COMMITTEE OF INQUIRY
ON THE
SHANNON RIVER BASIN

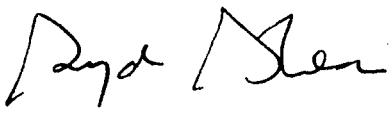
A Report to the
Hon. Minister for Conservation and Land Management
October 1987

COMMITTEE OF INQUIRY
ON THE
SHANNON RIVER BASIN

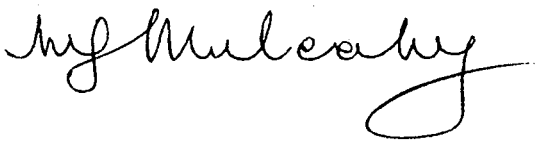
HON MINISTER FOR CONSERVATION

AND LAND MANAGEMENT

We are pleased to submit herewith our Report on the Shannon River Basin requested in your letter of 25 August, 1987.

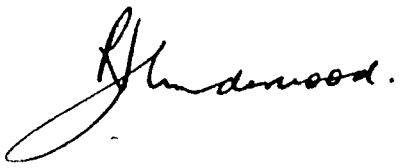


S R Shea



M J Mulcahy

P W G Newman



R J Underwood

15 October 1987

COMMITTEE OF INQUIRY ON THE SHANNON RIVER BASIN

TERMS OF REFERENCE

1. To examine the history of the reserve proposals for the Shannon River Basin in the light of current knowledge of southern forest ecosystems.

2. To consider the merit of the Shannon River Basin as a National Park in relation to the overall reserve system proposed for the Southern Forest Region in the Department of Conservation and Land Management's Draft Regional Forest Management Plans and Timber Strategy (April 1987).

3. To consider the impact of the reservation of the Shannon River Basin as a National Park on the Government's capacity to ensure a sustainable level of timber supply to the timber industry.

MEMBERS

Dr S R Shea - Chairman
B.Sc.(For.), M.Sc.(For.), Ph.D.

Dr M J Mulcahy
A.M., B.Sc.(For.), Ph.D., F.A.I.A.S.

Dr P W G Newman
B.Sc.(Hons.), Ph.D., Dip.E.S. and T.

Mr R J Underwood
M.Sc.(For.), B.Sc., Dip. For.

SECRETARY

Ms T Berson
B.A.

MINISTER FOR CONSERVATION
AND LAND MANAGEMENT

25 AUG 1987

Dr S R Shea
Executive Director
Department of Conservation
and Land Management
Hackett Drive
CRAWLEY WA 6009

Dear Dr Shea

As a consequence of concerns raised in the Parliament concerning the Government's proposal to declare the Shannon River Basin a National Park, I wish you to convene and chair an expert Committee of Inquiry comprised of yourself, Dr Maurice Mulcahy, Dr Peter Newman and Mr Roger Underwood.

The Terms of Reference for the Committee of Inquiry are as follows:

1. To examine the history of the reserve proposals for the Shannon River Basin in the light of current knowledge of southern forest ecosystems.
2. To consider the merit of the Shannon river Basin as a National Park in relation to the overall reserve system proposed for the Southern Forest Region in the Department of Conservation and Land Management's Draft Regional Forest Management Plans and Timber Strategy (April 1987).
3. To consider the impact of the reservation of the Shannon River Basin as a National Park on the Government's capacity to ensure a sustainable level of timber supply to the timber industry.

I would appreciate receiving a report from your Committee by 1 October 1987.

Would you please write directly to the other proposed members advising them of their appointment to the Committee of Inquiry as soon as possible.

Yours sincerely

B Hodge.

Barry Hodge, MLA
MINISTER FOR CONSERVATION
AND LAND MANAGEMENT

7th Floor, May Holman Centre,
32 ST. GEORGE'S TERRACE, PERTH, 6000, WESTERN AUSTRALIA
Phone (09) 325 4133
Facsimile (09) 325 1873

TABLE OF CONTENTS

CONTENTS (continued)

CONTENTS (continued)

1. INTRODUCTION

A number of comprehensive reports on the merits of reserving the whole or part of the Shannon River Basin have been prepared in the last 12 years (see Section 2). This report attempts to resolve the apparent conflicts which they present concerning the scientific merit of the proposal to reserve the Shannon River Basin as a national park. The report also assesses the impact of reserving the Shannon Basin on the timber industry in the light of the most up to date ecological and timber resource data.

In preparing this report we have made extensive use of three new documents which have been prepared by the Department of Conservation and Land Management (CALM) in the last 12 months - the draft Southern Forest Regional Management Plan, the draft Timber Strategy and the draft Management Plan for the Shannon Park and D'Entrecasteaux National Park. As these are publicly available documents, the relevant scientific data which is contained in them have not been reproduced in detail in this report.

The premise upon which our inquiry was based is that a reserve system must be based upon a scientific analysis of the total ecosystem which is being considered. This report aims to clarify the scientific basis of the reserve system proposed in the Western Australian southern forest. Once the framework of a reserve system with specific reference to the Shannon River Basin has been established in this way, the final size and location of any reserve must involve "value" not "scientific" judgement. In Western Australia, we believe the appropriate final arbiter of value judgements is the Parliament of the State.

The role of this Committee is to provide the scientific aspects of the proposal.

2. HISTORY OF RESERVE PROPOSALS

2.1 Reservation in the karri forest

The karri forest of the lower south-west has been "reserved" as State forest since 1930. A system of reservation for conservation and recreation purposes in the main karri belt has been the subject of prolonged investigation dating back to 1972 (see Table 1).

The Forests Department first proposed to set aside areas for conservation and recreation within State forest in its General Working Plan No 85 of 1972. This was followed by a series of investigations under the umbrella of the Environmental Protection Authority (EPA) between 1972 and 1982.

The Forests Department's General Working Plans No 86 and 87, of 1977 and 1982 respectively, introduced a system of management priorities for individual units over the entire State forest. This included a system of scientifically selected Management Priority Areas (MPAs) for conservation of flora, fauna and landscape.

The Forests Department's General Working Plan of 1982 is now being replaced by CALM's Regional Management Plans for the Northern, Central and Southern Forest Regions and associated Conservation, Recreation and Timber Strategies. Drafts of these plans were released for public review in April 1987.

CALM's plans reflect the Government's commitment to the establishment of the Shannon River National Park. The background to this is outlined below.

TABLE 1

Reports Containing Reserve Proposals for the Main Karri Belt, including the Shannon River Basin

YEAR	TITLE	BODY RESPONSIBLE FOR PREPARATION
1972	General Working Plan No 85	Forests Department
1974	Conservation Reserves in WA. Report to the EPA	Conservation Through Reserves Committee
1975	Proposal for a South Coast National Park	Institute of Foresters of Australia
1976	Special Review Committee Report	Environmental Protection Authority
1976	Conservation Reserves for WA. System 1,2,3,5	Environmental Protection Authority
1976	Submission to the Senate Standing Committee on Science and the Environment on the Environmental Impact of Woodchipping	Director for Conservation and Environment
1977	General Working Plan No 86	Forests Department
1981	System 6 Study Report to the EPA	System 6 Committee
1981	Conservation of the Karri Forest	Forests Department

TABLE 1 (continued)

YEAR	TITLE	BODY RESPONSIBLE FOR PREPARATION
1982	Karri at the Crossroads	Conservation Council of WA (Inc), South West Forests Defence Foundation, Campaign to Save Native Forests and Australian Conservation Foundation (Inc)
1982	Redirection of the Karri Forest Economy	Conservation Council of WA (Inc), South West Forests Defence Foundation and Campaign to Save Native Forests.
1982	Critique: Karri at the Crossroads and associated paper Redirection of the Karri Forest Economy	Conservator of Forests
1982	People in Glass Houses...	South West Forests Defence Foundation
1982	General Working Plan No 87	Forests Department
1982	Conservation and Management of the Karri Forest. Report to the EPA.	P M Attiwill
1982	Karri Forest Conservation	Environmental Protection Authority
1983	Conservation Reserves for Western Australia. System 6.	Environmental Protection Authority
1983	Save the Shannon Sensibly	Manjimup Shire Council

TABLE 1 (continued)

YEAR	TITLE	BODY RESPONSIBLE FOR PREPARATION
1986	Shannon Park and D'Entrecasteaux National Park - Draft Management Plan	Department of Conservation and Land Management
1987	Draft Regional Forest Management Plans and Draft Timber Strategy	Department of Conservation and Land Management

2.2 Reservation of the Shannon Basin

The report of the Conservation Through Reserves Committee (1974) was the first to identify the Shannon River Drainage Basin as having special significance worthy of protection.

In summary, the CTRC recommended selection of a substantial area of the wet sclerophyll forest in the Shannon Basin to be conserved in perpetuity and managed by the Conservator of Forests as if it were a national park.

Following a review of the CTRC's recommendations by the Special Review Committee, the EPA formulated its recommendations for Systems 1, 2, 3 and 5 into the report "Conservation Reserves for Western Australia (1976)". These recommendations included the creation of a number of "forest parks" throughout the main karri belt. The CTRC's recommendations on the Shannon River Drainage Basin were not accepted by the EPA in its 1976 report to Government. Rather, the EPA recommended a system of "forest parks" in the karri forest based on the Forests Department's system of MPAs. This system of proposed "forest parks" included the lower part of the Shannon karri forest south of Dog Pool (Lower Shannon MPA) and part of the Curtin block (Curtin MPA). In regard to the central section of the Shannon, the EPA recommended its regeneration using established techniques with a view to reservation in the future.

The EPA's definition of "forest parks" in its 1976 report permitted the cutting of timber under certain conditions:

> *"We (the EPA) suggest that a 'forest park' should be an area of forest which is kept unavailable for the commercial production of timber except in the ordinary course of forest management and to such limited extent as would enable the Conservator for the betterment of the park to cut and remove timber for the purpose of tree regeneration in any areas containing trees which have been damaged or which have deteriorated through age, fire or disease."*

Before the EPA received the report of the Special Review Committee in March, 1976, it addressed the conflict of the Shannon River Basin in its Second Interim Report on the Woodchip (Manjimup) Project in September 1975. In this report, the EPA announced that it had reached agreement with the Conservator of Forests that in the first five years of the woodchip licence period, not more than 9 per cent of the Shannon Basin would be logged. This figure was derived from data relating to areas in the Shannon Basin requiring immediate regeneration. The EPA also reached agreement with the Conservator of Forests that there would be no further use of the Shannon Basin after the first five years without the approval of the EPA.

It was as a result of the expiry of this agreement over the Shannon Basin that the EPA re-examined karri forest conservation in 1982.

The Forests Department submitted a plan for management to the EPA ("Conservation of the Karri Forest", 1981) which followed, fairly closely, the earlier recommendations of the EPA in that it included reservation of parts of the Shannon Basin. It also proposed a substantial reduction in sawlog harvest. Conservation groups submitted that the area of reservations within the main karri belt should be substantially increased above that recommended by the EPA, to include the Shannon River Drainage Basin ("Karri at the Crossroads", 1982). Thus, by 1982 the divergent views on reservation of the whole of the Shannon Basin were established.

In 1982 the EPA commissioned Dr Peter Attiwill to review its recommendations for conservation in the karri forest. These recommendations included the two MPAs in the Shannon Basin (Curtin and Lower Shannon) which comprised about 40 per cent of the area of the Basin. Dr Attiwill concluded that the EPA's recommendations for reservations within the main karri belt were, in terms of the biology of the species, adequate.

In 1983 the Burke Government announced its commitment to create the Shannon River Basin National Park.

Preparation of a draft management plan for the Shannon Park and D'Entrecasteaux National Park commenced immediately after the formation of the Department of Conservation and Land Management in March

1985. It was released for public review in 1987 and is currently approaching finalisation.

2.3 Significance of the EPA recommendations

As mentioned above, the Attiwill Report concluded that the EPA's 1976 recommendations, which were endorsed by Cabinet, provided a sound basis for conservation of the karri forest.

The EPA's 1976 report discussed in some detail the question of management of forest ecosystems and, in particular, the rehabilitation of the Shannon River Basin. The question was also discussed in the 1976 Submission to the Senate Committee on Conservation and Environment on the Woodchips (Manjimup) Project by the Director of the Department of Conservation and Environment, Dr Brian O'Brien, who was also Chairman of the EPA.

The basic argument of the EPA in 1976 was that cutting was permissible in rehabilitation because it helped to defray the costs of management and also meant that access to the resource was retained. The EPA, in 1976, was motivated by a desire to make the resource available because of the social and economic costs of its loss to industry.

It is one of the objects of this Committee to reassess whether this motivation still holds, that is, whether there would be social and economic losses if the whole Shannon Basin were reserved.

3. THE SCIENTIFIC MERITS OF THE SHANNON BASIN RESERVATION AS A NATIONAL PARK

3.1 Introduction

In all previous studies of reserve proposals for the southern forests of Western Australia there is general agreement that those areas in the Shannon Basin which were designated as MPAs (Curtin, Lower Shannon) by the Forests Department were worthy of reservation for conservation and recreation with secure tenure and purpose. These areas constitute approximately 40 per cent of the Shannon Basin.

The remaining 60 per cent lies in the central basin. The principal issues that need to be considered in an analysis of the merits of reservation of that 60 per cent of the basin are -

-the conservation and recreation value of these areas and

-the significance and advantages of the reservation of a total river basin.

3.2 Conservation values

The Shannon Basin consists of three major ecosystems -

-the tall open wet sclerophyll forests dominated by karri (*E. diversicolor)*;

-mixed forests dominated by jarrah (*E. marginata*) and marri *(E. calophylla)*; and

-open swamps, wetlands and sedgelands, known locally as "flats".

3.2.1 Major vegetation types in the Shannon Basin

The major vegetation types of the Shannon are described in detail in the draft management plan for the Shannon Park and D'Entrecasteaux National Park (CALM 1986).

According to the draft management plan, considerable information is available about the structural characteristics of the forested areas, but only limited information is available about species composition and diversity. In the plan, the general distribution and structural characteristics of the plant associations found in the Shannon Basin are described from previously published vegetation surveys (Smith 1972, McArthur and Clifton 1975 and Muir 1981) and recent field surveys, the information from which is not yet published.

Tall karri-dominated forest occurs throughout the Shannon Basin. Distribution is closely allied to loamy soils derived from granite and gneiss. Pure karri stands occur throughout the Shannon Basin except in the upper reaches of the river basin where marri-karri associations occur on brown, gravelly, sandy soils. Jarrah becomes co-dominant with karri on soils of lateritic origin. On favourable sites trees exceed 70m in height.

Isolated patches of karri occur on low hills throughout the lower Shannon and Pingerup Plains. On these sites, trees seldom reach more than 30-40m in height.

The open structure of the canopy in the tall karri forest allows sufficient light penetration for the development of a substantial understorey of small trees and shrubs.

Extensive areas of jarrah forest occur on the lateritic soils of the upper Shannon. On more favourable sites jarrah exceeds 30m in height. It forms woodland (10-30 per cent canopy cover) to open low woodland (0-5m, 2-10 per cent canopy cover) on less favourable sites.

In the lower Shannon Basin pockets of jarrah forest on duplex soils form a complex mosaic with islands of tall karri forest, low jarrah-banksia woodland, *Melaleuca* heathland and low sedges on flat, seasonally-inundated plains.

On the more sandy soils, jarrah occurs in association with marri. Yarri (*E. patens*) is co-dominant with jarrah on wetter sites along the margins of broad, swampy water-courses.

The jarrah forest understorey is usually more open with more distinct structural variation than in tall karri forest.

Large pockets of jarrah-dominated lowland forest and woodlands occur in the lower part of the Shannon Basin. They also occur less extensively around the perimeter of tall karri forest, forming a distinctive structural gradient between the surrounding heath and sedge communities. Blackbutt and sometimes marri occur as the co-dominant or dominant species in these woodland associations. A rich variety of understorey species occur in these inland woodlands.

Peppermint (*Agonis flexuosa*) forms a low forest and low open woodland association on the coastal dunes.

Many of these coastal low forest and low woodland associations have similar low scrub understoreys.

Jarrah-banksia and paperbark (often *Melaleuca preissiana*) woodland associations are widespread on the lower Shannon Basin, with a low scrub and sedge understorey.

In swampy depressions and along some water-courses *Melaleuca* open low woodlands are common. A similar association is also found in the swampy head-waters of the northern part of the Shannon Basin.

Thickets and dense thickets are common throughout the Shannon Basin in swampy gullies, on broad water-courses and in moist sites on the extensive plains.

Sedgelands are common on the seasonally water-logged flats. In the lower parts of the Shannon Plain sedgelands are interspersed by thickets, scrubland and other woodland and forest associations. There is considerable species diversity within the sedge communities.

3.2.2 Special features of the flora

According to the draft management plan, the Shannon Basin (and associated D'Entrecasteaux area) contains a wealth of species of interest to scientists and the wider community. The plan lists rare, restricted, poorly collected, undescribed and high priority species in the two parks. The area is not yet fully surveyed; systematic flora surveys of less accessible areas may add to the list.

3.2.3 Fauna

No detailed fauna surveys have been undertaken. Nevertheless, the vertebrate fauna in the Shannon is well known from broadscale ecological surveys (Christensen Iet al 1985).

Four species gazetted as "rare or in need of special protection" occur in the area - the Peregrine Falcon (*Falco peregrinus*), Crested Shrike-tit (*Falcunculus frontatus*), Red-eared Firetail (*Emblema oculata*) and Freckled Duck (*Stictonetta naevosa*).

The most interesting and diverse fauna occurs on the flats and associated woodlands of the lower Shannon and Broke Inlet area.

Two species vulnerable to insensitive fire management occur within the Shannon Basin - the quokka (*Setonix brachyurus*) and the mardo (*Antechinus flavipes*). Current planning proposals would ensure continued survival of populations of both species.

3.2.4 Effect of fire damage

A mosaic of severe fire damage is characteristic of the fires of the central and lower Shannon.

Although no details are available, wildfires were common in the area before World War II, principally originating from burning on the coast on cattle leases. The Department had no management staff or no detection system in the area before about 1950 and the forest was almost completely inaccessible for fire-fighters.

Three fires are of particular note. Details are available from Departmental archives. The first Boorara Fire commenced on the coast near Northcliffe in the early 1950s and over the next three weeks burnt right across the region (including the Shannon Basin) from west to east during mid-summer. The Dog Road Fire was started by multiple lightning strikes in January 1961. An intense crown fire drove into the central area of the Basin under the influence of hot northerly winds. The second Boorara Fire commenced on a farm east of Northcliffe in March 1969. Under high temperatures and gale force north-westerly winds, it burnt across the whole Shannon forest almost to the Deep River in under two days.

All of these fires killed or killed back stands of mature karri forest and the effects are still obvious today. They also burnt through jarrah and plain country but the effects on these more fire resistant stands is less apparent. Since the early 1970s the Shannon forests have been subject to periodic fuel reduction by prescribed burning, and an efficent fire detection and suppression system has been developed. No serious forest fires have occurred in the Basin in this time. The 1982 Chesapeake Fire, started on a cattle lease near Broke Inlet, was confined mainly to the Pingerup Plains.

This history of severe fires during the years 1950 to 1970 was the primary reason for the recommendation in 1976 that the central areas should be logged and regenerated before reservation. In its later report of October 1982 the EPA recommended -

- that rehabilitation of those parts of the central Shannon in need of restoration, particularly the fire-damaged forest, should proceed by appropriate harvesting procedures and regeneration techniques based on those applicable to MPAs for wood production;
- that the central Shannon having been rehabilitated, its suitability for reservation should be reviewed at some time (perhaps one or two decades) in the future.

3.2.5 A timber harvesting and forest regeneration

A number of areas were harvested and regenerated between 1949 when timber cutting began in the area until 1983 when the Government decided to proceed towards reservation. These amount to 5 200 ha, or 25 per cent of the karri forest and 3 100 ha or 17 per cent of the jarrah forests in the basin. Regrowth will require special fire protection for a short period, but will quickly mature and will be unrecognisable as regrowth stands to the untrained eye in about 50 years time.

3.2.6 Options for management of fire damaged and regenerated forests

Elsewhere it has been suggested that regrowth karri stands in the central portion of the Shannon Basin, originating from previous timber production and regeneration operations, should be subjected to commercial thinning to enhance growth and development of these stands.

Both the EPA recommendation for fire damaged areas (Section 3.2.4) and the thinning proposal have to be judged in the context of a land use decision for the Shannon Basin.

If the Shannon is to be managed in future for timber production, then harvesting and regeneration of fire damaged areas and thinning of regrowth would be highly desirable. These treatments will improve the rate of growth and therefore bring forward the development of the tree stands.

On the other hand, if the areas become national park it will not be necessary to rehabilitate fire damaged areas or thin regrowth stands. Fire damaged areas can be rehabilitated without the necessity for harvesting.

If the areas are burnt during a karri seed year, the forest regenerates. A subsequent period of fire protection will ensure survival of the young trees which become established. Eventually the old fire damaged trees will die and disappear. In regrowth stands natural thinning will occur, aided by occasional fires. These are natural processes. The end result in respect of the health of the forest will be the same as in forest managed for timber production, but it will take far longer. The forest will also be more diverse in terms of faunal habitats. Time is not a problem for processes such as this in a conservation area.

Therefore, timber cutting and commercial thinning are not essential to ensure survival and future development to maturity of fire damaged stands in an area set aside for conservation.

Since fire is a natural factor of the southern forest environment it is impossible to sustain an argument that fire damaged stands do not have conservation values. Thus, provided that management is carried out to ensure that these stands are perpetuated, as we have described above, current and future conservation value will be maintained.

3.3 Recreation assets

There has been a major increase in public interest in the Shannon since it was identified as a potential national park. This interest has expanded in the last two years as a result of:

(i) The release of the draft management plan and associated material.

(ii) The promotion of the area by tourist bureaux.

(iii) The development of the old Shannon River townsite by CALM, and the release of a number of pamphlets, maps and other recreation/tourist documents.

Because there are no permanent staff in the area, and because it is traversed by National Highway No 1, visitor statistics are difficult to obtain.

However, a network of survey devices were established by CALM in September 1986.

The statistics indicate that an average of 66 cars, 63 caravans and 6 motor cycles use the area for camping every month. An average of two people stay in each hut in the Shannon on every night of the year.

Outside the developed area, no survey data is available yet. However, it is known that the area is used regularly by -

- horse riders
- fishermen
- bush walkers
- general tourists

A self-guide driving route and extension of the Bibbulman Track have been designed but are yet to be implemented on the ground. The Department expects that these projects, plus the promotion associated with the area becoming a national park, will see a major expansion in use of the Shannon Basin over the next few years.

The question of whether the fire damaged forests in the central Shannon or the areas previously harvested and regenerated have value for recreation cannot be answered quantitatively. CALM has recently employed a research officer to study landscape preferences and design in the karri forest. Results from this study will not be available for 12 months.

Nevertheless, it is well known that the karri forests in the Walpole-Nornalup National Park (which were extensively fire damaged in the 1930s and 1950s) and regrowth karri forests arising after clearfelling at Big Brook and Boranup are all highly popular destinations. In the case of the regrowth forests, CALM has conducted one excellent study which shows that forest visitors liked regrowth forests and would return to them for another recreation experience.

From these results it can be inferred that the forests of the central Shannon have value for recreation which is not lost by virtue of their present condition.

Reservation and management of the central Shannon Basin for conservation and recreation will still require roads and therefore some risk of disease introduction and soil disturbance. However, these risks are certainly no greater, and should be less than if the area is managed for timber production.

3.4 Significance of whole basin reservation

The arguments in support of the reservation of a whole river basin were originally put forward by the CTRC in 1974. The main advantages of total basin reservation are discussed here:

3.4.1 Representation of ecosystems

The Shannon Basin has a diverse range of soil types, geomorphic elements and vegetation types as well as having a rainfall gradient from 1 400mm at the mouth to 900mm in the upper reaches (Shannon Park and D'Entrecasteaux National Park Management Plan, CALM 1987). This means that a suite of ecosystems are contained within the one reserve.

3.4.2 Size and contiguity

The reservation of the Shannon Basin would result in the creation of a large essentially contiguous area in the southern forest which would be managed to ensure that natural ecosystem processes were maintained and artificial disturbances to the ecosystem would be minimised. The contiguous area would extend from the

south coast park through the Shannon Basin and westwards to encompass the proposed Mt Franklin National Park (29 500 ha). The advantages of size and contiguity to conservation are extensively documented in the scientific literature.

3.4.3 Integrity of the reserve

Ninety-eight per cent of the total area of the Shannon Basin is public land. This is the highest percentage for any major river catchment in the south-west.

3.4.4 Aquatic ecosystems

The Shannon Basin provides the sole remaining opportunity to retain an entire major south-west watershed as a relatively undisturbed aquatic ecosystem, consisting of the Shannon River itself and the waters of Broke Inlet into which it drains.

Investigation of the effects of forest management on aquatic fauna of south coast river systems is almost totally lacking. Potential effects have been reviewed by Hilliard, Pen & Potter (1987), who point out that in many south-west rivers there have been substantial changes due to agricultural clearing.

The condition of Broke Inlet has been reviewed by Hodgkin (1987 pers. comm.). It forms a large (45 km^2) estuarine lagoonal system with its long axis of 15 km parallel to the coast between low hills and swamps on the southern edge of the Yilgarn Block, and massive Pleistocene dunes and swamps on its seaward side. A 3 km long narrow channel through the dunes connects the lagoon to the sea. The sea bar is closed for the first seven months of the year.

The water is brackish (observed surface salinities 6-20 ppt), probably fresh when the river is flowing strongly, and with sea water (35 ppt) in deeper parts when the bar is open. The Inlet is oligotrophic, the seagrass *Ruppia* forms dense beds and there are other halophytes, common estuarine species of benthic invertebrates are present, 25 species of fish have been identified from the Inlet and there is a small net fishery, mainly for Yellow-eye and sea mullets and King George whiting. It is thus one of the least disturbed of the south coast inlets, and is judged to be in almost pristine condition.

Broke Inlet is in the D'Entrecasteaux National Park; the only road access is to Camfield (a map name only) on the northern shore where there is one private residence and several fishermen's shacks. Being in low-lying country it does not have

the spectacular scenery of Nornalup Inlet and attracts few visitors other than fishermen.

Clearing for agriculture increases both the volume of runoff and flow rates in rivers. It also results in major and prolonged increases in the amount of sediment brought down, especially by unseasonal heavy rainfall when the catchment is dry. The change in flow regimes also shortens the period of runoff. This reduces recruitment to fish stocks, increases the period when evaporation exceeds input to the estuary and lowers water levels in summer.

Since most south-west rivers in WA have been seriously affected by salinisation due to agricultural clearing, the reservation of the Shannon Basin affords a valuable conservation opportunity to maintain at least one river and inlet in a near to pristine condition.

Logging associated with timber production in the southern forests has been shown not to have a significant effect on stream quality. It may, however cause temporary and local turbidity unless carefully managed ("Impact of Logging on the Water Resources of the Southern Forests, Western Australia" - Report by the Research Steering Committee, May 1987).

Although no significant adverse effects of logging on the ecology of the streams and Broke Inlet have occurred in the past, scientific data in this area is meagre. The reservation of the whole river would permit conservative management of forest areas.

This would ensure that there was a relatively complete river basin in the south-west which could be used as a scientific benchmark.

3.5 Summary

We conclude that the proposal to reserve the 60% of the Shannon Basin previously not reserved has scientific merit. The fact that areas of the Shannon Basin are fire damaged does not mean that they do not have inherent conservation and recreation values. It will also be possible to perpetuate these stands without logging them. Similarly the regrowth stands in the Basin have conservation and recreation values and also can be managed to ensure their continued development without commercial logging.

There is significant scientific merit in reserving a total river basin and managing it to ensure disturbances to its ecosystem are minimised.

4. RELATIONSHIP OF THE SHANNON TO THE REMAINDER OF THE RESERVE SYSTEM

4.1 General

As outlined in Section 2, a reserve system for the karri forest has been the subject of considerable study and prolonged debate.

Nevertheless, studies carried out by the EPA have confirmed that the reserve system developed by the Forests Department is sound and adequate in its representation of the ecosystems of south-west wet and dry sclerophyll forests.

The EPA's consultant, Dr Peter Attiwill stated in his report of 1982 that:

> "*I also accept the EPA (1976) recommendations for reservations within the main karri belt and I consider that, in terms of the biology of the species, the proposed area of reservation is adequate.*"

On Attiwill's report, the EPA (1982) concluded that:

> "*This reassessment of karri forest conservation has confirmed that (the EPA's) 1976 recommendations provide a sound basis for a system of reservation of karri forest ecotypes for conservation and recreation.*"

The proposals contained in the regional management plans and timber strategy prepared by CALM if implemented will further enhance this reserve system. The plans and strategy propose to secure both the tenure and the purpose of the forest reserve system recommended by the EPA. This will be done by excising the reserves from State forest and rededicating them as A Class reserves. This concept was accepted in principle by the Government at the time of the release of the draft plans in April 1987.

If achieved, this rededication of a representative system of reserves in the karri forest as A class reserves will implement the remaining outstanding recommendations of the EPA 1976 report.

4.2 The impact of the Shannon Basin reservation on the total reserve system

One of the concerns with the proposal to reserve the Shannon Basin has been that it may result in the loss of other areas which are more worthy of reservation.

In our assessment of this question we have assumed that if the reservation of the Shannon Basin does not derogate from the reserve system endorsed by the EPA's 1976 report and the Attiwill (1982) report, then these concerns are not valid.

The reserve proposals in the Southern Forest Regional Management Plans comply with the recommendations in the above reports in all respects with the exception of Beavis-Giblett blocks. However, the 1976 EPA reports ard the Attiwill report are themselves contradictory on this issue. The EPA had recommended in 1976 that Beavis and Giblett should be added to the reserve system following cutting and regeneration. The Attiwill report which was subsequently endorsed by the EPA in 1982, recommended that Beavis and Giblett blocks be included in the reserve system as "forest parks".

With the Government's commitment to maintaining timber production at current levels, reservation of the Shannon will mean that Beavis and Giblett blocks cannot be recommended for reservation at this stage. However, under CALM's Southern Forest Region management plan, Beavis and Giblett will be reserved from cutting for the next fifteen years. This will preserve the option for consideration of their reservation at a later stage, when the results of current timber utilisation research are known and in the light of community expectations at that time.

The regional management plans and the timber strategy include a proposal to selectively thin the road and stream zones. This is not in conflict with the EPA's 1976 report as thinning has been carried out in these areas ever since they were created.

The regional plan proposes that an intensive review of the road, river and stream zones be undertaken with the objective of improving their efficiency. It is also proposed that no changes will be made to the existing system until the proposals are approved and evaluated by the EPA.

4.3 Impact on other areas of State forest

Forest areas that are available for timber production are also managed to maximise conservation, recreation and catchment protection values. It has been suggested that the reservation of the Shannon Reserve would result in more intensive timber production in areas which will reduce their other values.

Improvements in the yield of sawlogs resulting from logging of existing forest have resulted primarily from improvements in utilisation. Logs that previously were rejected by sawmillers in the forest are now being utilised. This has occurred for a number of reasons not the least being improvements in milling technology and the increased value of hardwood logs. The utilisation of these logs as first grade sawlogs does not affect other forest values because they would have either been left at the mill landing or in the forest or utilised as second grade logs.

4.4 Summary

We conclude that the reservation of the Shannon Basin will not derogate from the total reserve system proposed by the EPA in 1976.

5. MANAGEMENT OF THE SHANNON RIVER BASIN

An underlying concern, often implicit in the numerous reports and submissions on the proposal, has been that the management of the proposed park would be inadequate. These concerns related firstly to the obvious logistical problems which would have resulted from management of adjacent areas of forest by separate management authorities and, secondly, to specific management practices

5.1 Integrated land management

Many previous studies on reservation of the Shannon showed an underlying concern that effective management of the Shannon Basin (as a national park) could not have been achieved by the National Parks Authority acting independently of the Forests Department. Clearly, there were difficulties in having two separate land management agencies managing land side by side, particularly when the National Parks Authority lacked the staff, resources and skills to take on the management of a new, large and complex forested national park. The expertise of both organisations was clearly relevant to the management of such an area of forest as a national park.

With the formation of CALM, this argument has been overcome. CALM is an integrated land management agency with a wide range of planning and management skills. Because CALM also manages the surrounding State forest, difficulties involved in having two different agencies with different policies managing adjacent lands are removed.

5.2 Management Practices

In some sections of the community there has been concern that the creation of the Shannon River Basin as a national park would result in the imposition of management practices which would be undesirable. Fire management has been the principal issue raised in this area.

This concern has been alleviated by the availability of experienced wildlife, recreation and protection staff within CALM and the requirement in the CALM Act that management plans for areas under the Department's control must be prepared and subjected to full public scrutiny.

CALM has produced a draft management plan for the Shannon Park and D'Entrecasteaux National Park which, following public consultation, is now being finalised. This document has been essentially endorsed by all sections of the community and specifically the Manjimup Shire Council which, although objecting to the Shannon Basin being made a national park, has accepted the principles of the plan.

5.3 Summary

The Committee of Inquiry concludes that the concerns about management of the Shannon have been substantially met by the formation of CALM and the production of a management plan for the area.

6. IMPACT OF THE SHANNON BASIN RESERVATION ON THE TIMBER INDUSTRY

The timber industry has provided, and will continue to provide, a major contribution to employment and to economic development in the lower south-west. Consequently, one of the principal concerns surrounding the proposal to reserve the total Shannon Basin has been the effect of the withdrawal of the timber resource in the Shannon River Basin on the level of timber production possible from the southern forests.

6.1 The timber resource in the Shannon River Basin

There are 21 500 ha of karri forest in the Shannon Basin with a standing volume of timber equal to 1.3 million m^3 which will be foregone if the Shannon River Basin is reserved as a national park. The estimated annual increment on this area of forest, assuming an annual rate of increment of $5m^3$ per ha per annum is 107 $500m^3$ per annum.

There are 19 200 ha of jarrah forest with a standing volume of commercial timber equal to 445 $100m^3$ which will not be available for timber production. The annual increment on this forest area assuming an annual rate of $.75m^3$ per ha is 14 $400m^3$ per annum.

6.2 Total annual timber production in the southern forest (excluding the timber resource contained in the Shannon River Basin)

The allowable cut of karri, marri and jarrah sawlogs in the southern forest is set out in detail in Tables 9 and 10 of the draft timber strategy.

The allowable cut of first grade karri logs over the period 1989-2008 is 153 $000m^3$ and from this date onward the level of cut is sustainable indefinitely at 133 $000m^3$ per annum.

Improvements in management of the timber industry, utilisation, that is more efficient use of logs, together with the allocation of some of the resource from road and stream reserves by selective thinning, has made it possible to sustain the allowable cut of karri first grade logs at a level greater than was proposed in Working Plan 87.

The current allowable cut of first grade jarrah logs is 206 $000m^3$ per annum. The draft timber strategy foreshadows an immediate reduction of 25 $000m^3$ and a further reduction of 30 $000m^3$ over the next five years. Further significant reductions in the level of allowable cut of jarrah are foreshadowed but the strategy also proposed to review the level of allowable cut in the jarrah forest by 1992 following the completion of a comprehensive inventory.

6.3 Desirable levels of timber production from the southern forests

In order to assess the impact of the reservation of the Shannon Basin on the timber industry, it is necessary first to determine the desirable level of timber production for the southern forests. The timber production levels that can be sustained indefinitely for any forest area are related to the area of forest on which timber production is permitted. It is thus possible to argue that any reduction in the area available for timber production would result in a reduction of the desirable level of production. However, it is also generally accepted that in any forest ecosystem it is desirable that a proportion of the forest should be reserved from commercial timber production.

In our assessment of the impact of the Shannon River Basin at sustainable timber production levels in the southern forest, we have assumed that the "desirable" level of production is that predicted in the Forests Department Working Plan 87. This prediction was based on a land use plan in which only 40 per cent of the Shannon Basin was excluded from timber production. Therefore, the difference between the sustainable level predicted in General Working Plan 87 and that predicted in the draft Timber Strategy (which assumed that all of the Shannon Basin would be excluded from timber production) provides an objective measure of the effect of the reservation on sustainable level of timber production in the region.

We have also based our assessment entirely on the production and availability of first grade sawlogs, since these are the only forest product not in abundant supply in the region.

Working Plan 87 foreshadowed that the allowable cut of first grade karri sawlogs would be reduced to 133 000m^3 per annum. We have assumed that it was proposed to sustain this level of production indefinitely.

A reduction in the allowable cut of first grade jarrah sawlogs was also foreshadowed in Working Plan 87 but the magnitude of the reduction was not quantified. It is possible, however, to estimate the allowable cut in the southern forest if the Shannon River Basin resource was not excluded by calculating the contribution of the Shannon resource to the allowable cut and adding this to the predicted allowable cut in the draft timber strategy.

There are 19 200 ha of jarrah forest with a standing volume of sawlogs of 445 100m^3 in the Shannon River Basin. This area was not included in the reserve proposals on which Forests Department Working Plan 87 were based. The timber productivity of the jarrah forest in the Shannon Basin is generally low. As a consequence, the estimated annual increment can be assumed to be no more than .75m^3 per ha per annum. Thus the nominal annual sustainable yield is 14 400m^3 per annum of wood.

If the jarrah forest in the Shannon Basin was managed independently of the remainder of the forest, then forest management practice would be to harvest it in such a way as to convert it to "normal" forest. The actual area cutover each year would depend on the rotation age for the forest. If it is assumed the rotation age of 100 years was desirable, then the annual cutting rate per annum would be 160 ha yielding 4 500m^3 per year. But the jarrah forest in the Shannon River Basin cannot be considered in isolation. Consequently, provided that the total production from the jarrah forest does not exceed the annual potential yield, the rate of cut in any part of the forest can be flexible.

For the purpose of our calculations, we have assumed that had the Shannon River jarrah resource been available it would have been cut over a period of 20 years. This assumption is based on our understanding of the overall jarrah forest wood allocation strategy set out in the draft timber strategy. Therefore, we conclude that the allowable cut for jarrah overall in the Southern Region would have been 22 255m^3 per annum larger for a 20 year period than that predicted in the draft timber strategy.

6.4 Softwood resource

In 1983 following the decision to exclude the timber resource in the Shannon Basin, the government directed the Forests Department to assess whether a pine plantation could be included in the lower south-west to compensate for the loss of the timber production areas foregone in the Shannon Basin.

Subsequently, a programme to establish 15 000 ha of pine plantations in the lower south-west at a rate of approximately 500 ha per year was initiated. 1 695 ha of pine plantations have since been established and it is anticipated that the programme will be completed in 2016.

At this date the pine plantations will be producing 125 000m^3 to 200 000m^3 of pine sawlogs per annum on a sustained basis.

The decision to establish this plantation program will mean that it will be possible to establish a major softwood sawmill in the lower south-west by the year 2000. This is an additional benefit to the economic development of the lower south-west. Prior to the decision to withdraw the Shannon Basin timber resource it had not been proposed to locate a softwood sawmill in the southern forest region. The decline in the hardwood allowable cut in the southern region would have occurred if the Shannon had not been reserved and would have been compensated for by an increase in pine sawlogs. However, these logs would not have been processed in the southern forest region.

6.5 Summary

The allowable cut data with and without the Shannon Basin resource is summarised in Table 2.

The Shannon River Basin reservation will result in the reduction of the allowable cut of 2 225m^3 per year for a period of 20 years. This represents a reduction of less than one per cent of the total annual quantity of first grade jarrah and karri logs which have been supplied from the southern forest.

TABLE 2

Predicted Allowable Cuts of First Grade Sawlogs (cubic metres/annum)

		FORESTS DEPARTMENT WORKING PLAN 87	DRAFT TIMBER STRATEGY	DIFFERENCE
Jarrah	1989-1995	172 255	150 000	-22 255
	1996-2008	122 255	100 000	-22 255
	1996-2020	100 000	100 000	---
Karri	1989-2008	133 000	153 000	+20 000
	2008-2035	133 000	133 000	---

The annual nominal yield of timber which would be foregone if the Shannon Basin was reserved would be 121 900m^3 per annum made up of 107 500m^3 of karri and 14 400m^3 of jarrah. This is compensated by the annual increment of softwoods on the 15 000 ha of pine forests which will be established in the lower south-west. The average yield per annum during the period of plantation establishment (assuming a yield of 15m^3 per ha per annum) would be 112 500m^3. At the completion of the plantation establishment programme in the year 2016, the annual yield of sawlogs, which will be sustained indefinitely from that year, would be between 125 000m^3 and 200 000m^3 per annum.

We conclude from this analysis that the reservation of the Shannon River Basin would not significantly reduce the level of production of first grade karri and jarrah logs below that which was foreshadowed in the Forests Department Working Plan 87 which assumed the Shannon resource would be available. The long term yield potential that is nominally foregone by the removal of areas which previously would have been available for timber production is compensated for by yield from pine plantations that are being established in the Southern Region.

This conclusion is based on the assumption that the area of forest proposed to be reserved from production in the Southern Forest Regional Management Plan will not be increased.

7. CONCLUSIONS

In accordance with the request by the Hon Minister for Conservation and Land Management , the Committee of Inquiry has examined the scientific basis for the reservation of the Shannon River Basin.

The Committee has concluded that the reservation of the Shannon Basin as a National Park has scientific merit.

The Committee also concludes that the reservation can be achieved without any derogation of previous proposals for reserves in the Southern Forest Region.

We are confident that management of the Shannon Basin in accordance with the management plan currently being finalised will ensure that the purposes for which it is reserved will be maintained, and that human life and adjacent property will not be threatened.

Finally, the Committee concludes that the reservation of the Shannon will not have any impact on the long term viability of the timber industry. There will be no reduction in the level of economic activity in the timber industry as a result of the reservation.

REFERENCES

Beggs, B.J. (1982). Critique: Karri at the Crossroads and associated paper Redirection of the Karri Forest Economy. Forests Department, Western Australia.

Bradshaw, F.J., and Lush, A.R. (1981). Conservation of the Karri Forest. Forests Department, Western Australia. 60 pp & maps.

Bradshaw, F.J., Underwood, R.J., Quain, S.J., White, B.J. and Grace, D.E. (1975). Proposal for a south coast national park, Western Australian Division of the Institute of Foresters of Australia, Perth.

Christensen, P.E.S., Annels, A., Liddelow, G. and Skinner, P. (1985). Vertebrate fauna in the southern forests of Western Australia: A Survey. Forests Department of Western Australia, Bulletin No. 94, Perth.

Conservation and Land Management Act (1984). No. 126 of 1984, Western Australian Government, Perth.

Conservation Council of W.A. (Inc.). Campaign to Save Native Forests (W.A.), South-West Forests Defence Foundation, and Australian Conservation Foundation (Inc.), Western Chapter (1982). Karri at the Crossroads, 61 pp.

Conservation Council of W.A. (Inc.). South-West Forests Defence Foundation, Campaign to Save Native Forests (W.A.) (1982). Redirection of the Karri Forest Economy, 4 pp.

Conservation Through Reserves Committee (1974). Conservation Reserves in Western Australia, Report to The Environmental Protection Authority.

Department of Conservation and Environment (1981). The Darling System, Western Australia. Proposals for Parks and Reserves. The System 6 Study Report to the Environmental Protection Authority. Report No. 8, April 1981.

Department of Conservation and Land Management (1986). Draft Management Plan for the Shannon Park and D'Entrecasteaux National Park.

Department of Conservation and Land Management (1987). Draft Management Plans for the Northern, Central and Southern Forest Regions, April 1987.

Department of Conservation and Land Management (1987). Timber Production in Western Australia (Draft) - A Strategy to take W.A.'s Forests into the 21st Century, April 1987

Environmental Protection Authority (1976). Conservation Reserves for Western Australia (Systems 1, 2, 3, 5). Environmental Protection Authority, Perth.

Environmental Protection Authority (1982). Karri Forest Conservation. Report and Recommendations by the Environmental Protection Authority. Department of Conservation and Environment, Western Australia. Bulletin No. 123 (Contains Dr P.M. Attiwill's Report).

Environmental Protection Authority (1983). Conservation Reserves for Western Australia. The Darling System - System 6. Department of Conservation and Environment, Western Australia. Report No. 13, October 1983.

Forests Department of Western Australia (1972). General Working Plan No. 85, Forests Department, Perth.

Forests Department of Western Australia (1977). General Working Plan No. 86, Forests Department, Perth.

Forests Department of Western Australia (1982). General Working Plan for State Forests in Western Australia: Working Plan No. 87, Part I.

Hilliard, R., Pen, L. and Potter, I. (1987). An appraisal of the south-west rivers and their fish fauna. A submission to the Department of Conservation and Land Management Draft Regional Management Plans for the Forest Regions of Western Australia. School of Biological and Environmental Sciences, Murdoch University, Western Australia. 11pp.

McArthur, W.M. and Clifton, A.L. (1975). Forestry and agriculture in relation to soils in the Pemberton area of Western Australia. Soils and land use series No. 54, C.S.I.R.O. Division of Soils, Perth.

Muir, B.G. (1981). D'Entrecasteaux National Park resource study, National Parks Authority of Western Australia, Perth.

O'Brien, B.J. (1976). Submission to the Senate Standing Committee on Science and the Environment on the Impact on the Australian Environment of the Current Woodchip Industry Programme. Department of Conservation and Environment, Perth.

O'Brien, B.J. (undated). Save the Shannon Sensibly. Produced for the Shire of Manjimup by Brian J. O'Brien and Associates Pty Ltd, Perth.

Smith, F.G. (1972). Vegetation Map of Pemberton and Irwin Inlet (Veg. Surv. of W.A.), Western Australian Department of Agriculture, Perth.

South-West Forests Defence Foundation (1982). People in Glass Houses ...; 38 pp.

Special Review Committee (1976). A review of recommendations for reserves in the south-west and south coastal areas of Western Australia. Environmental Protection Authority, Perth.

Water Authority of Western Australia (1987). The Impact of Logging on the Water Resources of the Southern Forests, Western Australia. A report by the Steering Committee for Research on Land Use and Water Supply. Report No. WH41.