant effect on the National Park. We believe these land uses are likely to be compatible.

Recommendation

that a portion of reserve A 25295 be excised and added to reserve 30360 to provide facilities for the Quararup Youth Camp.

2.12 WETLANDS

The Committee considers that reservation of wetland areas may not provide sufficient security when their water inputs come largely from catchments outside the reserves. This is the case with the Lake Muir complex discussed previously and we feel that some of the recommendations made for Lake Muir could be applied on a more general scale to wetlands throughout the State.

Recommendation

that the Public Works Department refer all proposals for drainage schemes to the Department of Conservation and Environment for evaluation for possible implications for wetland areas.

2.15 KENT AND DENMARK RIVER CATCHMENTS

These are reserved for water catchments, but they also contribute to the objective of reservation of a number of habitats.

Recommendations

that the Public Works Department, in which the catchment of the Kent River is vested as Reserve No. 29660, be informed of its conservation values, and asked to give an undertaking that these will be preserved;

that the Forests Department, which manages the catchment of the Denmark River as State Forest No. 64, be informed of its conservation values, and asked to give an undertaking that these will be preserved;

VI. CONCLUSION

In the absence of broad scale ecological sufficient detail, we depended greatly on the local considerable, of some members of our Committee. Government's proposals for reserves (their "Priority Use Parks") have been incorporated in our recommendations alternative areas suggested. Potential water supply protected for other reasons are also indicated.

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Ideally, selection and location of reserves by the concept of buffering (Specht et al 1974) of areas requiring exclusion of the public are successively increasing public access or intensifications form a pattern in which reserves purely for are to some extent surrounded by State Forests, s farmland or National Park.

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Since selection of areas for reservation often precludes or limits other forms of land use been easier had there been some form of regional land use policy statement of policy for the area. The maps presented show existing forms of land use and their distribution for Systems 1 and 2; such a compilation would be invaluable in dealing with the other Systems. This is particularly true of System 6, where the task of selection of reservations has scarcely begun, and where the pressure of competing demands in the Darling Range and on the Swan Coastal Plain is greater.

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In relation to management, certain situations present particular problems. Among them are:

- (1) Wetlands - these are frequently important habitats, especially for birds, including migratory species. They are often in private ownership, and valuable for grazing. They may be subject to drastic hydrologic modifications due to such operations as draining or clearing in areas outside the reserve, but feeding water to it.
- (2) Coastal dunes are erosionally unstable in their naturally exposed situation. They are the subject of pastoral leases on the south coast and in danger from over grazing or burning, or too great an intensity of use by wheeled vehicles.
- (3) Recreation areas - preservation of man-made and attractive landscapes, often shaped by agricultural development of historical importance may be required. Public access is needed but should be controlled, due to conflicts with the rights of land owners. Skilled management, under professional direction by some type of National Parks Authority is clearly necessary.

A significant body of public comment made the valid point that numbers of existing reserves are at present virtually unmanaged, and may constitute a hazard or nuisance to neighbouring owners due to lack of fire control or weed infestation. The Committee believes that:

- (1) Once reserves are established, they must be managed, and local interests involved to ensure their advice and support;
- (2) A Management Authority is needed to provide competent professional direction, though day to day local management may be delegated to competent bodies such as the W.A. Forests Department with staff and organisation on the ground;
- (3) Definition of the objectives of management of reserves, whether for scientific purposes or for public enjoyment is required;
- (4) A knowledge and appreciation of the dynamics of the ecosystem processes being manipulated by management is essential.

APPENDIX I

DESCRIPTION OF ADDITIONAL RESERVES UNDER CONSIDERATION
BY W.A. FORESTS DEPARTMENT AND PROPOSED BY THE
SPECIAL COMMITTEE

SYSTEM 1

No.	Name	Description	Purpose	*Status
1.	Blackwood River Reserve	Strip of forest 1.5-3 km wide bordering Blackwood River between Nannup and Warner Glen - Riverbank vegetation of <u>Melaleuca raphiophylla</u> - <u>Eucalyptus rudis</u> , <u>E. patens</u> - <u>E. calophylla</u> on alluvium, <u>E. marginata</u> on uplands.	Recreation	F
2.	Layman	Large contiguous block north of Blackwood River representative of Donnybrook Sunkland. Vegetation ranges from open forest to <u>Eucalyptus marginata</u> to high shrubland of <u>Kingia australis</u> and low open forest of <u>Banksia</u> spp.	Scientific reserve benchmark v. pine plantations	F
3.	Milyeannup	Large block of virgin forest south of Blackwood representative of Donnybrook Sunkland and Bunbury basalts. Vegetation ranging from tall open forest of <u>Eucalyptus marginata</u> - <u>E. calophylla</u> to low shrubland of Myrtaceae and low open forest of <u>Banksia</u> sp.	Scientific Reserve	F
4.	Chester A.	Medium size outlier of <u>Eucalyptus diversicolor</u> in southern Donnybrook Sunkland.	Scientific Reserve, gene conservation.	F
5.	Chester B.	Medium size swampy plain in southern Donnybrook Sunkland with outstanding development of Scented Boronia. (<u>Boronia megastigma</u>)	Scientific Reserve	F

* Proposed by this Committee - C
Proposed by W A Forests Department - F

SYSTEM 1 (cont)

No.	Name	Description	Purpose	Status
6.	Cambray	Strip of forest 1-1.5 km wide along St. Johns Brook in eastern Donnybrook Sunkland, characterised by outstanding development of <u>Eucalyptus patens</u> forest with dense shrubby understorey.	Recreation scientific reserve.	F
7.	Mowen Res. 12974	Large basin with several types of swamp vegetation ranging from sedgelands through shrublands to low closed forest of <u>Melaleuca raphiophylla</u> .	Scientific reserve.	F
8.	Rapids	Small recreational reserve on upper Margaret River comprising large pools and intervening rapids, surrounded by forest of <u>Eucalyptus marginata</u> , <u>E. calophylla</u> and <u>E. megacarpa</u>	Recreational	F

SYSTEM 2

No.	Name	Description	Purpose	Status
9.	Dickson	Virgin jarrah representing typical southern lateritic plateau forest.	General Conservation.	F
10.	Iffley	Jarrah, Marri and Karri mixed forests.	Study area for <u>P. cinnamomi</u>	F
11.	One-Tree Bridge	Pure Karri ranging through Marri mixtures to pure Jarrah. Virgin and regrowth stands. On west bank of the Donnelly River.	Recreation and Conservation.	F
12.	Brockman	Pure Karri, selectively cut in the past. Also Jarrah Marri mixtures.	Recreation and Conservation	F
13.	Dombakup	Virgin Karri	Recreation (Scenic)	F
14.	Road Reserves in Chipwood Licence Area.	Covers the range of forest types that occur within the chipwood licence area. Important as fauna refuges and corridors.	Passive Recreation (Scenic) and Conservation.	F
15.	River and Stream reserves in Chipwood Licence area.	Covers the range of vegetation bordering streams and rivers throughout the chipwood licence area. Important as fauna refuges and corridors.	Stream Protection and Conservation and Recreation (Rivers).	F
16.	Lindsay	Forest types ranging from Karri to Jarrah. Selectively cut about 40 years ago. The catchment for Manjimup water supply.	Catchment Protection.	F
17.	Johnston/O'Donnell	Forests are virgin. Covers a wide range of types from Karri, Marri mixtures, and Jarrah to large open flats.	Conservation	F
18.	Soho	Varies from extensive flats to closed forest. Includes two tingles - <u>E. guilefoylei</u> and <u>E. brevistylis</u> and Red flowering Gum, <u>E. ficifolia</u> .	Conservation	F

SYSTEM 2 (cont)

No.	Name	Description	Purpose	Status
19.	Strickland	Virgin Karri on the slopes of the valley of the Donnelly River. Represents the western plant associations of the Karri forest.	Recreation (Scenic) and Conservation.	C
20.	Beavis	Virgin Karri representing the western plant associations of the Karri forest.	Conservation.	C
21.	Giblett	Ranges from virgin Karri, through Marri mixtures to Jarrah. The Jarrah forests were selectively cut a few decades ago. This proposal forms a northern extension of Beedelup National Park.	Conservation	C
22.	Hawke Treen	Virgin and regrowth pure Karri forest. Forms a northern and eastern extension of Warren National Park.	Conservation	C
23.	Boorara	Virgin Karri forest representing the southern plant associations.	Conservation.	C
24.	Curtin	Virgin Karri representing the south eastern plant associations.	Conservation.	C
25.	Wattle	Virgin Karri representing the south eastern plant associations and enclosing an entire sub-catchment.	Conservation.	C
26.	Lower Shannon (Chesapeake-Pingerup)	Represents islands of Karri forest and ridges of Jarrah in large seasonally flooded plains. Forests are uncut.	Conservation Protection of Broke Inlet.	C
27.	Mitchell Crossing	An alternative large area between the Johnston-O'Donnell and Soho and it further covers the vegetation range represented in these two Forests Department reserves.	Conservation	C

APPENDIX II

TABULATED RECOMMENDATIONS

FOREST PARKS (See p.11)

that the CTRC recommendation on the amendment of the Forests Act to permit the establishment of Forest Parks be implemented as soon as possible.

CONSERVATION OUTSIDE RESERVES

Acquisition of Freehold Land for Conservation (See p.13)

that where the owner is in voluntary agreement the land be purchased at an acceptable price;

that exchange of land be made where a mutually acceptable alternative area can be found;

that, if purchase or exchange is unacceptable, negotiations proceed, on the understanding that the owner retain the land, leading to its management for the purpose of the proposed reserve, where necessary assisted and subsidised by the State under some form of satisfactory legal agreement;

that, in the case of the previous recommendation, the State endeavour to purchase if the land should be offered for sale;

that if the above alternatives are unsuccessful and emphasising again that the land must be essential to the proposed reserve, it be resumed.

Environmental Control of Freehold Land (See p.15)

that the National Parks Board consider ways and means of establishing a network of walking trails in the Leeuwin-Naturaliste area, based on existing road, railway and other reserves.

TABULATED RECOMMENDATIONS

CTRC RECOMMENDATIONS

(a) General

1. that the Ludlow-Wonnerup area, as delineated in Fig. 1.3, be managed by a Committee of Management as though it were a National Park;

that the Committee of Management comprise representatives of appropriate public authorities - the Forests Department, the proposed Estuarine Conservation and Management Committee of the Environmental Protection Authority, the National Parks Board and such other authorities as might be considered appropriate;

that the Government purchase all freehold land within the delineated area and place it under the control and the proposed Committee of Management;

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

1.1 Ludlow-Wonnerup Area

Agreement in principle, some revision, particularly as to vesting and management.

General

that the Ludlow-Wonnerup area, as delineated in Figure 1.3 of the CTRC Report be managed for three main purposes:

- (i) preservation of the existing scenic, recreational and tourism values
- (ii) improvement of wetland habitats
- (iii) conservation of the Tuart (E. gomphocephala) ecosystem;

that guidelines for management of the delineated area to achieve the above aims be evolved by a local advisory committee consisting of representatives of Forests Department, Wildlife Authority, National Parks Board, Busselton Shire Council and the individual landholders concerned;

CTRC RECOMMENDATIONS

(b) Ludlow Tuart Forest

that all of Ludlow forest as delineated in Fig. 1.3 remain a proclaimed State Forest under the control of the Conservator of Forests and be managed by the Forests Department in liaison with other authorities (through the proposed Committee of Management recommended in 2 above) as though it were a National Park;

that the remaining portions of Tuart Forest within the area be retained in perpetuity and managed to maintain their conservation/recreation values; that there be no further planting of exotic forest species and that mining be permitted;

that consideration be given to replacing pines with Tuart as pines are cut down, but it is recognised that the management of the forested parts of area 1.1 by the Forests Department may depend on the retention of pine growing/milling operations in the vicinity of Ludlow;

that no mining within the pine plantation in area 1.1 be approved until a pilot study has demonstrated that Tuart can be satisfactorily re-established after mining;

that while recognising that proposed extensions of current mining operations near Capel will require the realignment of Bussell Highway and the railway, the Main Roads Department, the Railways department and local authorities be informed of the special importance attached to area 1.1, and be requested to respect the verge flora associated with the Tuart forest;

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

Ludlow Tuart Forest

that Ludlow Tuart forest remain State Forest under the control of the Forests Department and be managed under a new Working Plan for multiple use, priority being given to recreation and conservation of the ecosystem;

that the existing pine plantations within the defined Tuart forest be progressively phased out and replaced by Tuart;

that due to the unique character of this remnant of a once more extensive ecosystem, mining be excluded from the forest;

that Bussell Highway from Ludlow to the Sabina River should not be widened as this is a unique scenic drive;

that the inclusion of the Minnipup Block in the Ludlow State Forest to improve the representation of the shrub understorey of the Tuart forest as recommended by the Forests Department be implemented;

CTRC RECOMMENDATIONS

(c) Vasse and Wonnerup Estuaries as delineated in Fig. 1.3

that this area be brought under the control of the proposed Estuarine Conservation and Management Authority of the Environmental Protection Authority and that they investigate the boundaries with a view to deciding whether these should be extended to include more of the Broadwater-Vasse-Wonnerup estuary;

that the proposed Estuarine Conservation and Management Authority of the Environmental Protection Authority be asked to investigate the desirability of continuing the lease of Crown land on the margin of Wonnerup Inlet at the mouth of Malbup Creek;

that no mining be permitted within the Vasse-Wonnerup Estuary;

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

Vasse and Wonnerup Estuaries

that the Committee of Management proposed by CTRC seek the voluntary cooperation of landholders in the area in achieving the aims outlined above, with the technical advice of the W.A. Wildlife Authority. If voluntary cooperation of landowners is not possible, then the State should purchase private property involved if and when it is offered for sale;

that where conservation of wetlands can be shown to inhibit the productive potential of farmland, the State provide monetary compensation. Such compensation should, however, be contingent on an owner's consent to a legally binding agreement protecting the State's investment;

that no mineral claims be granted in the delineated area without the approval of the Environmental Protection Authority;

that no subdivision of existing properties, nor change in rural zoning be permitted;

that the Wildlife Authority confer with the Department of Lands and Surveys to ensure that the conditions of lease of Crown land of the mouth of Malbup Creek are compatible with the above aims and to determine whether the continuation of this lease is desirable;

CTRC RECOMMENDATIONS

(d) Geographe Bay Coast

that the following camping and recreation reserves situated on the shores of the Vasse-Wonnerup Estuary or nearby Geographe Bay foreshore, be

- (a) consolidated and enlarged where possible, and extended to the low water mark of adjoining tidal waters;
- (b) proclaimed Class A for National Park and placed under the control of the National Parks Board of Western Australia;

These are:

Reserve No. 31188, C Class for Recreation Area, no vested, area 4 ha; (locality C, Fig. 1.3)

Reserve No. 385, A Class for Camping and Recreation Area, controlled by the Busselton Shire Council, area 11 ha;

Reserve No. 5217, A Class for Camping and Recreation Area, vested in the Busselton Shire Council, area 11.2 ha;

Reserve No. 22952, C Class for Camping and Recreation Area, vested in the Busselton Shire Council;

that no extension of existing approved mining tenements be granted and that consideration be given to discontinuing their tenure forthwith. There should be no further approval of applications to mine within Sub-area 1.3.

RECOMMENDATION OF THE SPECIAL COMMITTEE

Geographe Bay Coast

that reserves 385, 5217 and 22952, all A class reserves for Camping and Recreation, remain vested in the Busselton Shire Council. The Council should avoid any more intensive development that exists at present;

Reserve 31188 (C class for Recreation) be gazetted as a fauna reserve and vested in the Wildlife Authority;

CTRC RECOMMENDATIONS

1.2 The Broadwater

The Committee recommends that the West Australian Wild Life Authority be asked to give an opinion as to whether it would be desirable to enlarge the reserve and whether any other measures are needed to conserve its value as wildlife habitat.

1.3 Whicher Range

- (1) that the following blocks of State Forest No. 33 be released from the State Forest and made a Class A reserve for the Conservation of Flora and Fauna and vested in the W.A. Wild Life Authority; namely McGregor, Whicher and part of Bovell as shown in Figure 1.5;
- (2) that, on the coastal plain between Jalbarragup Road and Wonnerup Road, road verges still carrying natural vegetation be protected.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

2.1 The Broadwater

that the Department of Fisheries and Wildlife approach landholders in this area to gain their voluntary agreement to manage the appropriate areas for the protection and improvement of wetland habitats;

that Department provide technical advice for this purpose;

that the State provide monetary compensation for loss of agricultural productivity where necessary (refer to Vasse-Wonnerup proposals).

1.3 Whicher Range

that Whicher and part of Bovell forest blocks in State Forest 33 (See Map 1 and Appendix 1) be managed by the Forests Department primarily for recreation and flora and fauna conservation as a Forest Park;

that a more complete survey be carried out to determine whether several rare or new species of plants in this area are adequately represented either in the above reserve or elsewhere in nearby Crown land.

CTRC RECOMMENDATIONS

1.4 LEEUWIN-NATURALISTE RIDGE

Recommendations:

1. That all reserves in the area (Figs. 1.9 to 1.12) be consolidated into a single Class A reserve for National Park and be placed under the control of the W.A. National Parks Board.
2. that all vacant Crown land as shown in Figs. 1.10, 1.11 and 1.12 be incorporated into the proposed National Park.
3. that the Conservator of Forests be asked to manage State Forest No. 45 (Figs. 1.11, 1.2) as if it were a National Park, and that the methods employed take account of possible direct mechanical damage to caves, as well as indirect deleterious effects such as those resulting in interference with the watertable.
4. that an expert Committee be appointed by the Environmental Protection Authority to co-ordinate the management of the area, and that this Committee comprise representatives of the National Parks Board, the Conservator of Forests, the West Australian Wild Life Authority and such other persons, or representatives of Authorities, as the Environmental Protection Authority deems appropriate;
5. that selected freehold land be purchased and included in the proposed National Park.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

1.4 LEEUWIN-NATURALISTE RIDGE

Agree in principle

that all reserves in the delineated area (Figures 1.9 to 1.12 of the CTRC Report) be transferred to a single A Class reserve to be managed by the National Parks Board;

that all vacant Crown Land as delineated in Figures 1.9 to 1.12 of the CTRC Report be incorporated in the proposed Park;

that there be no further alienation of other vacant Crown Land on the Leeuwin-Naturaliste Ridge until an overall land use study for the area has been carried out;

that the Forests Department continue to manage State Forest 45, (Boranup) as a Forest Park so that priority is given to maintenance of the Karri forest ecosystem, and for recreation and scenery preservation rather than production forestry. The existing liaison with the W.A. Museum in respect of protection of caves should continue;

that the National Parks Board be assisted to evolve management procedures for the proposed National Park by an advisory committee composed of representatives of the Busselton and Augusta-Margaret River Shire Councils, Forests Department and the Wildlife Authority;

CTRC RECOMMENDATIONS

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

that there be limited purchase by the State of freehold land to consolidate the proposed Park and to preserve certain historical sites. Such purchase should take place if and when the properties listed in the Confidential Appendix are offered for sale;

that should the integrated public-private land National Park be considered feasible, it first be tried on Cape Naturaliste. Once any problems have been resolved it should be extended to the whole of the Leeuwin-Naturaliste Ridge.

1.5 DONNYBROOK SUNKLAND

1.5 DONNYBROOK SUNKLAND

that the Blackwood River between Nannup and Augusta be maintained in its present, largely undisturbed state, and the scenery along the river be preserved essentially as it is now;

that Milyeannup Block be managed by the Forests Department as a Forest Park, that is, as a "benchmark" scientific reference area. The Forests Department should carry out investigations to determine whether Layman Block is suitable for management in a similar way;

CTRC RECOMMENDATIONS

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

that the Committee endorses the Forests Department proposals for Forest Parks for recreation and conservation purposes in the Rapids, Cambray, Oasis and Chester Blocks.

CTRC RECOMMENDATIONS

2.1 SCOTT NATIONAL PARK

The Committee recommends that an area of vacant Crown land as shown in Fig. 2.1. be added to the Scott National Park (Reserve A 25373)

2.2 PEMBERTON NATIONAL PARK

1. that the Minister for Lands be advised to transfer the control of Warren and Beedelup Parks to the National Parks Board of W.A.;
2. that the Pemberton National Parks Board confer with the National Parks Board of W.A. to prepare a timetable for the transfer from the Pemberton National Parks Board to the National Parks Board of W.A. and make recommendations on the future of the other, smaller reserves.

2.3 PROPOSED SOUTH COAST NATIONAL PARK

1. that all existing reserves and Vacant Crown land as shown in Figs. 2.2, 2.3 be added to the Walpole-Nornalup National Park (Reserve No. A. 31362 and placed under the control of the National Parks Board of W.A., the park to extend to low water mark;

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

2.1 SCOTT NATIONAL PARK

that the Department of Lands and Surveys proceed with negotiations in respect of reserve 25856; that if it is no longer required for mining purposes, it be cancelled and its area added to reserve A25373;

that if a decision not to mine in reserve]8644 is made, then it be gazetted a National Park.

2.2 PEMBERTON NATIONAL PARK

Agree, but add third recommendation:

that there be a local advisory committee involved in the planning and management of the Pemberton National Parks;

that minimum representation on the advisory committee be Local Government, the Pemberton Tourist Bureau, the Forests Department, and the National Parks Board.

2.3 PROPOSED SOUTH COAST NATIONAL PARK

Agree in principle, recommendations revised in the interests of practicability:

that a new National Park should be proclaimed between the Scott River area and Nornalup. The Park should extend to the low water mark;

CTRC RECOMMENDATIONS

2. that existing leases within the boundaries of the proposed park be terminated and the land contained therein be incorporated within the proposed park;
3. that the government acquire all private land inside the proposed boundary and that the management authority consult with appropriate Government departments to prepare a priority schedule for acquisition;
4. that as soon as legislation is enacted to permit it, Broke Inlet be declared an aquatic reserve for National Parks and placed under the control of the National Parks Board of W.A;
5. that reserve 14325 be cancelled and its area added to reserve A 31362

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

- that the external boundaries of the new Park be as shown in the CTRC Report in Figures 2.2 and 2.3;
- that Freehold land within the Park boundary be purchased by the State as it is offered for sale, then added to the Park;
- that pastoral and grazing leases within the proposed Park eventually be terminated, unless a closer study of the place of grazing in the area leads to future modification of this policy;
- that the Department of Lands and Surveys incorporate more stringent specifications in the leases;
- that both Broke and Walpole-Nornalup Inlets be made aquatic reserves;
- that all other reserves (except those shown below) and vacant Crown land within the Park boundary be included in the National Park;
- that Reserves 17495 and 18717 remain vested in the Manjimup Shire Council.

2.4 SHANNON RIVER DRAINAGE BASIN

1. That during the first license period of the Wood Chipping Industry Agreement Act, 1969-73 clear-felling should not be carried out in an area designated here the Shannon River Drainage Basin.

2.4 SHANNON RIVER DRAINAGE BASIN

- that the Forests Department make a selection of reserves from those listed in Appendix I, to be managed as Forest Parks;

CTRC RECOMMENDATIONS

2. that precise boundaries of the area to be set aside as the Shannon River Drainage Basin be determined by the Environmental Protection Authority in consultation with the Conservator of Forests.
3. that all Crown land within the designated boundaries which is not at present incorporated in State Forests should be immediately reserved;
4. that, towards the end of the first license period when the effects of clear-felling in other areas can be assessed, a committee select, from within the Shannon River Drainage Basin, a substantial area of wet sclerophyll forest to be conserved in perpetuity as natural forest; the Environmental Protection Authority, the Conservator of Forests, the Western Australian Wildlife Authority and the National Parks Board of Western Australia should be represented on this committee;
5. that the Conservator of Forests be asked to manage the area selected for conservation as though it were a National Park;
6. that during the first license period of the Wood Chipping Agreement, the Environmental Protection Authority collaborate with the Forests Department in initiating a project to study in detail, and over a prolonged period, any aspects of the biology of the Shannon River Drainage Basin (including Broke Inlet) that appear relevant to assessment of the environmental effects of the woodchip industry and to the conservation of the wet sclerophyll forest.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

that the Department seek the advice of the W.A. Herbarium, the Department of Fisheries and Wildlife and the CSIRO before making final decisions;

that these decisions be incorporated in the General Working Plan of the Forests Department at the next revision (1976).

CTRC RECOMMENDATIONS

2.5 TONE-PERUP RIVER AREA

1. that on the understanding that the forests Department intends to manage the area to the benefit of its fauna, the entire area delineated in Fig. 2.9 be classified State Forest and be managed by the Forests Department as though it were a reserve for flora and fauna;
2. that if at any time the area is relinquished by the Forests Department it be made a Class A Reserve for Conservation of Flora and Fauna vested in the W.A. Wildlife Authority.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

2.5 TONE-PERUP RIVER AREA

Agree in toto

2.6 LAKE MUIR

1. the following reserves, for the Conservation of Flora, Fauna and vested in the WA Wildlife Authority, be declared Class A
26677 Kulunilup Lake
26678 Kodjinup Swamp
26679 Pindicup Lake and Bodginup Swamp
26680 Noobijup Lake
26681 Cobertup Swamps
26682 Pinticup Swamp;
2. reserve No. 29601 (Yarnup Swamp) for the Conservation of Flora and Fauna, not vested, be declared Class A and vested in the WA Wildlife Authority;
3. the purpose of reserves 6549 (Galamup Swamp) and 14739 (Bokarup Swamp) set aside for "Water" and not vested, be amended to include Conservation of Flora and Fauna and vested in the WA Wildlife Authority.

2.6 LAKE MUIR

CTRC Recommendations endorsed and added to as shown below:

that the hydrology of the area be investigated;

that further drainage for agriculture and extension of peat cutting operations be delayed until the hydrology of the wetland complex is known;

that the situation be kept under review by the Wildlife Authority.

CTRC RECOMMENDATIONS

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

The Committee endorses the status, purpose and vesting of reserve No. 31880 (Class C, Conservation of Flora and Fauna vested in the WA Wildlife Authority, including Lake Muir, Byenup Lagoon, Tordit-Gurru Lagoon, Neeranup Swamp, Poorginup Swamp and Coorinup Swamp) and recommends the following be added to it:

1. the temporary reserve to the north-east of Lake Muir (Nelson Location 12694)
2. the vacant Crown land south-east of Neeranup and Coorinup Swamps (Nelson Locations 12566, 12567 and 12568).

Mining operations on this reserve should be subject to conditions laid down by the Environmental Protection Authority and designed to preserve the wetlands.

2.7 PORONGURUP NATIONAL PARK

The Committee endorsed the status, purpose and control of the Porongurup National Park.

2.7 PORONGURUP NATIONAL PARK

Agree in toto

2.8 MILLBROOK RESERVE

The Committee recommends that the status and purpose of reserve No. 18739 be changed from C Class for "Conservation of Flora" to A Class for "Conservation of Flora and Fauna" and that it be vested in the W.A. Wildlife Authority.

2.8 MILLBROOK RESERVE

Agree in toto

CTRC RECOMMENDATIONS

2.9 WEST CAPE HOWE

The Committee recommends that the status and purpose of reserve No. 26177 be changed from C Class for Common to A Class for National Park, and that it be placed under the control of the National Parks Board of W.A.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

2.9 WEST CAPE HOWE

Agree in toto

2.10 TORNDIRRUP NATIONAL PARK

1. that the status and purpose of Reserve No. 28232 be changed from C Class for tourist lookout to A Class for National Park, and that it remain under the control of the National Parks Board of W.A;
2. that the purpose of reserve No. A 25295 be changed from "Recreation" to "National Park" and that it be placed under the control of the National Parks Board of W.A.

2.10 TORNDIRRUP NATIONAL PARK

Agree with CTRC, but add the following;

that a portion of reserve A25295 be excised and added to reserve 30360 to provide facilities for the Quararup Youth Camp.

2.11 TWO PEOPLES BAY WILDLIFE SANCTUARY

The Committee endorses the purpose status and vesting of the Two Peoples Bay Wildlife Sanctuary.

2.11 TWO PEOPLES BAY WILDLIFE SANCTUARY

Agree in toto

CTRC RECOMMENDATIONS

2.12 WETLANDS

The Committee recommends that:

1. reserve No. 30626 be increased in size as shown in Fig. 2.1. It should remain for the Conservation of Flora and Fauna, be declared Class A and vested in the WA Wildlife Authority.
2. a Class A reserve for the Conservation of Flora and Fauna, vested in the WA Wildlife Authority, be created at Owingup Swamp. The reserve should include the open waters of Owingup Lake and part of the surrounding and adjoining swamps. Boundaries to be determined by the Environmental Protection Authority following consultation between the Departments of Agriculture, Fisheries and Fauna, and Lands and Surveys.

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

2.12 WETLANDS

Agree with CTRC but add the following;

that the Public Works Department refer all proposals for drainage schemes to the Department of Conservation and Environment for evaluation for possible implications for wetland areas.

2.13 ISLANDS

1. that the status of the following reserves be changed from Class C to Class A and that they remain for the Conservation of Flora and Fauna, vested in the WA Wild Life Authority;

No. 144 - Mistaken Island
No. 27614 - Breaksea Island
No. 30049 - Michaelmas Island
No. 31904 - Chatham Island
No. 32199 - Seal Island (King George Sound)

2. that the purpose of Reserve No. A24808 (Green Island) be changed from Recreation to Conservation of Fauna and Flora and that it be vested in the WA Wildlife Authority.

2.13 ISLANDS

Agree in toto.

CTRC RECOMMENDATIONS

2.14 The South Coast

The Committee recommends that a working group comprising representatives of relevant local authorities, State Government Departments and the public be set up by the Environmental Protection Authority. The terms of reference to be to make recommendations on

1. The future control and management of Crown lands along the South Coast between Capes Leeuwin and Arid, excepting
 - (a) the proposed South Coast National Park (Area 2.1)
 - (b) Walpole-Nornalup National Park (Area 2.1)
 - (c) William Bay National Park
 - (d) proposed West Cape Howe National Park (Area 2.9)
 - (e) Torndirrup National Park (Area 2.10)
 - (f) Two Peoples Bay Wildlife Sanctuary (Area 2.10)
 - (g) Fitzgerald River National Park (Area 3.2)
 - (h) Cape le Grande National Park (Area 3.4)
 - (i) Cape Arid National Park (Area 3.5)
2. the financial implications of creating a special authority to manage these Crown Lands;
A list of land to be included in the study is as follows (see also System 3, Area 3.10)

SYSTEM 2 WEST TO EAST

19787	"C" Class, Camfield, Camping Area
15677	"A" Class, near Irwin Inlet, Inspection of Flora
22975	"C" Class, Irwin Inlet, Camping and protection of flora
17734	"C" Class, Irwin Inlet, Common
10224	"C" Class, Foul Bay, Government Requirements
7723	"C" Class, Boat Harbour, Government Requirements
2010	"C" Class, Boat Harbour, Public Utility
2008	"C" Class, Point Hillier, Public Utility

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

2.14 The South Coast

Agree in toto

but the working group should consider also Reserve 25865 near Mt. Many Peaks No. 29883 (Catchment Area), 27502 (Recreation and Camping) and vacant Crown land between Waychinicup River and the whaling station.

CTRC RECOMMENDATIONS

RECOMMENDATIONS OF THE SPECIAL COMMITTEE

- 20928 "A" Class, Parry Inlet, Recreation and Camping
- 24913 "A" Class, Ratcliffe Bay, Park Lands and Recreation
- 30883 "A" Class, near Youngs siding, Recreation
- 17464 "C" Class, Tennessee siding, Common
- 24514 "A" Class, Torbay, Recreation and Camping
- 20367 "C" Class, Port Hughes, Common
- 2217 "C" Class, Port Hughes, Public Utility and Camping
- 4732 "C" Class, south of Lake Powell, Common
- 13773 "C" Class, south of Cuthbert, Pine plantation
- 24547 "A" Class, Port Harding, Camping and Recreation
- 24548 "A" Class, Port Harding, Camping and Recreation
- 22998 "A" Class, Port Harding, Camping and Recreation
- 2903 "C" Class, west of Princess Royal Harbour, Quarantine station for stock.
- 22698 "C" Class, Emu Point, Residences Business area, Public Utility,
- 27107 "A" Class, Emu Point, Townsite extension (Albany) and National Park.

All vacant Crown land on coastline.

2.15 KENT AND DENMARK RIVER CATCHMENTS

that the Public Works Department, in which the catchment of the Kent River is vested as Reserve No.29660 be informed of its conservation values, and asked to give an undertaking that these will be preserved;

that the Forests Department which manages the catchment of the Denmark River as State Forest No. 64, be informed of its conservation values, and asked to give an undertaking that these will be preserved;

APPENDIX III

HISTORY OF THE SHANNON BASIN

Until they were dispersed early this century, tribal aborigines lived in the lower south west for upward of 20,000 years (Merrilees et al 1973). Accounts from older settlers indicate that they tended to avoid the heavier forest but spent more time in the drier more open forest inland from it, or on the coast itself. The Shannon Basin is understood to have contained a particular swamp which provided good spears from its thickets, but apart from occasional expeditions there to replenish supplies, the aboriginals appear not to have frequented the basin to any extent.

The first significant incursion by European man was cattle grazing which began on the coast west of Broke Inlet and near the mouth of the Shannon about 1860. From then on cattle have been herded back and forth annually through the Shannon Basin. The earliest route established, now known as the Deeside Coast Road, traverses the west boundary of the catchment from end to end. Other routes followed, one of which became, in part, the present South West Highway between Manjimup and Walpole. Cattle are still herded along the highway. The establishment of the Manjimup-Walpole Road was in fact the next significant incursion by European man.

Large areas of the Shannon Basin were classified and surveyed for farming sub-division in the early 1900's. In the 1920's other field parties carried out assessments of timber and forest values. Group settlement No. 147 in the north west corner of the Shannon Basin began at about the same time, the total area of farmland involved being approximately 1800 acres, only part of which was cleared.

The next period of activity followed the Second World War. War Service Land Settlement, using the newly introduced bulldozer, renewed clearing activity within Settlement No. 147. Sawmilling permit 1329 was put up for tender and granted to State Sawmills. A railway line was constructed to the Shannon Townsite from Terry Siding near Northcliffe, allowing clearing of the townsite and mill construction to proceed. The last nine miles of the line followed the banks of the Shannon River. Large scale sawmilling began in the early 1950's. Clearing, amounting to several hundred acres, was necessary to accommodate the mill, the settlement and ancillary services. Due to faulty planning, which did not take into account the steepness of the site, severe erosion took place. Former residents can well remember having to replace topsoil before they could establish lawns. A dam of considerable size was built across the river upstream from the Mill site.

Upgrading of the South West Highway was undertaken progressively so that the present highway was completed by about 1960. The Forests Department also began making access tracks into the forests to introduce fire control and initiate forest management. It was probably during this period that Dieback (Phytophthora cinnamomi) was introduced along the South West Highway and elsewhere.

The first logging was by bush tramway immediately south of the townsite and east of the river. It was not long, however, before the change to truck logging was made, whereupon all weather logging roads began to wind out into the forest from the mill. The first major log road was Bevan Road which went due east, tapping the timber resource of that part of the Shannon catchment and then crossing into that of the upper Deep River. Selection cutting of Jarrah commenced along both sides of the road within the Shannon catchment. Then cutting of both Jarrah and Karri was concentrated for a few years in the Deep River area.

Much of the Karri forest in the central half of the Shannon basin has been severely fire damaged. From the mid 1950's onward pressure was put on the mill to transfer logging into this forest type, so that the saleable timber could be won before further deterioration took place, and so that the forest could be put in a healthy regenerated condition with least delay. As a result, Dog road, leading south from the Shannon Mill was upgraded to logging standard, and cutting began in both fire damaged forest in the Shannon Basin and healthy forest in the upper Weld catchment.

In the mid 1950's a fire originating near Broke Inlet headed north then west through the catchment, adding to the fire damage already there.

The early 1960's saw the Northcliffe Mill begin logging in the central Shannon Basin, commencing in Babbington and O'Sullivan blocks near Nelson Road, now upgraded as a logging road. Entry into the Shannon basin was encouraged to recover and regenerate fire damaged forest.

In 1962, Hawker Siddeley bought the Shannon and Pemberton sawmills from State Building Supplies. A change in policy saw the termination of cutting at the Shannon Mill in the mid 1960's and transferral of its cutting potential to a rebuilt mill at Pemberton. Thus the Shannon mill and settlement ceased to exist, but the cutting continued at the same intensity within the catchment. The settlement, comprising about 500 people, was in existence for over 20 years, during which time industrial and domestic wastes were fed into the river.

The next notable happening was the Boorara fire in the summer of 1968/69, which started in Northcliffe farmland and headed east, traversing the mid Shannon Catchment. The severity of this fire is noteworthy in the Australian literature on fire behaviour. The Northcliffe mill was directed to concentrate cutting in the fire devastated area.

Since then operations out of Pemberton and Northcliffe have proceeded in an orderly manner, cutting fire damaged forest as a first priority, but adding healthy forest when necessary to maintain economic and product standards. To date some 14% of the catchment area has been cut, amounting to approximately 20% of the actual forest contained therein. A further 9% of the basin has been approved by EPA for cutting during the first five years of the woodchip licence period.

APPENDIX 4

REFERENCES

Anon 1975

Afforestation with Pines in the Donnybrook Sunkland: Statement of Intent. Forests Department of WA.

Bettenay E., McArthur W.M., and Hingston F.J. (1964)

The Soil Associations of part of the Swan Coast Plain, W.A., CSIRO Aust. Div. Soils, Soils and Land Use Ser. No.35.

Bettenay, E., Mulcahy, M.J. 1972

Soil and landscape studies in Western Australia (2)
Valley form and surface features of the South-West Drainage Division.
J. Geol. Soc. Aust. 18: 359-369.

Bradshaw, F.J., Underwood, R.J., Quain, S.J., White, B.J., Grace, D.E., 1975.

Proposal for a south coast National Park
Institute of Foresters of Australia, W.A. Division

Christensen, P.E., Kimber, P.C. 1975

Effect of prescribed burning on the flora and fauna of the Southwest Australian forests.
Proc. Ecol. Soc. Aust. 9: 85-106.

CSIRO 1975

Report on some aspects of the environmental effects of woodchip fellings in south western Australia.

McArthur, W.M., Clifton, A.L. 1975

Forestry and agriculture in relation to soils in the Pemberton area of Western Australia.
CSIRO (Aust) Soils and Land Use Series No. 54.

Merrilees, D., Dix, W.C., Hallam, S.H., Douglas, W.H., Berndt, R.M. (1973)

Aboriginal man in south western Australia.
J. Roy. Soc. West. Aust. 56: 44-55.

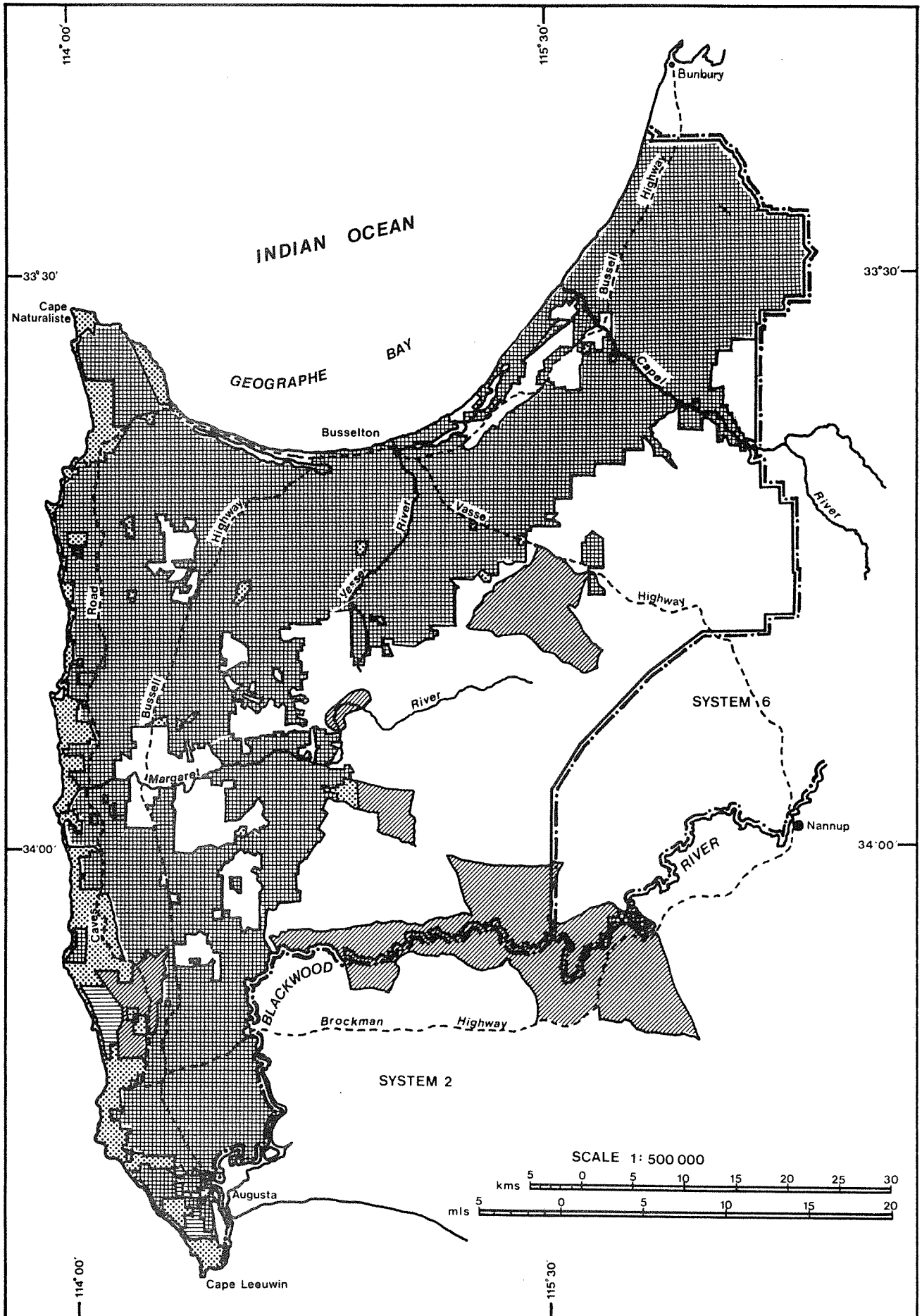
Morrissey, N.M. 1974

Reversed longitudinal salinity. Profile of a major river in the south west of Western Australia.
Aust. J. Mar. Freshwat. Res. 25: 327-335.






Mulcahy, M.J. 1973

Landforms and Soils of Southwestern Australia
J. Roy. Soc. West. Aust. 56: 5-15.

SYSTEM 1 MAP OF EXISTING AND PROPOSED RESERVATIONS



LEGEND

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|---|---|--|---|---|
|  STATE FOREST & V.C.L. |  FREEHOLD LAND |  C.T.R.C. PROPOSED RESERVES |  CURRENT RESERVES |  AREAS PROPOSED FOR RESERVATION BY W.A. FORESTS DEPARTMENT |
|---|---|--|---|---|

N.B. This plan is intended to show broad land use patterns rather than accurate Location and or Boundaries.

Northcote, K.H., Bettenay, E., Churchward, H.M., McArthur, W.M., 1967.

Atlas of Australian Soils, Sheet 5 (Melbourne University Press)

Sadler, B.S., Field, A. 1974

Projections of water demands for industry and urban use, supply sources and cost.

Institute of Engineers of Australia and Australian Institute of Agricultural Science Symposium.

Slatyer, R.O. 1975.

Ecological reserves: size, structure and management. In "A National System of Ecological Reserves in Australia". Ed. F. Fenner. Rept. Aust. Acad. Sci. No. 19, Canberra 1975.

Smith, F.G. 1972

Vegetation map of Pemberton and Irwin Inlet W.A.
Department of Agriculture.

Smith, F.G. 1973

Vegetation map of Busselton-Augusta W.A.
Department of Agriculture

Smith, R. 1951a

Soils of the Margaret and lower Blackwood River Districts, Western Australia.
CSIRO (Aust) Bull No. 262.

Smith, R. 1951b

Pedogenesis in the Frankland River Valley, Western Australia
CSIRO (Aust) Bull. No. 265.

Specht, R.L., Roe, E.M., Boughton, V.H. 1974 (eds)

Conservation of major plant communities in Australia and Papua New Guinea
Aust. J. Bot. Suppl Series 7.

Valentine, P.S., and Enright, N.J. 1975

Cape Naturaliste "Geowest" to be published.

W.A. Forest Department 1973

Marri Woodchip project. Environmental Impact Statement.

