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Draft
Avon River System
Management Strategy

Prepared for the
Avon River System Management Committee
by the Waterways Commission

WATERWAYS COMMISSION
REPORT 25
1991

Draft
Avon River System Management Strategy

SUMMARY

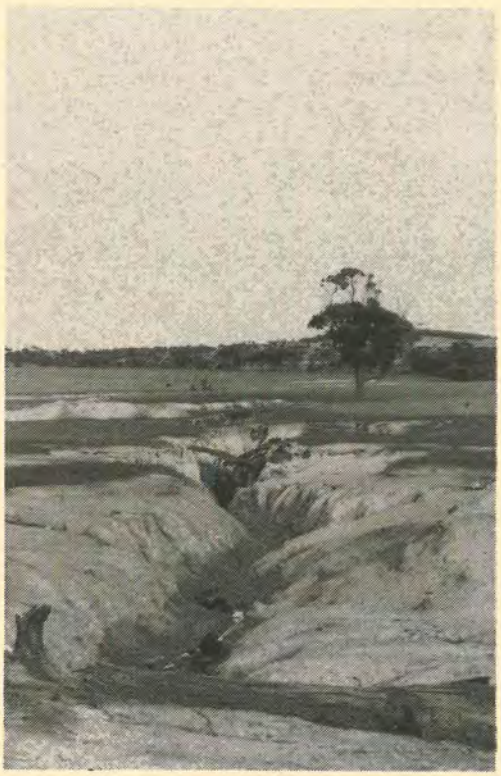
Prepared for the
Avon River System Management Committee
by the Waterways Commission

Why was the Draft Management Strategy prepared?

In recent years the people of Western Australia have become increasingly concerned about the problems facing the Avon River System. Deterioration of water quality, siltation of river pools and consequent loss of wildlife habitat are the main areas of concern for the river and its foreshores. Linked with this are the problems of land degradation faced by the catchment and their effect on the river system. The Avon River changes its name to the Swan River at Wooroloo Brook. Therefore the impact the river system may have on the downstream Swan River within the Metropolitan Area of Perth is also of major concern.

The Avon River System Management Committee representing local government authorities along the river and in the wider catchment was formed in 1984. Since its inception, the committee has been pressing for better management of the Avon River System. The Committee approached the State Government in May 1990 about the preservation of the river sytem and the need for government involvement in management.

It was clear that there were a number of ways of doing this, depending on the tasks the Committee believed should be carried out and the powers needed to achieve effective and appropriate management. It was agreed that a management strategy be prepared to provide the basis for deciding the most appropriate form of management for the area. The preparation of the Strategy was jointly funded by State and local government.



How was the Draft Management Strategy developed?

Preparation of the Draft Avon River System Management Strategy involved consideration a wide range of issues. Objectives were defined to cover these issues and recommendations developed on the most suitable management actions to be undertaken.

During preparation of the Strategy wide consultation was carried out with all sectors of the community concerned with management of the river system. Thishas hopefully led to the development of a form of management which reflects community attitudes and is what the community wants.

What does the Draft Management Strategy achieve?

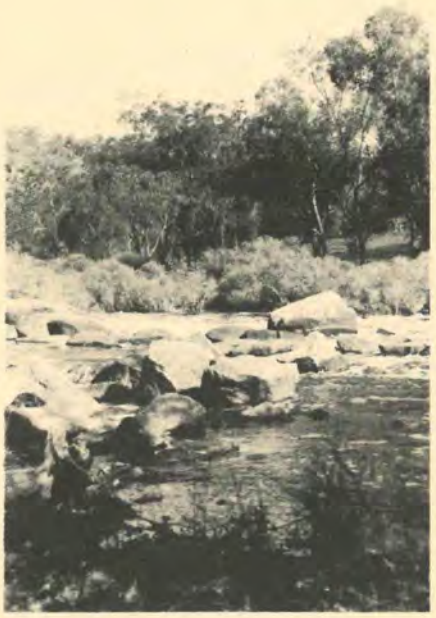
The Draft Management Strategy is a broad based document used to direct future management of the river system. The Strategy:

- Identifies the issues facing the Avon River System and identifies tasks necessary to address these issues.
- Identifies common management directions for agencies involved in management.
- Defines roles and responsibilities of agencies involved in management.
- Provides a management framework for existing and future issues to be addressed in a coordinated manner.

The Draft Management Strategy makes recommendations to the State Government on what tasks need to be carried out and how best this can be coordinated. Following a three month public comment period, a final document will be released incorporating comments received. This will then act as a blueprint for future management of the Avon River System.

Aim

The primary focus of the Draft Management Strategy is the management of the Avon River and its foreshores, it also promotes the concept of integrated catchment management. Long term objectives for the protection of the river system for future generations require strategies for integrating catchment management with river management and developing cooperation between the agencies and individuals involved.



The main thrust of the recommendations is to ensure that the river remains biologically 'alive' and that its physical and cultural integrity is maintained to the greatest possible extent. The aim of the Draft Management Strategy is:

'To balance the need to restore, protect and enhance the natural attributes of the Avon River System with its use and development by present and future generations and to ensure an adequate management framework is provided within which this can be achieved.'

Management Objectives

Issues addressed in the Draft Management Strategywere divided into three broad categories:

- Foreshore and Waterway Management
- Catchment Management
- Management Framework

Under these categories six primary objectives were defined.

• Foreshore and Waterway Management

Primary Objective 1: Conservation and Rehabilitation

'To maintain a functioning healthy river environment by conserving, protecting and rehabilitating the river and its foreshores.'

Primary Objective 2: Land Use and Waterways Planning

'To balance existing and future land use and development in the waterway environment with the need to protect and enhance the river system.'

Primary Objective 3: Recreation and Tourism

'To encourage and provide recreation and tourism opportunities and facilities that reflect the needs of the community and are compatible with the natural environment and the rights of local landowners.'

• Catchment Management

Primary Objective 4: Catchment Planning

'To encourage integrated and coordinated catchment planning at a local and regional level which addresses all issues in the catchment.'

Primary Objective 5: Linking the Catchment with the Waterway

'To ensure an integrated approach is taken to catchment and waterway management with the development of mechanisms which consider the impact the catchment has on the waterway and vice versa.'

• Management Framework

Primary Objective 6: Management Coordination

'To ensure the provision of a management structure including an adequate legislative and administrative base and funding to effectively achieve the other primary objectives of this management strategy'.

Recommendations

A summary of the recommendations contained in the Draft Avon River System Management Strategy is provided overleaf.

The Avon River System

The Avon River and the many tributaries and lakes which are situated within the Avon River Basin are a major asset to the community of the Avon Region. The river system is a major drainage network for agricultural land and provides recreational, aesthetic and conservation pleasure to the community. As the headwaters of the Swan River, the Avon River is also a major asset to the people of Western Australia.

Many of the problems facing the Avon River are not new. Destruction of native vegetation and wildlife habitats has been occuring since the early 1900's and flooding has always been a threat to landowners and towns along the river. In 1985 the Avon River Fact Finding Study, funded by the Waterways Commission, identified the major sources of concern in the early 1980's as salinity, soil erosion, flooding, pollution, nutrient enrichment and siltation of river pools.

Addressing the range of environmental issues facing the river and its catchment is a complex task. The Avon is fed from a widespread surface and underground drainage network covering approximately 120 000 square kilometres and spanning a large number of local government areas. Effective management will require a catchment - wide effort to improve the river's water qualtiy and restore the sediment balance, as well as local actions to protect and restore the habitat of the river foreshores and pools. Such a concerted effort will only be possible with broad community support.

Have Your Say

Public submissions on the Draft Avon River System Management Strategy are now invited. All public submissions received will be considered before preparation of the Final Management Strategy. If you would like to make a submission towards preparation of the final document please comment on any part of the document you agree or disagree with. Address your written submission by October 31 1991 to:

Project Officer
Draft Avon River System Management Strategy
C/- Waterways Commission
3 rd Floor
184 St George's Terrace
Perth WA 6000

This brochure provides a brief summary of the Draft Management Strategy. If you would like more details of the recommendations you should refer to the full Draft Management Strategy text. Further information is also available by contacting Ms Caroline Seal at the Waterways Commission on (09) 321 8677.

Copies of the full Management Strategy text are available for viewing at:

- Local Government Public Libraries within the Avon River Basin
- Shire Offices within the Avon River Basin

Copies of the document can also be obtained free of charge from:

- Waterways Commission
  3rd Floor
  184 St. Georges Terrace
  PERTH WA 6000
  Ph. (09) 321 8677

- Avon River System Management Committee
  C/- Shire of Beverley
  PO Box 20
  BEVERLEY WA 6304
  Ph. (096) 461 200

or

- By contacting your Local Shire Office

The Avon River System - A Vision for the Future

• Foreshore and Waterway Management Issues

Conservation and Rehabilitation

Water Quality

The water quality of the Avon River has declined since the clearing of the Avon River Basin for agriculture and the causes of its deterioration should be more closely investigated. To provide a basis for assessing the impact of land use and development along the river a water quality monitoring programme should be established and water quality criteria, objectives and standards for the river's beneficial uses set. Water quality management includes pollution control and coordination of emergency procedures.

River Processes

The Avon River is losing its few remaining river pools through siltation which was exacerbated by the River Training Scheme. The task is to undertake remedial action without increasing the likelihood of flooding. Programmes to revegetate and regenerate the natural fringing vegetation, to excavate silt from pools, maintain weirs and control erosion should be designed and be subject to consultation and monitoring.

Flora and Fauna

It is proposed that trial plots be established to determine the most effective methods of regeneration and revegetation of the foreshore and the extent to which revegetation may increase flooding. Areas of high conservation can be managed by agreement with landowners or reservation with a vesting authority, and management plans prepared to allow uses which are compatible with the conservation of indigenous flora and fauna

Aboriginal and European Sites.

To protect areas of cultural or historic significance the Aboriginal Sites Department of the Western Australian Museum, and the Heritage Council of Western Australia should be consulted before development along the river is approved. With careful planning access to some historic sites for recreation and tourism need not be incompatible with preservation of the historic and cultural integrity of the river system.

Recreation and Tourism

Recreational Use and Facilities

Recreational activities which are compatible with protection of the natural environment should be encouraged. Planning for recreation facilities should take account of other competing uses (agriculture, conservation of flora and fauna, and drainage), the interests of landowners, and community expectations and demand.

Recreational Site Planning

Recreation nodes should be developed where facilities can be provided with minimal impact on the natural environment. Management plans prepared in consultation with agencies responsible for river management and the public will ensure efficient use of limited staff and funding.

Special Events

Special events on the river should be assesed for their environmental impact. Organisers should be required to submit management plans based on guidelines prepared by the river management agencies and the Western Australian Sports Dinghy Association.

Tourist Facilities and Activities

The Avon Valley attracts local, interstate and international visitors. Tourist activities and facilities must be compatible with protection of the natural environment, they should be planned in consultation will all relevant authorities, local residents and landowners with the Western Australian Tourism Commission as coordinator. All tourist developments should be subject to environmental assessment.

Land Use and Waterways Planning

Regional and Local Planning

To ensure consistency in planning and management for the river and its foreshores the Department of Planning and Urban Development and local government authorities should work together on the preparation of a regional plan for the Avon River System and on local rural strategies and town planning schemes. Agencies with expertise in waterways planning and management should provide advice and help prepare guidelines for the preparation of these plans.

Public Access

The public's right to use the Avon River for recreation and pleasure is recognised and the recommendations provide for access compatible with protection of the natural environment and the rights of landowners. Public access can be secured by development of access nodes with appropriate facilities, especially in towns, and by acquisition of reserves when private land is subdivided.

Foreshore Ownership and Management

The variety of ownership of river foreshore land results in inconsistent management. Rationalisation of reserves and vacant Crown land should include vesting them with authorities willing to manage them for conservation and protection of the foreshore and waterway. Privately owned land can be effectively managed by agreements between the landowner and relevant authorities.

Flooding and Flood Plain Management

A comprehensive flood study of the Avon River would determine the level to which development can be permitted on the flood plain. Consultation with the Water Authority of Western Australia will ensure that development that would obstruct the passage of flood waters are not permitted. Within the floodway, activities should be limited to recreation, agriculture and conservation.

Urban Development

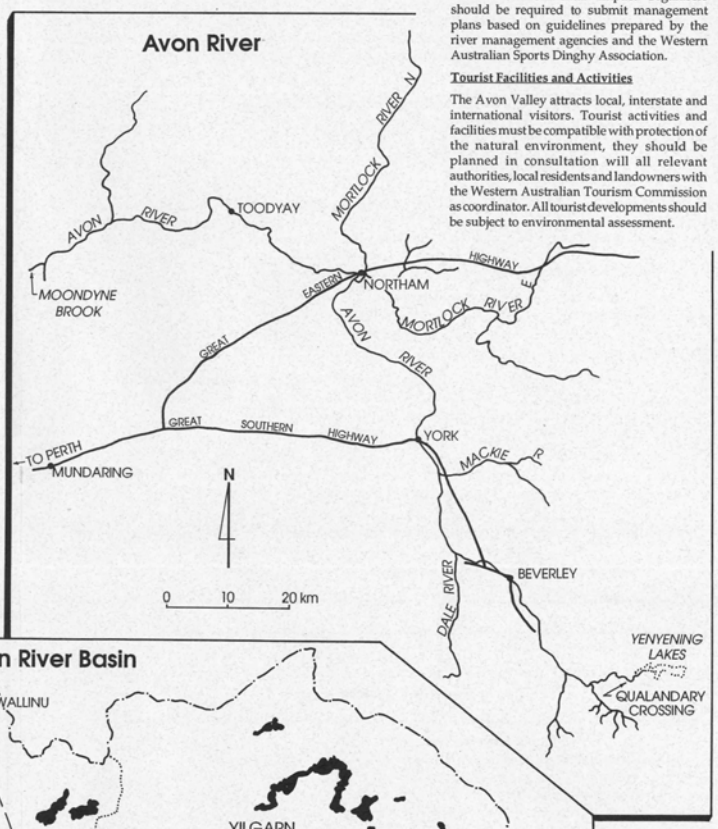
To minimise the impact of development on the river system town planning schemes should provide for appropriate zoning and reservation of land. Guidelines for development control should be prepared and include design and location of development, residential density, public access, drainage and retention of natural vegetation. Similar controls should apply to special rural subdivisions.

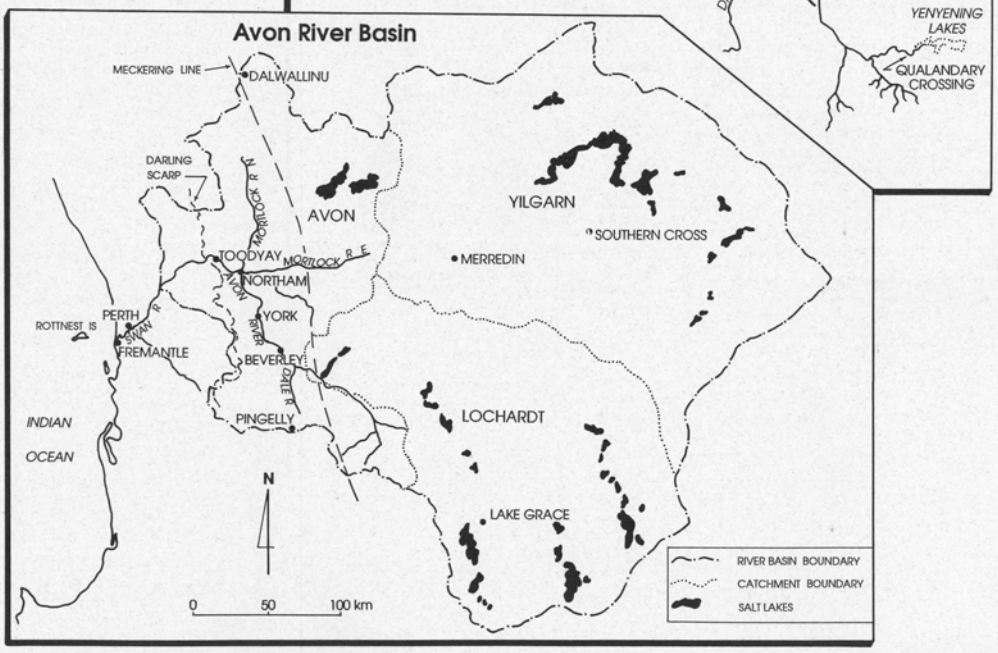
Industrial Development

Industrial development is not compatible with the riverine environment. Town planning schemes should locate industrial zones away from the river system and drainage networks, and include guidelines to ensure that industry does not affect the waterway. All industrial development should be referred to the Environmental Protection Authority for assessment.

Landscape Protection

Attractive foreshore landscapes and sites of historic or scientific interest can be protected through town planning schemes, coordinated landscape plans and site design criteria.





• Catchment Management Issues

Catchment Planning

In this section the strategy looks at issues such as salinity, erosion, pollution and flooding in the catchment, the Avon River Basin, which also affect the river and its foreshores. The problems have arisen largely from traditional agricultural practices, especially clearing and the use of fertilisers. Because agriculture is the major land use of the Avon River Basin, farming practices must be modified and remedial action taken to arrest the deterioration of soil and water quality and restore productivity as far as possible. The Management Strategy recommends monitoring to establish the extent and cause of these problems and specific actions to begin to reverse the trend.

Effective land management depends on cooperation and consultation. Farm and local catchment plans should be prepared by local groups and integrated with regional catchment plans for each of the three catchments, Avon Yilgarn and Lochardt. These plans should be prepared under the primary direction of the Western Australian Department of Agriculture.

Linking the Catchment with the Waterway

The Management Strategy proposes a mechanism to ensure that there are links between waterway management agencies and local catchment groups and land conservation district committees to facilitate consultation, policy preparation and cooperative action within the three catchments. In addition, waterway management and catchment management should be integrated through the preparation of a whole river basin plan.

• Management Framework Issues

Management Coordination

After examining the advantages and disadvantages of five options the Management Strategy recommends the establishment of a waterways management authority under the Waterways Conservation Act 1976-1982. The management authority would be responsible for overall management of the waterway and its foreshores and would also play a part in catchment management. Its management area would cover the entire Avon River Basin.

The Authority would coordinate conservation, management and restoration of the Avon River in cooperation with local government, State government agencies and local groups. The roles and responsibilities of other organisations in management of the river system would not alter greatly.

The management authority would have representation from local government, State government and the community. Operational and administrative costs would be funded from State Government Consolidated Revenue through the Waterways Commission. Other bodies would contribute to joint river works and associated management costs. In consultation with other agencies and affected persons the management authority would prepare a management programme containing policies, objectives and strategies for management of the river system.

It is also recommended that catchment coordinating groups be established in the three catchments of Avon, Yilgarn and Lochardt to coordinate catchment management on a regional scale and strengthen the link between catchment management and waterway management.

Draft
Avon River System
Management Strategy

Report to the Minister for the Environment

Prepared for the
Avon River System Management Committee
by the Waterways Commission

Compiled by Caroline Seal

Waterways Commission
184 St Georges Tce
Perth

Report 25
July 1991

Printed on 100% recycled paper

Avon River System Management Committee Membership

Cr F R.Bremner (Chairman)	**Shire of Beverley**
Cr T E Richards (Deputy Chairman)	**Shire of Quairading**
Cr A D Morgan	**Shire of Northam**
Cr J P Marshall	**Shire of Pingelly**
Cr C L Larke	**Shire of Corrigin**
Cr D F Turner	**Shire of Brookton**
Cr L A Hoft	**Shire of Toodyay**
Cr J W MacPherson	**Shire of Victoria Plains**
Cr J C Bennier	**Shire of Wickepin**
Cr H I E Hall	**Shire of York**
Cr D Beresford	**Town of Northam**
Technical Support for the Committee:	
Mr D C Brewin	**Western Australian Department of Agriculture**
Mr L Leith	**Water Authority of Western Australia**
Mr R P Atkins	**Waterways Commission**

Acknowledgements

Many people must be acknowledged for their assistance during preparation of this report.

Members of the Avon River System Management Committee provided extensive advice on issues of concern to the communities in their local areas. Technical advice was also provided by a wide range of government agencies in particular the Water Authority of Western Australia and the Western Australian Department of Agriculture. Information from local government authorities, land conservation district committees and members of the public through submissions and consultation was also invaluable to the preparation of this report.

Additional assistance came from the staff of the Waterways Commission, Lyn Hamilton prepared the maps and June Hutchison edited the text.

Caroline Seal, Project Officer

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Minister's Foreword

The Avon River System is a valuable asset to the people of Western Australia. The rural community of the Avon Region depends largely on the river for agricultural, recreational, conservation and pleasure activities. The Avon River is also an important resource to the people of Perth as the health of the Swan River which they value so highly is largely dependant on the condition of its source waters from the Avon .

Since European settlement the river and its vast catchment area has been subjected to a wide range of pressures. These pressures have taken their toll on the river and serious environmental problems are emerging. The State Government feels strongly about conservation of this valuable asset.

The Avon River System Management Committee approached me in May 1990 about the preservation of the Avon River. It was clear that the Committee was looking for a strong Government involvement in the management of the river system .

It was also clear there were a number of ways of doing this, depending on the tasks the Committee believed should be carried out and the powers needed to achieve effective and appropriate management. It was agreed that a management strategy should be prepared to provide the basis for deciding the most appropriate form of management for the area.

In response I made a submission to Cabinet for funds for the preparation of a management strategy. Recognising the need for coordination in management the State Government provided a special allocation of funds to the Waterways Commission to prepare a management strategy on behalf of the Avon River System Management Committee. Local government in the area was extremely supportive and provided additional funds.

The Draft Strategy was prepared in consultation with the Avon River System Management Committee, local government authorities, land conservation district committees, State government agencies and the community in the area. Cooperation between agencies and coordinated management with public participation are the main thrusts of the document.

The community now has an opportunity to comment on the Draft Strategy. I urge you to read the document carefully and make your views known to the Waterways Commission. If more information is required staff of the Waterways Commission are more than happy to help. Enclosed in the document is a form with which you may use to make a submission. All comments made to the Waterways Commission will be carefully considered in the preparation of the final document to complete what I hope will be a Management Strategy that the community supports.

Bob Pearce MLA
Minister for the Environment

Chairman's Foreword

The Avon River System Management Committee was formed in 1984. It evolved from an approach by concerned citizens to local government authorities along the river and within its catchment. Their main concern was the continuing siltation of existing river pools, hastened by the River Training Scheme. The aim of the committee was to find a balance between the problem of flooding of towns and farm land which occurred prior to the scheme and the deterioration of the river.

I personally have been involved with the committee since its inception and feel strongly about the need to restore and preserve the river system for present and future generations, as does the rest of the committee. Unfortunately the committee has been limited in its resources and powers to effectively manage the river system.

Through the years the committee has received support from the State Government through officers of the Waterways Commission, the Water Authority of Western Australia and the Western Australian Department of Agriculture. These officers have provided invaluable technical advice.

In 1985 the Waterways Commission kindly carried out a fact finding study on behalf of the committee. This document identified the major issues facing the river system and examined the effect current and past land use in the area has had on the river system. This study was the first step in identifying the need for more coordinated management to preserve the river and its catchment.

This Draft Management Strategy attempts to take management of the river system one step further with the development of a suitable management framework. The committee is indebted to the Minister for the Environment, the State Government and those local government authorities who contributed funds for the preparation of the Strategy. The funds were appropriately provided to the Waterways Commission which has done an admirable job in supporting the committee in achieving its aims.

The efforts of those members who served on the committee in past years and have since retired are also greatly appreciated. I would like to make a special mention of Dr Haydn Dyer whose efforts where instrumental in the establishment of the committee and Mr Jim Masters whose knowledge and dedication to the Avon River has been of great assistance to us all.

The committee is extremely excited about the Management Strategy. We believe the document provides recommendations for management that will be of great benefit to the river and its catchment in the future. We hope the community will support us in our endeavours and endorse the recommendations of this Management Strategy. I urge you to read the document and make comment to the Waterways Commission.

F. R. Bremner

Fred Bremner
Chairman
Avon River System Management Committee

List of Maps

List of Figures

Guide for Readers

The Coloured Pages

Two sets of coloured pages are contained in the front of the document following this page. These provide information the reader may want to have easy access to.

The **pink** pages contain the **Summary** of the document which gives the reader a brief overview of the contents of the Management Strategy.

The **silver** pages list the **Recommendations**.

The Main Body of the Document

The rest of the document contains the details of the Management Strategy. The following gives an outline of what each chapter will tell you.

Chapter 1 Outlines the reason for preparation of this document and gives background to the project.

Chapter 2-3 Outlines the current situation including:
Characteristics of the Avon River and the catchment.
Roles and responsibilities of management agencies in management.

Chapter 4 Outlines the issues facing the river system identified through workshops, consultation and submissions.

Chapter 5 Outlines the objectives for the issues developed in the Management Strategy.

Chapter 6 Outlines the problems facing the Avon River and its foreshores and makes recommendations for management .

Chapter 7 Outlines the problems facing the catchment of the Avon River and makes recommendations for management.

Chapter 8 Outlines the options available for a management framework for the Avon River System .

Chapter 9 Identifies the preferred option for management of the river system and details roles and responsibilities.

Abbreviations

Many organisations are mentioned in this Management Strategy including State government agencies, local government authorities and community groups. For brevity initials are used in most references. To aid the reader a foldout sheet listing all abbreviations is provided at the back of the document. The abbreviation RMB is used for the river management body. This body will be the agency resonsible for overall river management and may in the future be the Avon River System Management Committee or a new body depending on the level of management required. Section 3.2 discusses this concept further.

Glossary

Many terms are used which may not be familiar to the reader. A glossary explaining the meaning of these terms is provided at the back of the document.

How can I make a submission?

Public submissions on the Draft Avon River System Management Strategy are now invited. All public submissions received will be considered before preparation of the Final Management Strategy.

If you would like to make a submission towards preparation of the final document please comment on any part of the document you agree or disagree with. A tear out form is provided on the following page for this purpose. Send this to the Waterways Commission by October 31st 1991 at the address provided on the top of the form. Please note that submissions do not have to be confined to the length or layout of the form provided.

If more information is required prior to making your submission, officers of the Waterways Commission will be available to discuss any aspect of the Draft Strategy.

Where can I get other copies of this document?

Further copies of this document are available for viewing at:

- Local government public libraries
- Shire offices within the Avon River Basin

Copies of the document can also be obtained free of charge from:

- Waterways Commission
  3rd Floor
  184 St Georges Terrace
  PERTH WA 6000
  Ph. (09) 321 8677

- Avon River System Management Committee
  C/- Shire of Beverley
  PO Box 20
  BEVERLEY WA 6304
  Ph. (096) 461 200

or

- By contacting your local shire office

Draft Avon River System Management Strategy
Public Submission

Project Officer
Avon River System Management Strategy
C/- Waterways Commission
3rd Floor
184 St George's Terrace
Perth WA 6000

Name: .....
Title: .....
Organisation: .....
Address: .....
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I would like to make the following comments on the Draft Avon River System Management Strategy and would like them considered in the preparation of the Final Management Strategy.

Comments:

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I would also like a copy of the final document sent to the above address on its completion.

Signed,

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Summary

The Avon River and the many tributaries and lakes which are situated within the Avon River Basin are a major asset to the community of the Avon Region. The river system is a major drainage network for agricultural land and provides recreational, aesthetic and conservation pleasure to the community. As the headwaters of the Swan River, the Avon River is also a major asset to the people of Western Australia.

The Avon River System Management Committee was formed in 1984 bringing together local government representatives from shires along the river and in the wider catchment to address concerns raised by the community regarding the condition of the river. One main problem was the impact of the River Training Scheme on the river and the loss of valuable river pools through siltation.

Following an approach by the Committee in May 1990, the State Government initiated this study. The Draft Management Strategy has identified issues and common directions for management, defined roles and responsibilities for management and proposed a framework for future management of the Avon River System. It recommends the establishment of a body to take overall responsibility for coordination of future management and planning, referred to in this document as the River Management Body (RMB).

While the primary focus of the Management Strategy is on the management of the Avon River and its foreshores, it also promotes the concept of integrated catchment management. Long term objectives for the protection of the river system for future generations require strategies for integrating catchment management with river management and developing cooperation between the agencies and individuals involved.

The main thrust of the recommendations is to ensure that the river remains biologically 'alive' and that its physical and cultural integrity is maintained to the greatest possible extent. The overall aim of the Management Strategy is:

> **'To balance the need to restore, protect and enhance the natural attributes of the Avon River System with its use and development by present and future generations and to ensure an adequate management framework is provided within which this can be achieved.'**

A wide range of issues has been addressed. They have been divided into three broad categories:

- **Foreshore and Waterway Management Issues**

  - relating to issues facing the waterway and its immediate foreshores

- **Catchment Management Issues**

  - relating to issues facing the entire river basin which may impact on the river system

- **Management Framework Issues**

  - relating to the issues of coordination, responsibility and management which will allow the other issues to be addressed in the future.

Within these categories six primary objectives were defined. The summary following highlights the main thrust of the recommendations which relate to each objective. The recommendations appear in full on the following silver pages.

• Foreshore and Waterway Management Issues

Primary Objective 1: Conservation and Rehabilitation

> **'To maintain a functioning healthy river environment by conserving, protecting and rehabilitating the river and its foreshores'.**

Water Quality

The water quality of the Avon River has declined since the clearing of the Avon River Basin for agriculture and the causes of its deterioration should be more closely investigated. To provide a basis for assessing the impact of land use and development along the river a water quality monitoring programme should be established and water quality criteria, objectives and standards for the river's beneficial uses set. Water quality management includes pollution control and coordination of emergency procedures.

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Primary Objective 2: Land Use and Waterways Planning

> **'To balance existing and future land use and development in the waterway environment with the need to protect and enhance the river system'.**

Regional and Local Planning

To ensure consistency in planning and management for the river and its foreshores the Department of Planning and Urban Development and local government authorities should work together on the preparation of a regional plan for the Avon River System and on local rural strategies and town planning schemes. Agencies with expertise in waterways planning and management should provide advice and help prepare guidelines for the preparation of these plans.

Public Access

The public's right to use the Avon River for recreation and pleasure is recognised and the recommendations provide for access compatible with protection of the natural environment and the rights of landowners. Public access can be secured by development of access nodes with appropriate facilities, especially in towns, and by acquisition of reserves when private land is subdivided.

Foreshore Ownership and Management

The variety of ownership of river foreshore land results in inconsistent management. Rationalisation of reserves and vacant Crown land should include vesting them with authorities

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Industrial Development

Industrial development is not compatible with the riverine environment. Town planning schemes should locate industrial zones away from the river system and drainage networks, and include guidelines to ensure that industry does not affect the waterway. All industrial development should be referred to the Environmental Protection Authority for assessment.

Landscape Protection

Attractive foreshore landscapes and sites of historic or scientific interest can be protected through town planning schemes, coordinated landscape plans and site design criteria.

Primary Objective 3: Recreation and Tourism

> **' To encourage and provide recreation and tourism opportunities and facilities that reflect the needs of the community and are compatible with the natural environment and the rights of local landowners'.**

Recreational Use and Facilities

Recreational activities which are compatible with protection of the natural environment should be encouraged. Planning for recreation facilities should take account of other competing uses (agriculture, conservation of flora and fauna, and drainage), the interests of landowners, and community expectations and demand.

Recreational Site Planning

Recreation nodes should be developed where facilities can be provided with minimal impact on the natural environment. Management plans prepared in consultation with agencies responsible for river management and the public will ensure efficient use of limited staff and funding.

Special Events

Special events on the river should be assessed for their environmental impact. Organisers should be required to submit management plans based on guidelines prepared by river management agencies and the Western Australian Sports Dinghy Association.

Tourist Facilities and Activities

The Avon Valley attracts local, interstate and international visitors. Tourist activities and facilities must be compatible with protection of the natural environment, they should be planned in consultation will all relevant authorities, local residents and landowners with the Western Australian Tourism Commission as coordinator. All tourist developments should be subject to environmental assessment.

• Catchment Management Issues

Primary Objective 4: Catchment Planning

> **'To encourage integrated and coordinated catchment planning at a local and regional level which addresses all issues in the catchment'.**

In this section the strategy looks at issues such as salinity, erosion, pollution and flooding in the catchment, the Avon River Basin, which also affect the river and its foreshores. The problems have arisen largely from traditional agricultural practices, especially clearing and the use of fertilisers. Because agriculture is the major land use of the Avon River Basin, farming practices must be modified and remedial action taken to arrest the deterioration of soil and water quality and restore productivity as far as possible. The Management Strategy recommends monitoring to establish the extent and cause of these problems and specific actions to begin to reverse the trend.

Effective land management depends on cooperation and consultation. Farm and local catchment plans should be prepared by local groups and integrated with regional catchment plans for each of the three catchments, Avon Yilgarn and Lochardt. These plans should be prepared under the primary direction of the Western Australian Department of Agriculture.

Primary Objective 5: Linking the Catchment with the Waterway

> **' To ensure an integrated approach is taken to catchment and waterway management with the development of mechanisms which consider the impact the catchment has on the waterway and vice versa.'**

The Management Strategy proposes a mechanism to ensure that there are links between waterway management agencies and local catchment groups and land conservation district committees to facilitate consultation, policy preparation and cooperative action within the three catchments. In addition, waterway management and catchment management should be integrated through the preparation of a whole river basin plan.

• Management Framework Issues

Primary Objective 6: Management Coordination

> **'To ensure the provision of a management structure including an adequate legislative and administrative base and funding to effectively achieve the other primary objectives of this management strategy'.**

After examining the advantages and disadvantages of five options the Management Strategy recommends the establishment of a waterways management authority under the Waterways Conservation Act 1976-1982. The management authority would be responsible for overall management of the waterway and its foreshores and would also play a part in catchment management. Its management area would cover the entire Avon River Basin.

The Authority would coordinate conservation, management and restoration of the Avon River in cooperation with local government, State government agencies and local groups. The roles and responsibilities of other organisations in management of the river system would not alter greatly.

The management authority would have representation from local government, State government and the community. Operational and administrative costs would be funded from State Government Consolidated Revenue through the Waterways Commission. Other bodies would contribute to joint river works and associated management costs. In consultation with other agencies and affected persons the management authority would prepare a management programme containing policies, objectives and strategies for management of the river system.

It is also recommended that catchment coordinating groups be established in the three catchments of Avon, Yilgarn and Lochardt to coordinate catchment management on a regional scale and strengthen the link between catchment management and waterway management.

Recommendations

Recommendations for management of the Avon River System are outlined in this document and discussed in Chapters 6,7, and 9. These recommendations are based on general principles of waterway management. The agencies responsible for carrying out these recommendations are listed in abbreviated form after each recommendation with the initiating agency in italics. Abbreviations are listed at the back of the document. Implementation of these recommendations is outlined in Chapter 9.

Foreshore and Waterway Management

Conservation and Rehabilitation

Water Quality

1. Develop a water quality monitoring programme to determine changes in water quality. (*RMB*, WWC, WAWA)

2. Establish a water quality data base using existing water quality data collected by the Water Authority of Western Australia. Link this data with water quality data collected for the Swan River to provide a better understanding of the relationship between the Swan and Avon River systems. (*RMB*, WWC, WAWA)

3. Continue and support the Ribbons of Blue Monitoring Programme as a means to aid overall water quality monitoring. (*OCM*, RMB, WWC, WAWA)

Beneficial Uses

4. Develop water quality criteria, objectives and standards for the river system which reflect the identified beneficial uses. (*RMB*, WWC, WAWA)

Pollution Control

5. Minimise direct discharge of industrial wastewater to the river system by ensuring that industrial discharge licences are kept up to date, conditions reviewed and monitoring carried out to ensure compliance with licence conditions.(*RMB*,WAWA,EPA)

6. Delegate powers for pollution control under the Environmental Protection Act (1986) to the river management body.(*EPA*, RMB)

7. Develop an administrative arrangement between the river management body, Water Authority of Western Australia and Environmental Protection Authority to determine the lead agency for pollution control of surface waters.(*RMB*, WAWA, EPA)

8. Carry out surveys of all local government municipalities in the Avon River catchment to determine all sources of pollution entering the river system.(*RMB*, LGAs, WAWA)

Emergency Procedures

9. Include any river management body established to coordinate management of the Avon River in the 'Western Australian Hazardous Materials Emergency Management Scheme' and give staff of that body responsibility for protecting the river system. (*WASES*, RMB)

10. Ensure that management agencies have adequate equipment and staff training to control oil and hazardous material spills that may threaten the river system.(*RMB*, WAWA, WASES)

11. Develop a contingency plan for dealing with pollution of the river system from spills in the Avon River area. Update and modify this plan as required.(RMB, WASES)

River Processes

Pool Siltation

12. Carry out further investigations into sediment transport and river hydrology to determine the behaviour of sediment within the river and silt loads from the catchment.(*RMB*, WAWA,WADA)

13. Collate and analyse information stored in Public Works Department files to gain a better understanding of river processes.(*RMB*, WAWA)

14. Carry out site assessment surveys of all river pools to determine the viability of rehabilitation and excavation in terms of:

    - their value to the community for aesthetic and recreational purposes
    - the support and cooperation of the landowner
    - available funding
    - effect of rehabilitation on flooding
    - support of local government

    Select pools for rehabilitation from this assessment. (*RMB*, LGAs, WAWA)

15. Develop regeneration and revegetation trial plots upstream of selected pools. Consult WAWA on effects of rehabilitation on flooding. Monitor pool depth and sediment transport rates to evaluate the success of rehabilitation techniques. (*RMB*, LGAs)

Weir Maintenance

16. Carry out environmental and engineering feasibility studies to determine the viability of excavating the Northam Town Pool. (*NTC*, WAWA, DMH, RMB)

17. Investigate action required to prevent further silting of the Northam Town Pool.(*NTC*, RMB, WAWA)

18. Carry out maintenance of the weirs along the river to ensure their stability and to ensure that the river pools are not lost through further erosion of the river bed and banks.(*RMB*, LGAs, WAWA)

19. Carry out geological surveys to locate the original bed rock of the river and hence determine the level to which the river bed may erode in the future. (RMB, LGAs, WAWA)

Erosion Control

20. Carry out investigations into the causes of erosion and undertake surveys to identify erosion prone areas along the river system to determine priorities for rehabilitation. Conduct rehabilitation trials to develop methods to stabilise erosion prone banks.(*RMB*, LGAs)

21. Develop an erosion control programme including:

    - restriction of stock in erosion prone areas
    - tree planting along banks
    - restriction of public access to erosion prone areas
    - provision of information to landowners on appropriate erosion control techniques

    (*RMB*, LGAs)

22. Enter into agreements with landowners to carry out techniques developed in the erosion control programme.(*RMB*, LGA, LO)

Flora and Fauna

Foreshore Vegetation

23. Enter into agreements with local landowners to protect and allow regeneration of foreshore vegetation. These agreements would involve control of stock, fencing to allow regeneration and revegetation and control of fire, weeds and feral animals.(*LGAs*, RMB, LO)

24. Establish trial revegetation plots at appropriate points along the river and evaluate their success. Use these areas as demonstration sites.(*RMB*, LGAs)

25. Undertake research to determine the most appropriate techniques for foreshore revegetation.(*RMB*, WWC, CALM, LGAs)

26. Consult the Water Authority of Western Australia on the impact of revegetation on flooding.(*RMB*, WAWA)

27. Use local community groups and local land conservation district committees on a volunteer basis to carry out revegetation works. (*RMB*, LGAs, LCDCs)

28. Seek funding for revegetation works from appropriate sources including the Road Side Conservation Committee, Greening Australia, Remnant Vegetation Protection Scheme etc.(*RMB*, LGAs)

29. Supply information to landowners to raise the level of awareness of the importance of retaining foreshore vegetation. (*RMB*, LGAs)

Conservation Reserves

30. Identify areas of high conservation value and assess their regional significance. Recommend suitable areas for reservation under the Land Act and vest in the appropriate authority.(*CALM*, DOLA, RMB, LGAs)

31. Develop agreements between landowners and management agencies to manage areas of private land for specific purposes.(*LGAs*, RMB, CALM)

32. Prepare and release for public comment management plans for all areas reserved for the purposes of conservation.(*CALM*, RMB)

33. Prepare management plans for other reserves in accordance with Section 30A of the Land Act 1933.(*DOLA*, RMB, LGAs)

Fire Management

34. Develop a fire management plan to protect foreshore areas of the Avon River in cooperation with local government, the Bush Fires Board, and landowners. Incorporate management actions into agreements developed with landowners.(*RMB*, LGAs, BFB,LO)

Weeds and Feral Animals

35. Develop an active weed and feral animal management programme for foreshore areas. Incorporate management actions into agreements developed with landowners. (*RMB*, APB, LGAs, LO)

Aboriginal and European Sites

36. Consult with the Department of Aboriginal Sites,WA Museum to determine if proposed development or management actions concerning the Avon River and surrounds will have adverse impact on Aboriginal sites or heritage values.(*LGAs*, DPUD, EPA, RMB, WAM)

37. Identify and protect all European sites of cultural and historic significance by consulting the Heritage Council of Western Australia on all proposed developments and recommending for registration on the Western Australian Register of Heritage Places or the National Estate Register those sites of high cultural value.(*LGAs*, DPUD, EPA, RMB, HCWA)

38. Incorporate historic sites into planning considerations for recreation and tourist facilities. Develop historic attractions where educational information can be provided to raise public awareness of local history.(*LGAs*, RMB,WATC)

Land Use and Waterway Planning

Regional and Local Planning

39. Encourage local government authorities and Department of Planning and Urban Development to prepare regional plans for the Avon River System. (*RMB*, LGAs, DPUD)

40. Encourage local government authorities to prepare town planning schemes and local rural strategies which are consistent with DPUD's Rural Land Use Policy and any future regional plan. Refer all town planning schemes and rural strategies to the appropriate agencies for comment.(*DPUD*, LGAs, RMB)

41. Promote and encourage the consideration and integration of appropriate waterway and foreshore management issues in town planning schemes and local rural strategies and local government policy.(*RMB*, LGAs, DPUD)

42. Develop guidelines for the protection and enhancement of waterways in consultation with DPUD, EPA, WWC, WAWA, WADA and LGAs for consideration in local planning and management.(*RMB*, LGAs, DPUD, WWC, WAWA, WADA)

43. Zone all foreshore areas needing special protection as foreshore protection zones in town planning schemes and local rural strategies. Include management provisions for these areas to ensure the protection and enhancement of the waterway environment.(*LGAs*, RMB, DPUD)

Public Access

44. Carry out surveys to determine the level and type of public access required by the local and tourist communities. (*RMB*, LGAs, WATC, LO)

45. Identify suitable public access nodes and develop for these purposes. Consult authorities responsible for river management when identifying sites. (*LGAs*, RMB)

46. Restrict public access in environmentally sensitive areas. (*RMB*, LGAs)

47. Enter into agreements with landowners to provide public access to private land where appropriate. Agreements should protect the rights of the landowner and provide public liability cover.(*LGAs*, RMB, LO)

48. Acquire foreshore reserves at subdivision to provide for public access where necessary.(*DPUD*, LGAs, RMB)

Foreshore Ownership and Management

49. Carry out a foreshore study to determine the current ownership and management of all foreshore areas along the Avon River.(*RMB*, LGAs)

50. Develop management agreement with local landholders of foreshore areas to ensure the adequate protection and management of the foreshores.(*RMB*, LGAs)

51. Identify all areas of vacant Crown land needing specific management actions and vest in a willing authority for the purposes of conservation, environmental protection or waterways management. (*RMB*, DOLA, LGAs)

52. Vest all other vacant Crown land in the local government authority. The authority should have the power to lease to adjacent or nearby landowners through lease agreements. (*DOLA*, RMB, LO)

53. Assess the necessity of resuming a foreshore reserve at subdivision under Section 20A of the Town Planning and Development Act. Consult with the relevant authorities.(*DPUD*, LGAs, RMB)

Flooding and Flood Plain Management

54. Regularly review flood studies carried out for the four towns Toodyay, Northam, York and Beverley.(*WAWA*)

55. Carry out flood studies for rural areas outside townsites. Identify 1 in 100 year flood levels, define the river's floodway and flood fringe and estimate the impact development may have on flood waters in these areas.(*WAWA*)

56. Prepare flood study maps including definition of floodway, flood fringe and flood plain for use by planning authorities when assessing development proposals.(*WAWA*)

57. Prepare guidelines for planning authorities for consideration in planning and management of flood prone areas.(*WAWA*, DPUD, LGAs)

58. Refer all development proposals or management actions to the Water Authority of Western Australia for advice on the impact the proposals may have on flooding.(*LGAs*, DPUD, EPA, RMB, WAWA)

59. Discourage the construction of permanent buildings within the floodway and the filling of any area of the flood plain. Assess proposals for the building of weirs, bridges, crossings and the like for their potential effect on flooding. Apply special conditions to structures within the flood fringe as advised by the Water Authority .(*LGAs*, DPUD, EPA, RMB, WAWA)

60. Prepare an information booklet for landowners adjacent to the river to improve knowledge of the need for planning approvals for works along the river.(*RMB*, WAWA, LGAs)

61. Limit the activities within the floodway to recreation, agriculture and conservation.(*LGAs*, DPUD, RMB)

Urban Development

62. Use local town planning schemes to plan for urban development which is compatible with the river system. Consult with authorities responsible for river management in preparing town planning schemes.(*LGAs*, DPUD, RMB)

63. Prepare overall concept plans for urban and special rural development adjacent to the river. Include these plans in town planning schemes and local rural strategies. Plans to include factors such as:

- protection of environmentally sensitive areas.
- identification of development nodes.
- provision of public access and recreation areas.
- retention of natural vegetation.
- minimising of residential densities abutting the river.
- use of water sensitive design.
- improvement of the quality of stormwater entering the river system.
- impact of flooding.

(*LGAs*, RMB, DPUD)

64. Assess all future development proposals with regard for the above factors.(LGAs, EPA, DPUD, RMB)

65. Design and locate services associated with urban development so that they will not impact on the river system.(*LGAs*, RMB)

Industrial Development

66. Use town planning schemes to zone appropriate areas for future industrial development. Consult with agencies responsible for river management on suitable areas.(*LGAs*, DPUD, RMB)

67. Refer all proposed industrial developments along the river to the Environmental Protection Authority and other responsible agencies for environmental assessment.(*LGAs*, DPUD EPA, RMB)

68.Formulate guidelines for industrial development to minimise to the potential impact on the river system.(*RMB*, WAWA, LGAs)

Landscape Protection

69.Formulate policies or guidelines outlining acceptable standards and site criteria to ensure that development along the river is compatible with the landscape. (*LGAs*, DPUD, RMB)

70.Include landscape protection zones in Town Planning Schemes to protect landscape features on privately owner land. (*LGAs*, DPUD)

71.Develop Landscape Plans for river areas to protect unique features and the general character of the river landscape. (*RMB*,LGAs)

Recreation and Tourism

Recreational Use and Facilities

72. Encourage recreational activities and facilities which are compatible with the protection of the natural riverine environment and the legitimate rights and uses of adjacent landowners.(*RMB*, LGAs)

73.Ensure that recreational developments and activities in the riverine environment undergo adequate environmental assessment.(*RMB*, LGAs)

74.Carry out an assessment of the impact of recreation on the conservation value of the river pools along the river taking into account the type of activity and the time of year at which it occurs.(*RMB*,LGAs)

75.Monitor trends in recreational use of the riverine environment through survey, observation and consultation and ensure the provision of facilities for the needs of future generations.(*LGAs*, RMB)

Recreational Site Planning

76.Identify recreational nodes where future recreation facilities can be provided with minimal disturbance to the natural environment.(*LGAs*,RMB)

77.Provide for a range of recreational activities for the local and regional community at these sites. Supply appropriate facilities and undertake appropriate management.(*LGAs*,RMB)

78.Develop management plans for recreation nodes in consultation with local government authorities, local landowners and other affected parties.(*RMB*, LGAs,LO)

79.Ensure that management plans for recreation nodes are released for public comment and referred to the appropriate authorities.(*RMB*,LGAs)

80.Prepare a brochure which identifies recreation areas and facilities and encourage the public to use those areas most suitable for particular activities.(*RMB*, LGAs)

Special Events

81.Ensure that special events on the river are adequately assessed for their environmental impact by referring to relevant management bodies for approval. (*RMB*, WASDA, LGAs, EPA)

82.Require organisers of events to prepare management plans to address all aspects of the event and identify means to minimise environmental impacts. Consult with all relevant authorities in preparation of the plans. (*EPA*, WASDA,RMB)

83.Prepare guidelines for the preparation of management plans for special events including all aspects of environmental impact, monitoring and the responsibilities of organisers. (*EPA*, WASDA, RMB, LGAs)

84.Support the establishment of a set of rules by the WA Sports Dinghy Association to govern river racing events. Ensure that this set of rules is referred to the relevant authorities. (*RMB*, LGAs, WASDA)

Tourist Facilities and Activities

85.Support tourist developments which are compatible with the riverine environment and promote awareness of the natural environment. (*WATC*, LGAs, RMB)

86.Ensure that tourist facilities and activities cater for the local and regional communities. (*WATC*, LGAs, RMB)

87.Develop a tourism plan for the Avon River Region and consult all relevant authorities and local landowners in its preparation.(*WATC*, LGAs, RMB, LO)

88.Ensure that all tourist developments undergo adequate environmental assessment. (*LGAs*, RMB, WATC, EPA)

Catchment Management

A number of recommendations have been made in this Management Strategy for actions within the catchment that will impact on the Avon River and its tributaries.These are as follows:

Control of Saline Water Flow

89.Review the recommendations of the Yenyening Lakes Working Group for control of saline water flow from the Yenyening Lake system into the Avon River.(*RMB*, YLWG, WAWA)

90.Ensure that management actions recommended for Yenyening Lakes are implemented and carefully monitored for their effectiveness. Monitoring should include changes in salinity levels within the river and their impact on the flora and fauna of the river system. (*RMB*, YLWG, WAWA)

91.Ensure that appropriate land management initiatives to combat dryland salinity are employed and continuing study on these matters carried out to reduce the levels of salt being transported to the Avon River and its tributaries.(*WADA*, LCDCs, CGs, RMB)

Sediment Loads

92.Monitor sediment loads entering the Avon River and its tributaries from different catchment areas within the Avon River Basin.(*WADA*, RMB, WAWA)

93.Establish areas of priority for erosion control actions according to sediment loadings. (*WADA*, RMB, WAWA)

Pollution

94.Monitor levels of nutrients, pesticides and other pollutants entering the Avon River from different catchment areas within the Avon River Basin. (*RMB*, WADA, ROB)

95.Identify sources of pollution within the Avon River Basin and apply appropriate waterway and foreshore management techniques. (*RMB*, LGAs, LCDCs,WADA)

96.Improve fertiliser management practices with regard to type, rate and timing of fertiliser application. (*WADA*, LGAs, LCDCs, RMB)

Flooding

97.Monitor changes in water flow rates entering the Avon River and its tributaries from different catchment areas within the Avon River Basin.(*WAWA*, RMB)

98.Apply appropriate land conservation techniques in catchment areas to increase infiltration of rain where it falls and hence reduce the rate of water discharge into the Avon River and its tributaries.(*WADA*, LCDCs, CGs)

Lakes and Tributaries

99.Identify all problems associated with lakes and tributaries within the Avon River Basin and apply appropriate catchment management techniques. (LCDCs,CGs, RMB)

Catchment Planning

100.Encourage the development of catchment plans at a local and regional level to coordinate catchment management planning in the Avon River Basin.(*WADA*, CGs,LCDCs)

101.Ensure that catchment management plans consider all issues affecting the catchment including land and soil degradation, conservation, drainage and recreation.(*WADA*, CGs, LCDCs)

102.Involve the community, local government authorities and other affected parties in the development of catchment management plans.(*CGs*, LCDCs, WADA)

103.Ensure that the Department of Agriculture continues to support and provide technical advice to land conservation district committees and catchment groups. Ensure that adequate staffing and finances are provided for this task.(*SCAC*, WADA, LCDCs, CGs)

104.Encourage government agencies other than the Department of Agriculture to provide information towards the formulation of catchment management plans. Provide an information package for land conservation district committees and catchment groups to inform them of the role of these agencies in catchment planning and what assistance they can offer.(*WADA*, RMB)

105.Prepare guidelines for catchment groups and land conservation district committees to aid in the preparation of catchment management plans. Consult with agencies responsible for catchment and waterway management when developing these guidelines. (*WADA*, RMB)

Linking the Catchment with the Waterway

106.Encourage the development of a mechanism through which catchment groups and land conservation district committees can interact with waterways management agencies. (*RMB*, WADA, LCDCs, CGs)

107.Ensure that the mechanism facilitates effective communication, development of common policy and implementation of joint tasks (*RMB*, WADA, LCDCs, CGs)

108.Prepare a whole river basin plan to link catchment management initiatives with waterway management initiatives. (*RMB*, LCDCs, CGs)

The Preferred Management Framework

The River Management Body

109.Establish a waterways management authority under the Waterways Conservation Act 1976-1982 to manage the Avon River and its foreshores and to play a part in the management of the catchment of the Avon River. (*GOVT*, WWC)

110.Define the management area over which the management authority will carry out its activities as the lands and waters of the entire Avon River Basin. (*EPA*, GOVT, WWC)

111.Ensure that the waterways management authority is representative of all interests and areas within its management area and that local government has strong representation. (*GOVT*, WWC)

Links to the Catchment

112.Encourage the parallel development of catchment coordinating groups for the three catchments within the Avon River Basin i.e. Avon, Yilgarn, Lochardt. Ensure that these groups are LCDC based but include all interest areas within the catchment. (*WADA*, RMB)

113.Develop a mechanism to facilitate links between the waterways management authority and the catchment coordinating group formed within the Avon catchment. (*RMB*, WADA)

Roles and Responsibilities of other Organisations

114.Encourage local government authorities and State government agencies involved in management of the river system to implement recommendations outlined in this document for which they have been identified as the initiating agency. (*RMB*)

115.Ensure that there is liaison and effective communication is undertaken between agencies where joint responsibilities are recommended. (*RMB*)

116.Share responsibility for foreshore management and maintenance between the waterways management authority, local government authorities and other relevant agencies according to the following criteria:

- Works along the river which are a normal municipal responsibility should continue to be the responsibility of the local government authority
- Works on vested land should be the responsibility of the vestee.
- Works for the purposes of improving and maintaining the condition of river waters and associated lands should be approved by the waterways management authority. These works could be carried out by the waterways management authority but may be in conjunction with the local government authority.
- Works carried out by local government authorities, vestees or private landowners for the purposes of improving or maintaining the condition of river water and associated land should be specified in a management plan developed in conjunction and agreement with the waterways management authority.

(*RMB*, LGAs, all other responsible agencies)

Agency Coordination and Cooperation

117.Develop administrative referral and approval procedures with local government and State government agencies to ensure that all agencies involved in management are consulted on planning and management issues. (*RMB*, all other relevant agencies)

118.Prepare and review a management programme for the waterways management area to guide river planning and management actions. Consult with affected persons and agencies during its preparation. (*RMB*, WWC)

119.Prepare management plans for foreshore areas in conjunction with local government authorities and local landowners. (*RMB*, LGAs, WWC)

Community Participation and Education

120.Ensure that the community is adequately represented on the waterways management authority. (*GOVT*, WWC)

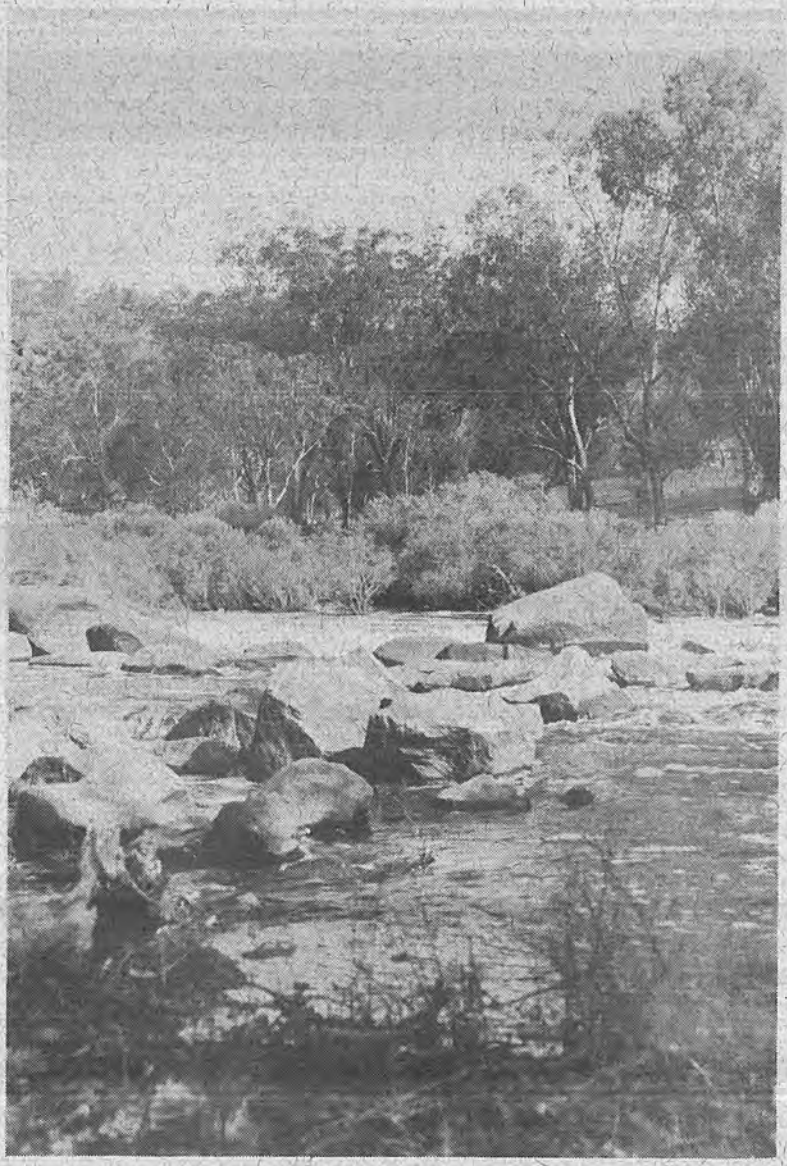
121.Ensure that all proposals for development and management actions on and around the river are available for public comment before approval is given. (*RMB*)

122.Implement community education programmes to promote awareness, appreciation and understanding of the riverine environment. (*RMB*)

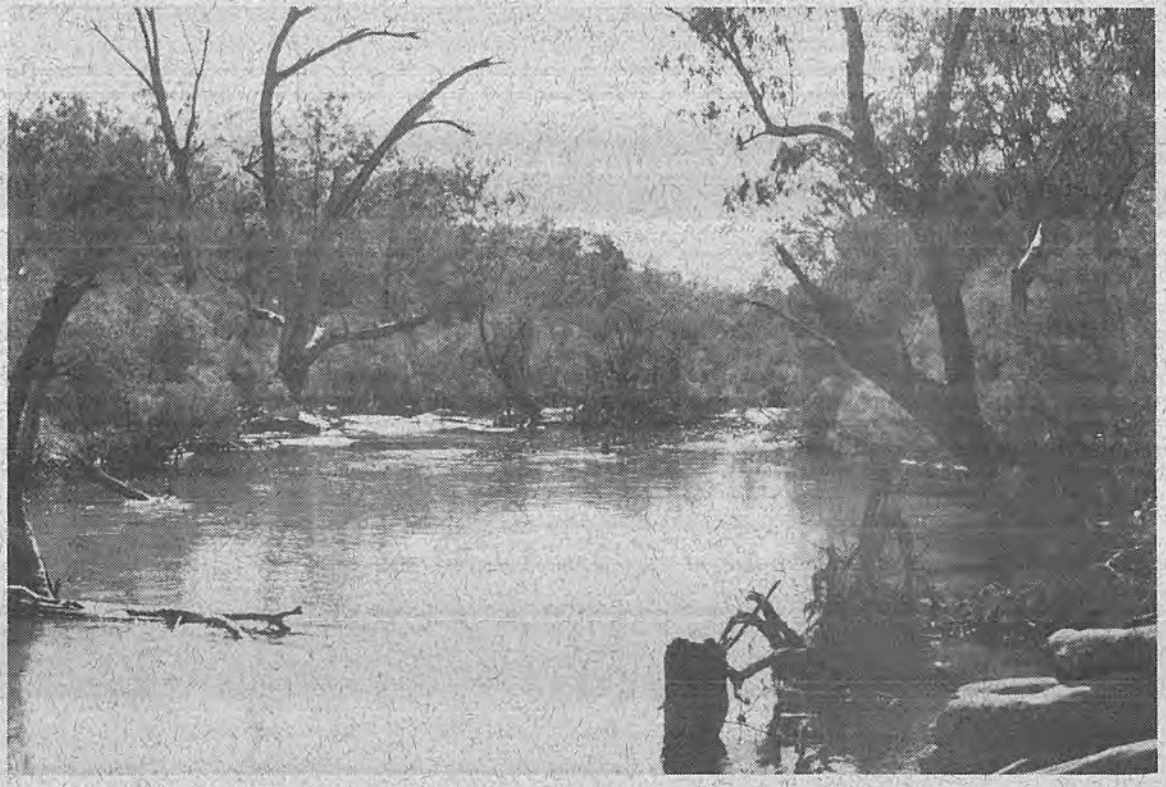
Staff and Finance

123.Ensure that funding provided to the waterways management authority is adequate to allow it to carry out its functions and effectively manage the river system.(*GOVT*, WWC)

124.Develop appropriate funding arrangements for river maintenance. This may include cost sharing between local government, the State, developers and private landowners.(*RMB*, LGAs, DEV)



Fringing vegetation along the banks of the Avon River provides a scenic outlook and protects the foreshore from erosion



CHAPTER 1: INTRODUCTION

1.0 Background

The Avon River System is a unique resource for Western Australia. It serves as one of the major drainage networks in the State, draining approximately 120 000 square kilometres of land mass. A wide variety of uses are supported by the river system. Agricultural pursuits are carried out throughout the vast catchment, the river and its foreshores provide habitat for flora and fauna and the river system provides a valuable recreational and aesthetic resource.

In recent years the people of Western Australia have become increasingly concerned about the problems facing the river system. Deterioration of water quality, siltation of river pools and consequent loss of wildlife habitat are the main areas of concern for the river and its foreshores. Linked with this are the problems of land degradation faced by the catchment and their effect on the river system. The Avon River changes its name to the Swan River at Wooroloo Brook. Therefore the impact the river system may have on the downstream Swan River within the Metropolitan Area of Perth is also of major concern.

The Avon River System Management Committee representing local government authorities along the river and in the wider catchment was formed in 1984. Its aim is to manage the Avon River and its catchment for social, economic, and environmental reasons. Since its inception, the committee has been pressing for better management of the Avon River System. The efforts of this committee together with the overall community desire to address the issues and find suitable solutions have prompted the preparation of this report.

The Avon River Fact Finding Study prepared by the Waterways Commission on behalf of the Avon River System Management Committee in 1985 identified the major issues of concern. This Management Strategy is intended to take those issues one step further. This will involve bringing measures to protect and manage the river system into a workable management framework.

1.1 Purpose of the Strategy

The Management Strategy will be a broad based document used to direct future management of the river system. Its purpose was to undertake the following:

- Identify the issues facing the Avon River System and identify tasks necessary to address these issues.
- Identify common management directions for agencies involved in management.
- Define roles and responsibilities of agencies involved in management.
- Provide a management framework for existing and future issues to be addressed in a coordinated manner.

In its present form the Management Strategy makes recommendations to the State Government on what tasks need to be carried out and how best this can be coordinated. Following a three month public comment period, a final document will be released incorporating comments received. This will then act as a blueprint for future management of the Avon River System.

1.2 Aim

The aim of the Management Strategy is:

> **'To balance the need to restore, protect and enhance the natural attributes of the Avon River System with its use and development by present and future generations and to ensure that an adequate management framework is provided**

The aim recognises that the river environment is a living system and its integrity should be maintained to the greatest possible extent. This means that a wide range of biological and physical functions should be retained.

It also recognises that the community of the Avon River System wants and needs to use the system and that this must be in a manner which is compatible with the protection of the natural environment.

1.3 Approach

To achieve the aim outlined above an approach needed to be taken which would direct planning and management for the River System. The approach taken in developing the Management Strategy involved a number of aspects.

Firstly the Strategy needed to look at long term objectives to cater for the protection of the river system for future generations.

Secondly, to ensure the health of the Avon River and the protection of its foreshores, the Management Strategy needed to look beyond the immediate river environment and include strategies for catchment management. Developing suitable solutions to the problems faced by the river system depends on integrating management of the river and the catchment.

Thirdly, the Management Strategy needed to develop cooperation between agencies managing the river system in order to achieve its objectives.

Finally, the Management Strategy needed to be consistent with other plans in the area. The Management Strategy is only one of many plans, programmes and policies addressing particular issues in the Avon Region. It is important that this strategy be integrated with these other plans and vice versa.

1.4 Community Input

During preparation of the strategy wide consultation was carried out with all sectors of the community concerned with management of the river system. This has hopefully led to the development of a form of management which reflects community attitudes and is what the community wants.

Three community workshops were held in November of 1990. These workshops gave the community throughout the catchment an opportunity to have input to the management strategy in its initial stages. The workshops involved participants identifying uses, issues and solutions for the Avon River System and then attempting to develop a framework within which management of the issues could be achieved. The findings of these workshops are presented in Appendix 1. The workshop findings provided a starting block for preparation of the management strategy.

Community input was also gained by an invitation to all government authorities, local governments, land conservation district committees and community groups to prepare a written submission towards the strategy. A large number of submissions were received and the information they supplied was invaluable to preparation of the strategy. A list of submissions received is presented in Appendix 2 and a summary of these submissions is available from the Waterways Commission. Further consultation was conducted to follow up issues raised by the submissions.

Close consultation with the Avon River System Management Committee throughout the preparation of the strategy has also allowed representatives of local government in the area to have input to the strategy.

This document is currently in its draft stage. A final document will be prepared following a 3 month public comment period. During this time the community will have a further opportunity to have input to the Strategy.. The Guide for Reader at the front of the document gives details of how to make a submission.

The remaining river pools provide valuable wildlife habitats and recreational and aesthetic pleasure to the community

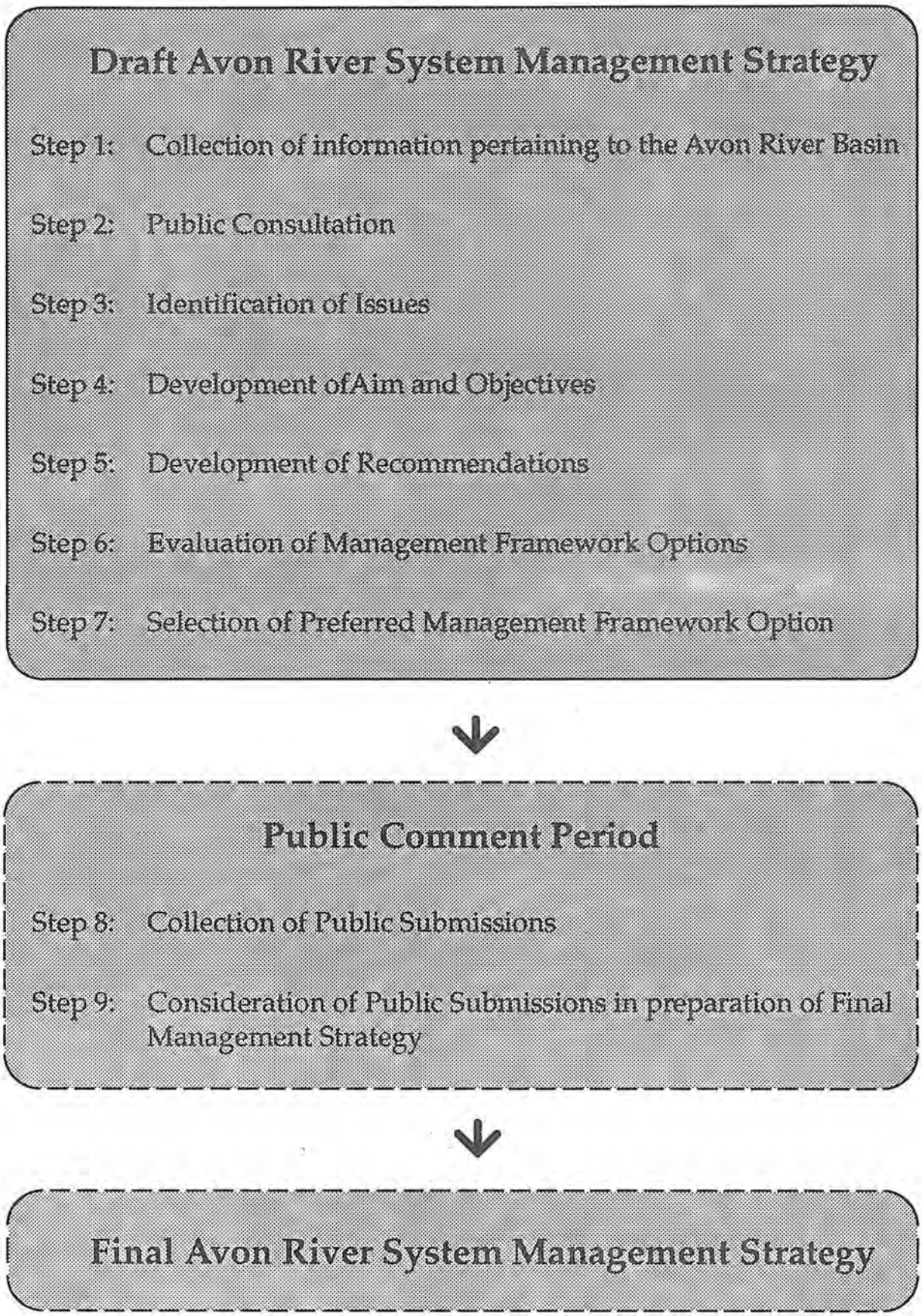


Figure 1: The Strategy Process

Recreational use of the river and its foreshores can be planned to minimise impact on the natural environment

CHAPTER 2: THE STUDY AREA

2.0 Introduction

This Chapter describes the study area being considered in this management strategy. The physical, biological and social environments of the Avon River System are briefly described. The reader is requested to consult quoted references for further detail.

2.1 Location

The study area considered in this management strategy is the Avon River Drainage Basin (No. 615). The basin is the largest catchment in the South West Drainage Division (V1) of Western Australia.

Located east of Perth, the Avon River Basin extends inland to the goldfields covering an area about 120 000 sq kilometres (Walker 1986). Map 1 shows the study area.

However, the main focus of the study is on the foreshore and waterway of the Avon River itself (see Map 6) from Qualandary Crossing (southeast of Beverley) downstream to the boundary of the Swan River Trust Management Area at Moondyne Brook. The Management Strategy also looks at catchment management issues throughout the basin on a broad scale but concentrates on these issues as far as they affect the river.

2.2 The Physical Environment

2.2.1 Geology, Landform and Soils

The study area lies to the east of the Darling Scarp on the Yilgarn Block, a relatively stable shield of Archaean granite and metamorphic rocks. This distinct geological province is characterised by low relief, sluggish drainage lines, weathering to great depths and lateritic soils.

The basin comprises three main catchment areas, the Yilgarn and Lochardt catchments in the east and the Avon catchment in the west (see Map 1). Although topographically similar in formation, the western Avon catchment is markedly different in landscape from the drier eastern catchments.

The western Avon catchment is characterised by steep valleys and hilltops. The formation of this landscape is believed to result from an uplift of the Darling Scarp in the early Tertiary Period. This event caused the reactivation of the rivers in the area. The erosional forces of these westward flowing rivers have cut down into the ancient granite and metasediment rocks underlying the plateau to form the present hilly landscape (Walker 1986).

Moving eastward through the Avon catchment the river develops from a relatively young river system to the west of Toodyay to a maturing river system in the east. The landscape becomes flatter and valleys broaden as a consequence. Dolorite dykes are evident in this area giving rise to the colour and fertility of the red brown soils of the valleys.

The eastern much drier Yilgarn and Lochardt catchments are, in contrast, of much lower relief. They consist of large open valleys with ancient salt lakes and marshes lying within them. The Meckering Line (see Map 1) is considered to be the point at which this ancient drainage system begins and rejuvenation of the river system ceases (Walker 1986).

Soils within the river basin are closely linked with differences in river form. In the western young section of the river grey alluvial soils are found on the river flats and red brown soils on the slopes. In the inland areas soil type is dominated by white and yellow sandplain soils and gravel laterite areas. Fertility tends to decrease as distance from watercourses increases (Walker 1986).

2.2.2 Climate

The Avon River Basin experiences a Mediterranean climate in the western section to a semi arid climate in the eastern section. Average annual rainfall decreases from 1200 mm over the Darling Scarp to the semi arid conditions of 400 mm in the inland catchment (Binnie and Partners 1985). Map 2 shows the average rainfall over the Avon River Basin.

Regular seasonal rains occur between May and October with approximately 80% of the yearly rain falling during this period. Temperatures vary from warm to hot in summer, mild during late autumn and spring with some frost experienced at night in winter (Walker 1986).

2.2.3 Hydrology

The Avon River System comprises four main river systems, the Avon, North Mortlock, East Mortlock and Dale, with Spencers Brook and Spice Brook being lesser tributaries. These rivers flow for at least part of the year, usually winter, and dry up nearly completely during summer.

The main Avon River flows from Yenyening Lakes downstream to Wooroloo Brook where it changes its name to the Swan River. This river is dry during the summer months except for a number of river pools which have permanent water throughout the year. A south branch of the river does continue upstream from Yenyening Lakes through the Shire of Brookton, Pingelly, Wickepin and part of Corrigin, however this section of the river only flows for a short period during winter.

The Mortlock rivers join each other just east of the Northam townsite and flow eastward to join the Avon downstream from the Northam Town Weir. The North Mortlock drains an area within the Wongan-Ballidu Shire and the East and South Mortlocks drain a large area of salt lakes within the Shires of Cunderdin, Tammin, Dowerin, Wyalkatchem and Koorda. See Map 3 for a schematic diagram of the river system.

The vast eastern section of the river basin only contributes water intermittently to the Avon River. Extensive lake systems are found throughout the area which act as compensating basins for rainfall that would otherwise become river flow. Both catchments eventually flow through the Yenyening Lakes system (see Map 3) and into the Avon River. Significant flow of this hypersaline water into the Avon River only occurs periodically when rainfall is high in eastern areas.

2.3 The Biological Environment

2.3.1 Foreshore Vegetation

Agricultural clearing along the Avon River and grazing of stock on the banks has resulted in the destruction of much of the natural foreshore vegetation. In most areas a thin line of vegetation now exists with a large number of introduced species present.

The banks of the river are lined with Flooded Gums *(Eucalyptus rudis)* and associated species of Swamp Sheoak *(Casuarina obesa)*. Acacia species and annual grasses introduced from adjacent farmlands are also common.

Within the river bed itself Swamp Paperbarks *(Melaleuca raphiophylla)* which are able to tolerate the great annual variation in salinity can be found. The establishment of salt tolerant plants such as samphire, salt water couch and sedges on exposed sand or mud flats of the river bed is also common (Walker 1986).

2.3.2 Catchment Vegetation

It is estimated that 75% of the Avon River catchment has been cleared for agricultural purposes (Binnie and Partners 1985). Completely open field now covers 48% of the catchment where introduced annual pasture plants, cereal crops and grazing pasture have altered plant communities eliminating virtually all native annual grasses and inhibiting the regeneration of trees and shrubs (Walker 1986).

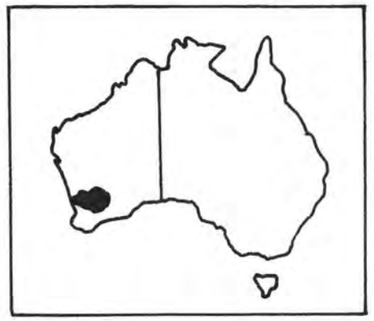
The natural vegetation which remains is fragmented and consists of three main vegetation associations. These are listed below and described in detail in Walker (1986).

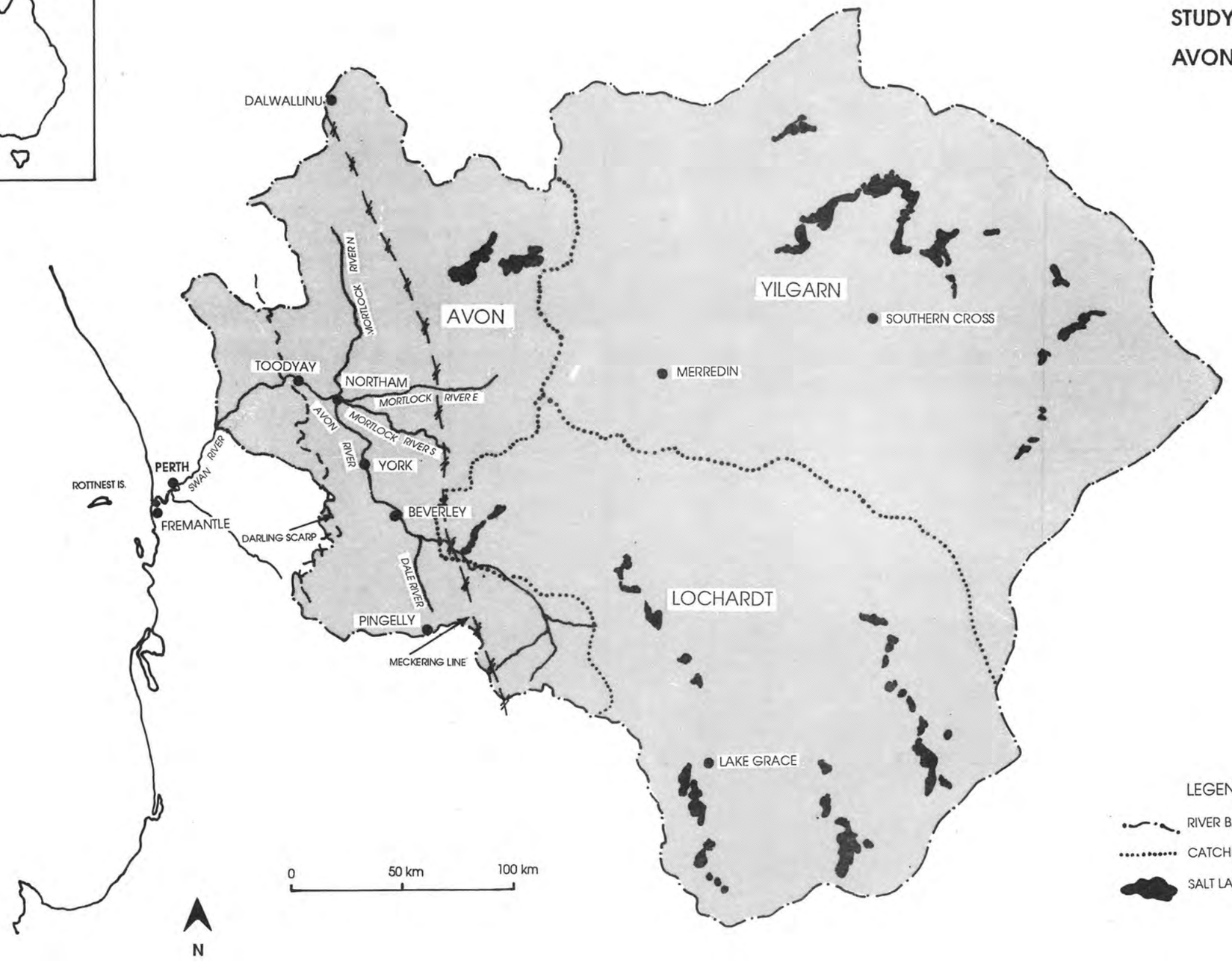
- York Gum *(Eucalyptus loxophleba)* and Jam Tree *(Acacia acuminata)*
- Wandoo *(Eucalyptus wandoo)* sometimes in association with Jarrah *(Eucalyptus*

MAP 1

STUDY AREA -

AVON RIVER BASIN





marginata), Powder-bark Wandoo *(Eucalyptus accedens)* and York Gum *(Eucalyptus loxophleba)*.

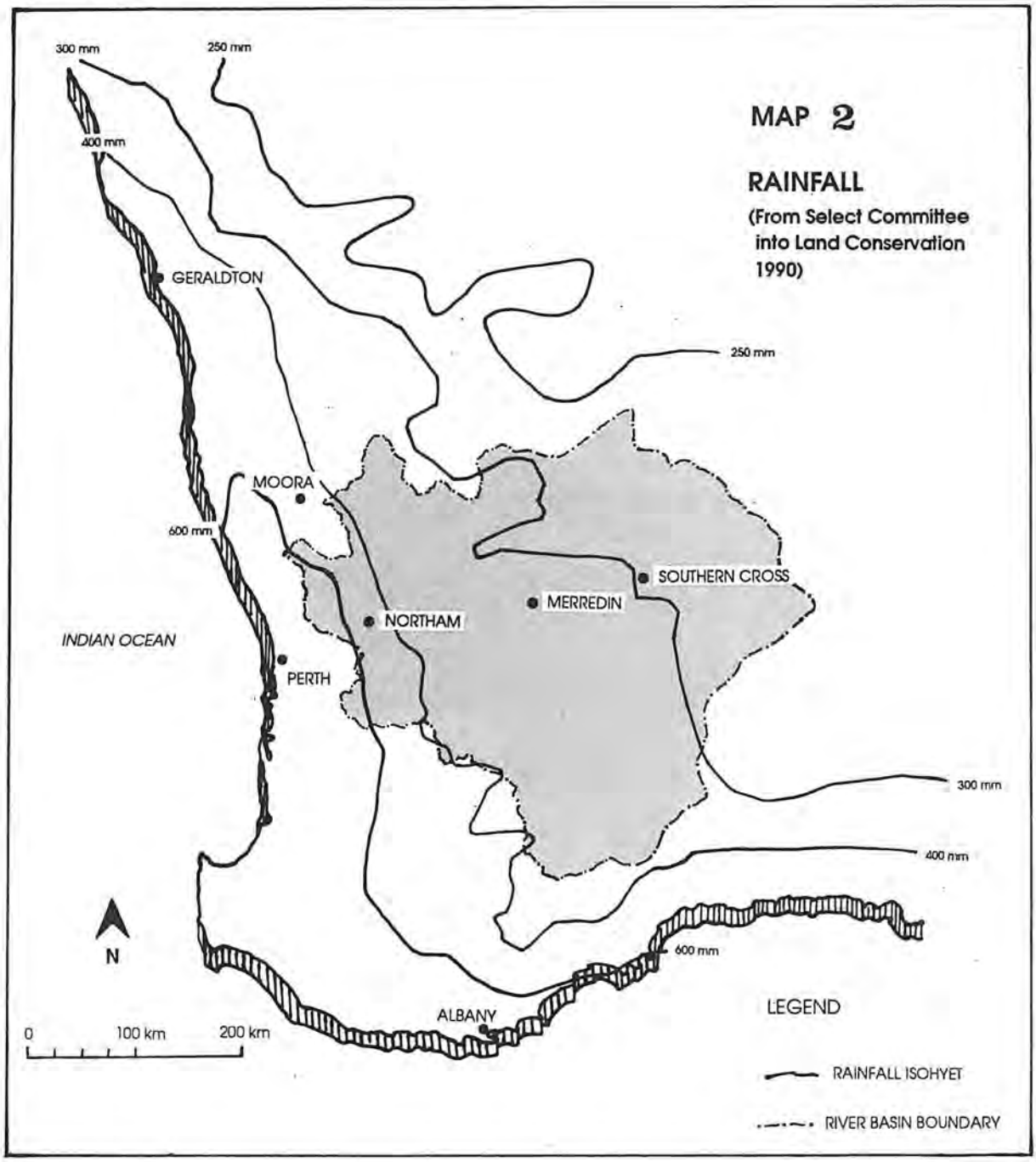
- Jarrah *(Eucalyptus marginata)* - Marri *(Eucalyptus calophylla)* forest and associated understorey.

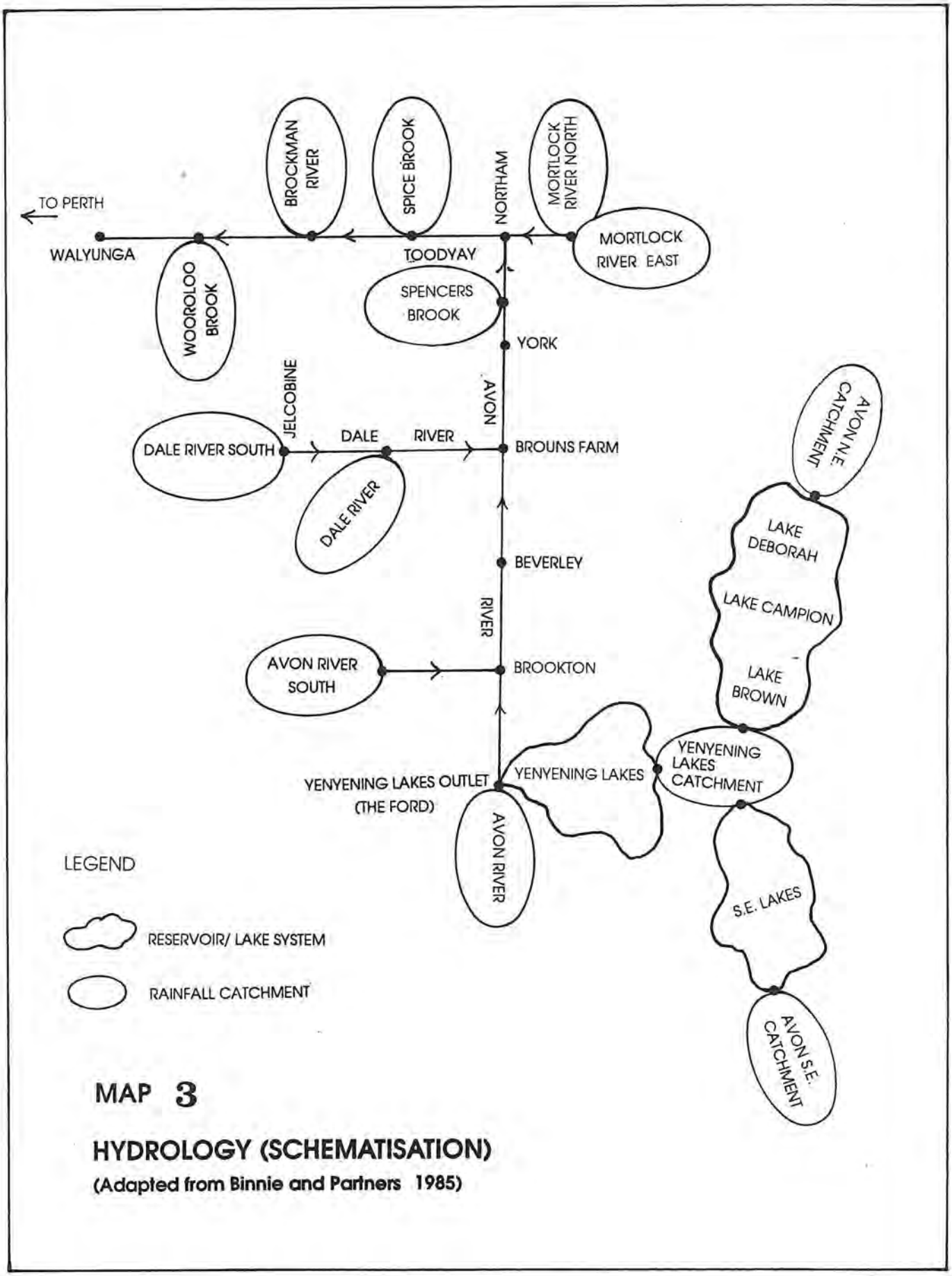
2.3.3 Fauna

The few remaining large summer pools of the Avon River form a permanent home for a large number of river based fauna. Many species have needed to adapt to the changing conditioned over recent years with increases in salinity, pollution and eutrophication of the river system.

Birdlife is the predominant faunal type with 90 wetland and dryland species having been recorded. Of these 90 species 53 have been recorded to breed within the Avon River System (Walker 1986).

Few fish species have been recorded along the river. Cobbler is the only large fish in the system. Mullet are known to move up the river in summer during periods of major flood. Other fauna present include molluscs, crustacea (gilgies found in fresher side streams), tortoises, Gwardar and Carpet Snakes, brush tail-possums, grey kangaroos and a few Euros (Walker 1986).





MAP 3

HYDROLOGY (SCHEMATISATION)

(Adapted from Binnie and Partners 1985)

2.4 The Social Environment

2.4.1 History

The first inhabitants of what is today known as the Avon Valley were the Aborigines. It is thought that Aboriginal people lived in these parts for some ten thousand years prior to European settlement. They dwelt in considerable numbers along the banks of the river and found plentiful food plants and wild game in both the lower country and the forests and woodlands on the plateau (Walker 1986).

In July 1830 an expedition led by Ensign Richard Dale of the 63rd Regiment set out to cross the barrier formed by the Darling Ranges. Their aim was to find new grazing land for the young Swan River Colony established in Perth. Eight days later Dale reached Mt Mackie, halfway between the present locations of Northam and York. The following day he was delighted to discover a substantial flowing river and followed it upstream in a southerly direction to examine the area around York (Garden 1979).

Dale took back a favourable report of the river and the open grassland country in the valley to the Colony. In August and September settlers applied to be granted land in the newly discovered region. The naming of the Avon River is not recorded, but it was presumably named by Governor Stirling, after the Avon River in England. It was not until 1834 that it was established that in fact the Avon River was the upper reaches of the Swan (Walker 1986).

Newcomers to the area first settled at York and within little over a year the whole of the Avon Valley had been explored. Only ten years later all the river frontage was occupied.

In the early days of settlement numerous floods were experienced in the Avon Valley, the most severe of which took place in 1872 when the highest flood level of the Avon River was recorded. Water was halfway up the Avon Bridge handrails in Northam (Hansen 1986).

By 1900 much of the western part of the river basin had been developed for agricultural purposes and the river was showing signs of rising salinity from the destruction of vast areas of native vegetation (Hansen 1986). With the introduction of phosphate fertilisers, making it possible to carry out agricultural pursuits on unfertile soils of the eastern basin, further extension of agriculture into the basin soon followed. By 1941 a substantial transformation of the river system in terms of high salinity was evident (Walker 1986).

In 1957 the River Training Scheme commenced. The scheme was carried out by the Public Works Department at the request of the local councils to alleviate the problem of flooding. River training involved the mechanical removal of all dead trees, logs and debris from within the river channel and the ripping of the river bed to induce scouring and hence form a deeper river channel (Hansen 1986).

The scheme exposed large amounts of sediment which was then free to redistribute itself along the channel filling in the river pools to varying degrees. Today three of the twenty two pools between Toodyay and Beverley are totally filled and only four remain close to their original condition. The remainder are partly filled and are in danger of filling completely.

2.4.2 Population

The population of the Avon River Basin is widely dispersed throughout the agricultural land of the basin. Concentrations of population occur in the many urban centres which support the agricultural landbase, the highest populations being within the towns of Northam, York, Toodyay and Merredin (ABS 1991).

Population growth within the agricultural areas has tended to decline in recent years as a result of a drop in the rural economy. Many people from the rural communities have moved to Perth and other major urban centres to look for work. The populations of the Shires of Toodyay, Northam, York and Beverley, however have increased as a result of the increase of hobby farms in the area and the flow of people from Perth seeking quieter lifestyles in the country (ABS 1991).

2.4.3 Land Use

Land use in the Avon River Basin is predominantly dry land agriculture. The activity is carried out over 82 000 square kilometres of the river basin . Decreasing rainfall from west to east influences soil and

vegetation patterns throughout the basin. Agricultural development is also closely linked to these factors.

To the west of the basin are the more fertile soils of the river valley. These areas are more suited to grazing than cropping and the farm economies in these areas are based predominantly on grazing activities. Moving eastward to areas of lower rainfall, soils become more suited to cropping with the most eastern parts of the basin predominantly wheat growing areas (see Map 4). A large area through the centre of the basin has traditionally undertaken a mixture of these activities.

The major produce of the river basin includes wheat and other cereals, and recently lupins. Sheep are the major livestock, for wool and meat. Pigs and cattle are also produced, but to a much smaller extent.

Other land uses in the river basin include urban and service activities carried out within small townsites scattered around theriver basin. These townsites provide services for the farming community and without agriculture few of these towns would survive. Industry within these townsites is associated with the agricultural land base and includes tanneries, abattoirs and flour mills. On the eastern edges of the river basin mining is also undertaken.

Drainage is also a major use of the Avon River Basin. The complex natural drainage system which exists within the basin services agricultural land and urban areas with water supply and serves as a drain for excess rainfall. Conservation areas exist on small pockets of nature reserve and on private land where remnant vegetation still exists.

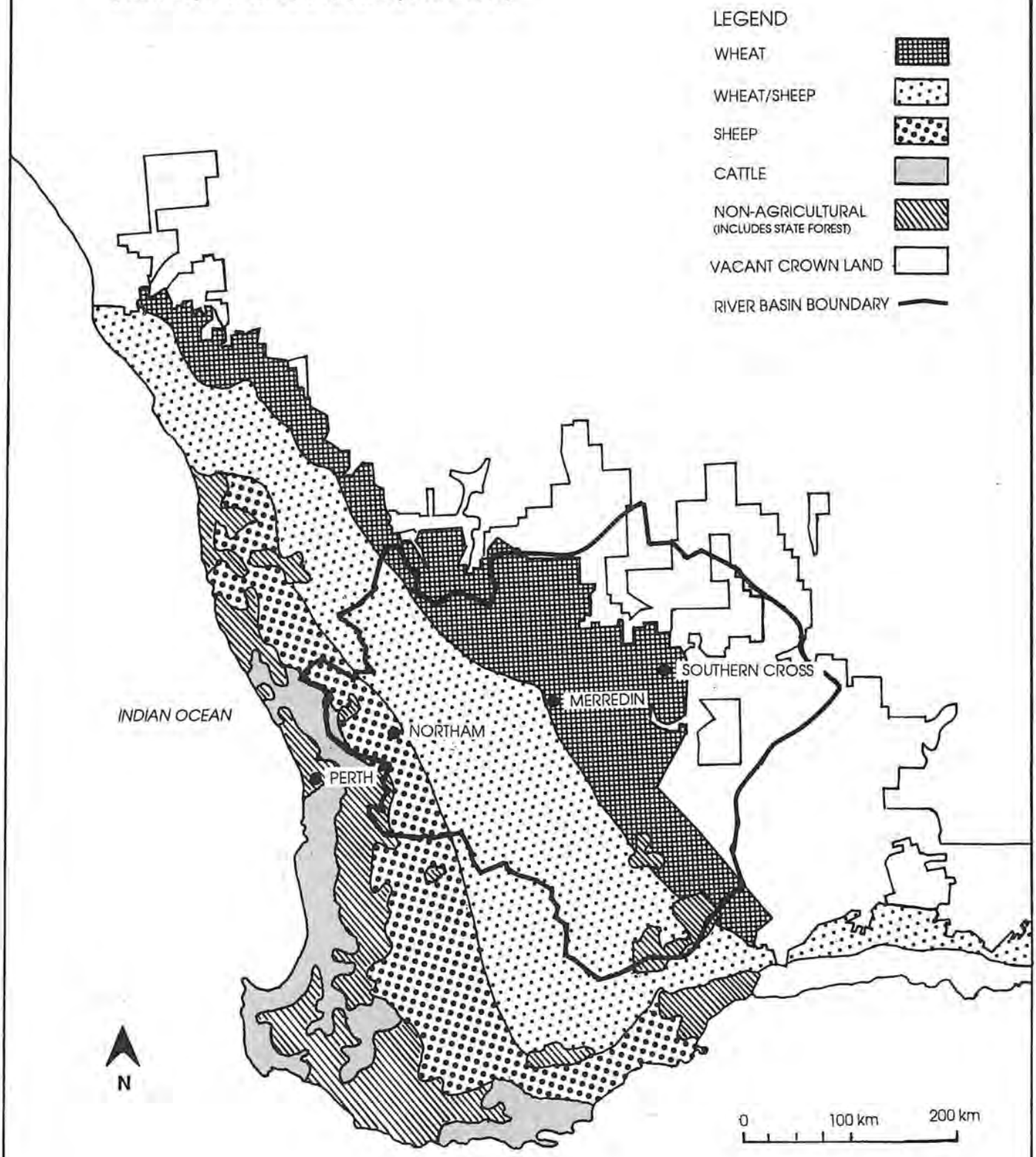
Recreational activities are undertaken throughout the catchment with the lake systems providing a valuable resource for water sports such as skiing.

Agricultural pursuits are the major land use of the Avon River Basin

MAP 4

DOMINANT LAND USE

(From Dept. of Lands and Surveys WA 1981)



The River Training Scheme has had an effected on the process of siltation within the Avon River

CHAPTER 3: EXISTING MANAGEMENT STRUCTURE

3.0 Introduction

Before any change in management of the Avon River System is considered the existing management structure should be explained.

This chapter briefly describes the roles and responsibilities of organisations involved in management of the river system and indicates the present policies, plans and research they are carrying out. The Chapter also outlines how they are currently coordinated in management.

Many of the bodies discussed do not have a direct role in management of the Avon River System. However they are indirectly involved because of their role in setting policy and direction for land use, catchment and waterway planning in Western Australia.

3.1 Roles and Responsibilities

3.1.1 Avon River System Management Committee

The Avon River System Management Committee was formed in March 1984. The committee is concerned with the management of the river system throughout the Avon Basin and involves itself in both river and catchment issues.

The Avon River System Management Committee has no legislative base and therefore no formal management powers. It has however carried out an advisory role which depends on the cooperation of all the local government authorities within the area. Through this role it has gained a high level of community respect.

Local government authorities throughout the basin are entitled to nominate representatives to the Avon River System Management Committee of which twelve members are elected.

The committee's constitution sets out the following aims and objectives:

Aim

- To manage the Avon River System for social, economic and environmental reasons.

Objectives

- To reduce the rate of water discharge into the river system by actively encouraging all recognised methods of soil conservation on rural land and to extend these concepts to the beds of the rivers.
- To encourage improvement of the quality of water flowing into the river system.
- To collect, collate and make available to the public all existing information on the river system.
- To seek financial and scientific assistance with which to further these aims.
- To establish and review through the medium of an annual general meeting policies for implementation of the objectives of the committee.

In May 1989 the committee met with the Minister for the Environment, Hon. Bob Pearce, to request State Government involvement in management. This Management Strategy has been prepared as a result of that meeting.

3.1.2 Local Government Authorities

Thirty nine local government authorities are situated wholly or partly within the Avon River Basin. These are listed below and located on Map 5.

Beverley	Mukinbudin
Brookton	Narembeen
Bruce Rock	Northam
Chittering	Town of Northam
Corrigin	Nungarin
Cuballing	Pingelly
Cunderdin	Quairading
Dalwallinu	Swan
Dowerin	Tammin
Dumbleyung	Toodyay
Goomalling	Trayning
Kellerberrin	Victoria Plains
Kent	Wandering
Kondinin	Westonia
Koorda	Wickepin
Kulin	Wongan-Ballidu
Lake Grace	Wyalkatchem
Merredin	Yilgarn
Moora	York
Mt Marshall	

Local government authorities (LGAs) are responsible for local planning and development control, provision of recreation facilities, and management and maintenance of reserves of which they are the vesting body.

LGAs are encouraged to prepare town planning schemes and local rural strategies to plan for development and changes in land use within their area.

The Town Planning and Development Act 1928-1986 confers several important powers upon LGAs which have a direct effect on the management of the river system. Firstly they can prepare and initiate changes to town planning schemes which control development along and in proximity to the river. Secondly they approve and supervise residential and commercial developments which may impact on the river system. And finally they provide advice to the Department of Planning and Urban Development on the suitability of subdivision and amalgamation in proximity to the river.

3.1.3 State Government Agencies

3.1.3.1 Western Australian Department of Agriculture

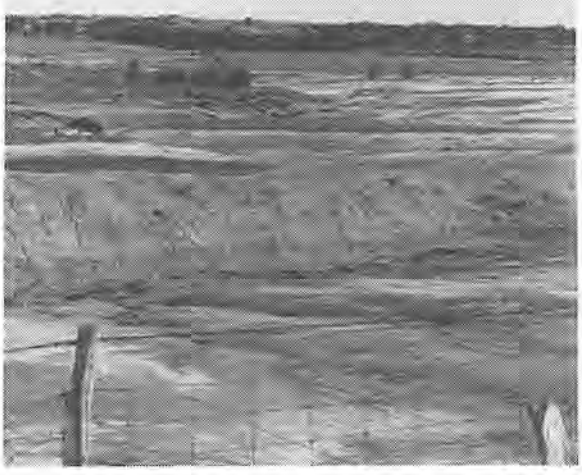
Because agriculture is the major land use in the river basin the Western Australian Department of Agriculture (WADA) plays a major role in the management of the Avon River System.

The Department of Agriculture's operations are wide spread. Within the river basin the Department has five Advisory Districts which carry out extensive agricultural research and extension programmes to improve agricultural productivity and the conservation of land and water resources.

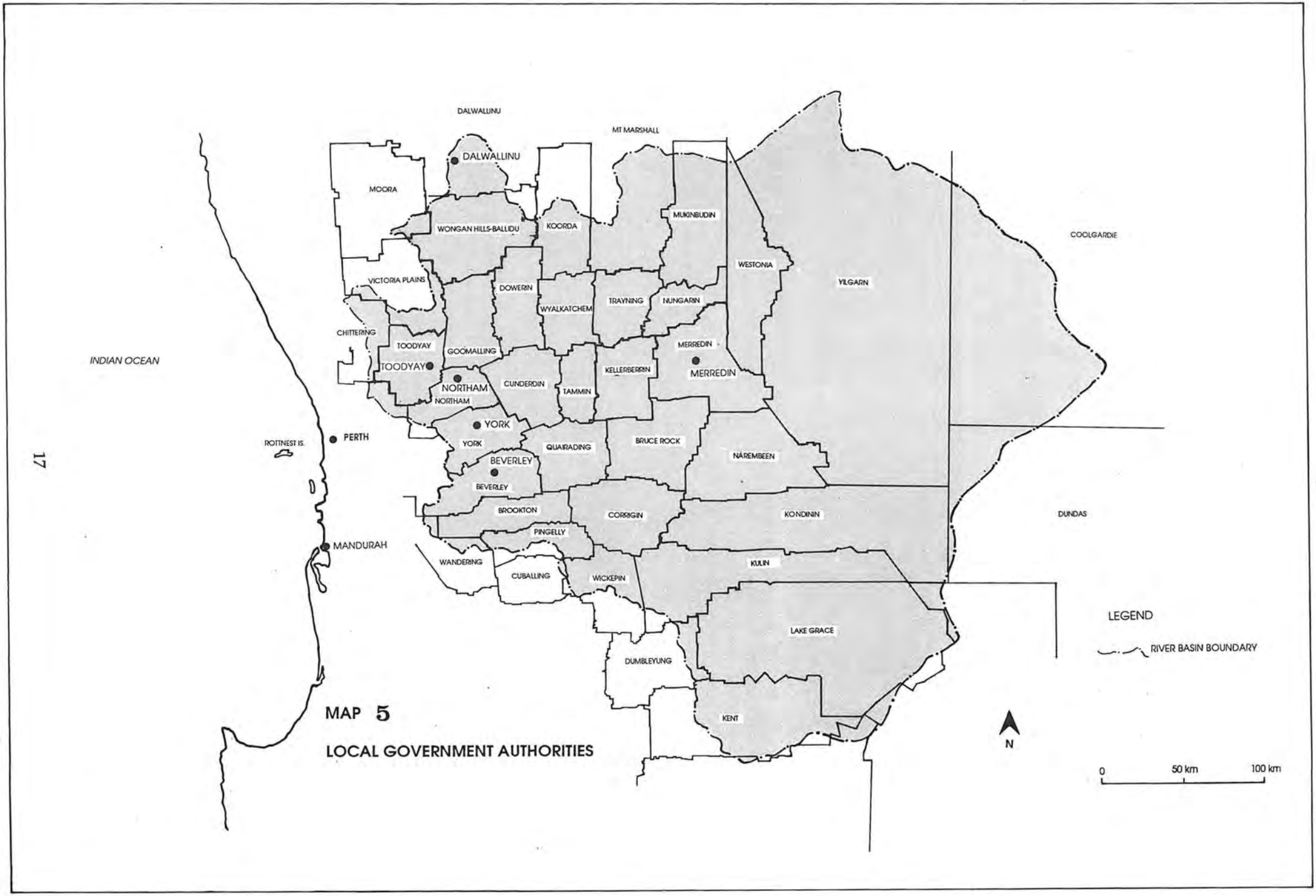
The Department administers the Soil and Land Conservation Act 1945-1988. The Act provides for the Commissioner of Soil Conservation to be responsible for the prevention and mitigation of land degradation and promotion of soil conservation.

Under this Act the Department of Agriculture has a statutory function to provide support to land conservation district committees (LCDCs). Section 3.1.4.1 provides more information these groups.. It is the Department's policy to assist LCDCs to become self directed bodies which develop and implement their own programmes. The Department is particularly keen to assist LCDCs in promotion and establishment of catchment based landcare groups.

In the Avon River Basin the Department has been funded through the National Soil Conservation Programme for contract positions in the area of resource survey (i.e. land resource data collection) and extension and facilitation. Through this funding the Northam office is operating a major landcare programme which is developing whole catchment demonstrations of appropriate land use with selected catchment groups and major support for land conservation district committees.



The Department of Agriculture aids in the prevention of land degradation



MAP 5

LOCAL GOVERNMENT AUTHORITIES

3.1.3.2 Water Authority of Western Australia

The roles and responsibilities of the Water Authority of Western Australia (WAWA) within the Avon River Basin are carried out primarily under the Water Authority Act 1984, the Rights in Water and Irrigation Act 1914, and the Environmental Protection Act 1986. The Authority also supplies water and sewerage services to communities within the basin under other legislation but this responsibility is not discussed in this document.

Water Resources Assessment

The Water Authority undertakes the monitoring of the quantity and quality of surface waters throughout the Avon River Basin. This includes streamflow and rainfall monitoring.

- **Water Resources Information**

  The Water Authority has developed and, as custodian, maintains the State Water Resources Information System Data Base. All hydrographic, meteorological, water quality, production and groundwater data for the Avon River Basin is stored on this data base, including information collected by other organisations.

- **Water Resources Protection**

  Using powers delegated under the Environmental Protection Act 1986 the Water Authority is responsible for water pollution control licensing of all industries with the potential to pollute or otherwise degrade water resources in the Avon River Basin.

  The authority is also concerned with degradation of water courses as a result of livestock, vehicles or other causes. Effective management is normally achieved through negotiation with the landowner or other affected parties.

- **Flood Plain Management**

  The Water Authority provides advice to local government authorities and individuals on flood levels in the Avon River. An Avon River Flood Study was undertaken for the Public Works Department by Binnie and Partners and is updated periodically as more information becomes available.

  The authority also plays a role in flood prediction and flood warning in times of flood emergency through their flood emergency team and the State Emergency Service.

- **Catchment Management**

  The Water Authority provides technical support and advice to land conservation district committees, catchment groups and other environmental organisations. The authority may be represented on some of these groups when requested.

At present the Water Authority has an interim policy on options for water course management through the land subdivision process which has been implemented state wide. This policy allows the Water Authority at the time of subdivision to ensure that water courses and water bodies within the subdivision plan will be effectively managed.

The authority's Hydrology and Land Use Research Section is currently undertaking the South West Salinity Study which includes the operation of a number of gauging stations in the Avon River Basin.

3.1.3.3 Waterways Commission

The Waterways Commission was established under the Waterways Conservation Act 1976-1982. Its role is to ensure that the State's waterways are conserved and effectively managed to maintain or enhance their environmental quality and public amenity, for the long term benefit of the community.

The commission has certain powers under the Waterways Conservation Act to carry out waterway planning and management in declared 'management areas'. Management of these specific areas is achieved by the establishment of community based management authorities with delegated powers under the Act.

To date the commission's focus has been in the high rainfall South West Region; three areas have been declared and management authorities established for Peel-Harvey, Leschenault and more recently Albany waterways. The management authority originally established for the Swan River was replaced in 1988 by the Swan River Trust with its own legislation.

Management authorities established under the Waterways Conservation Act and the Waterways Commission itself have an advisory role in waterways planning and management. The Act provides for control of certain activities on the banks and the bed of waterways and powers are delegated from the Environmental Protection Act to control pollution. The Act, however, provides for no

decision making powers as far as planning is concerned.

The commission's broad roles are set out below:

- To ensure that planning and development of waterways is compatible with their conservation, protection and enhancement.
- To provide advice to the Minister for the Environment, the community, and State and local government authorities, with a coordinating role which will result in the conservation and good management of waterways.
- To increase community awareness of the values of waterways and their appropriate uses.
- To maintain the quality of water in waterways for a range of uses and improve the community's understanding of waterways.
- To protect waterways to minimise the loss of habitat, aesthetic quality or function through the effects of erosion or human activity.
- To provide and promote facilities for public use of the waterways, which will allow the community access to waterways whilst conserving the environment.
- To control and wherever practicable prevent any act or emission which causes or is capable of causing pollution to the waters or land.

In 1985 the Waterways Commission carried out a fact finding study for the Avon River. This document identified many of the issues facing the river system and made broad recommendations for management. The study provided the information on which to base this Management Strategy.

Waterways Commission at present has no role in the Avon Region as the river system is not a declared management area. The commission has however aided the Avon River System Management Committee in a technical advisory capacity.

3.1.3.4 Department of Planning and Urban Development

The primary objective of the Department of Planning and Urban Development (DPUD) is to provide an effective urban and regional planning and development framework to guide decision making on land use, development and related matters for the benefit of present and future generations.

To fulfil that objective the department undertakes the following:

- Assists the government in integrating social, economic and environmental initiatives in planning.
- Provides a focus for community debate on land planning and development issues.
- Encourages public participation in the planning and development process to enable community needs and aspirations to be reconciled with appropriate land use patterns and development proposals.
- Undertakes and encourages new planning and development initiatives.

Within the Avon River Basin the department administers the following Acts including:

- Town Planning and Development Act 1928-1986
- State Planning Commission Act 1985
- Town Planning Regulations 1967
- State Planning Commission Regulations 1985

The department plays a part in planning and management of the river system through:

- **Town Planning Schemes**

  DPUD gives advice to the Minister for Planning on the approval of all local authority town planning schemes and amendments to those schemes. Town planning schemes zone and reserve land for a variety of uses and contain detailed provisions and policies relating to planning.

- **Subdivision Control**

  DPUD has statewide responsibility for subdivision control. Decisions on subdivision applications are made by seeking the advice of any relevant government agencies and the local authority. In the Avon River area agencies such as the Water Authority of Western Australia, Department of Agriculture, Environmental Protection Authority and the Department of Conservation and Land Management are consulted.

- **Policy Development**

  DPUD has a programme of policy formulation to guide decision making. All

approved DPUD planning policies are incorporated into three manuals for easy use by local government authorities, State government agencies, landowners and the public. The policies relate to development control, subdivision, town planning schemes and strategic planning.

In the Avon River area the most applicable policy is the Department's Rural Land Use Planning Policy. This policy statement addresses the different planning needs of the rural community, the economy and the environment while providing a framework within which State and local authorities can operate. Emphasis is on the preparation of local rural strategies to guide future zoning, subdivision and development on rural land.

The Department of Planning and Urban Development also prepares guidelines on specific issues for public information. 'Guidelines for Protecting Water Course Reserves' sets out various means by which protection of stream reserves can be achieved through the subdivision process. These guidelines are currently under review.

3.1.3.5 Environmental Protection Authority

The Environmental Protection Authority (EPA) is established under the Environmental Protection Act 1986 for the prevention, control and abatement of environmental pollution, for conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. The Environmental Protection Act makes it an offence to pollute.

The EPA's major objective in its protection of the Avon River System is to ensure that its existing value is maintained and enhanced. This means that a full complement of biophysical functions must be retained in the river and in its catchment.

Any proposed development that appears likely, if implemented, to have a significant effect on the environment must be referred to the EPA for environmental impact assessment by a decision making authority. A proponent or any other person may also refer a proposal and the EPA can call proposals in. The EPA determines whether proposals are likely to have a significant effect on the environment.

The EPA also has powers under its Act for the control, prevention and abatement of pollution on behalf of the Minister for the Environment. It issues licences, works approvals and notices. Certain pollution control powers have been delegated to the Water Authority of Western Australia and the Waterways Commission.

3.1.3.6 Department of Conservation and Land Management

The Department of Conservation and Land Management's (CALM) primary responsibility is to conserve Western Australia's wildlife and manage public lands and waters entrusted to the department for the benefit of present and future generations.

The department administers the Conservation and Land Management Act 1984 and the Wildlife Conservation Act 1950. It manages State forest, timber reserves, national parks, nature reserves and other lands vested in the Lands and Forests Commission and the National Parks and Nature Conservation Authority.

CALM is responsible for flora and fauna on land it manages, as well as the protection of native flora and fauna state wide under the Wildlife Conservation Act. This Act gives the department responsibility on private property as well as on Crown land. This is particularly in relation to the management of rare and endangered flora and fauna specified under the Act.

To achieve its objectives the department undertakes the preparation and implementation of management plans and wildlife programmes, develops opportunities for recreational use of entrusted lands and waters that are compatible with the purpose of the area, undertakes public education to increase community understanding of nature conservation and encourages public participation in development of policy, plans and research.

The Avon River Basin is covered by two CALM administrative regions, the Northern Forest Region administrated from Kelmscott and the Wheatbelt Region administered from Narrogin.

3.1.3.7 Department of Land Administration

The role of the Department of Land Administration (DOLA) is the administration of unvested (or vacant) Crown Lands, the gazetting of reserves, and the production of maps and remote sensing information of the cadastral and physical features of all lands of Western Australia.

The department administers several Acts including:

- Land Act 1933
- Transfer Land Act 1893
- Registration of Deeds Act 1856

Under these Acts DOLA has no direct responsibility for land or water management in the Avon River System. Certain sections of the Land Act 1933, however, are relevant to foreshore reserves, high and low water marks, land below low water mark and the beds of water courses. DOLA therefore has a clear involvement in the land adjacent and under rivers.

The department also has responsibility for the Western Australian Land Information System Secretariat and map production in general which plays a significant supportive role in land management. The Western Australian Land Information System is the State's computer based land information database. An integrated land information system ensures that land information gathered by various agencies is readily accessible and usable by land managers and landusers.

3.1.3.8 Department of Marine and Harbours

The Department of Marine and Harbours (DMH) is responsible for boating, control of vessels on navigable waters, and the approval of aquatic events under the Western Australian Marine Act 1982 and its Regulations. The department has direct responsibilities relating to marine and river waters.

The department is also responsible for the survey and operation of commercial ferries and hire and drive vessels, registration and control of pleasure craft, enforcement of safe navigation, granting of mooring licences, closure of navigable waters, and limit of boat speeds, and has it the power to set aside navigable waters for particular purposes.

The department is responsibile for the approval of boating events on the Avon River.

3.1.3.9 Water Resources Council

The Western Australian Water Resources Council (WAWRC) is a statutory body established under the Western Australian Water Resources Council Act and is responsible to the Minister for Water Resources. The council's main role is to promote the orderly, equitable and sustainable utilisation of Western Australia's water resources in the best long term interests of the State.

The council provides advice to the Minister for Water Resources on water, related land use and environmental issues and is also playing a part in promoting the integration of water resource and land use planning and management in Western Australia.

3.1.3.10 Integrated Catchment Management Coordinating Group

The Integrated Catchment Management Policy Group (ICMPG) was established on the adoption of the Integrated Catchment Management Policy by the State Government in 1987. This policy group was later restructured to become the Integrated Catchment Management Coordinating Group (ICMCG).

The Policy on Integrated Catchment Management provides for the coordination and integration of planning and management on a river or groundwater catchment basis. The group's main function is to implement this policy by considering broad objectives and principles for catchment management in the State, coordinating Government actions and fostering community participation in catchment management.

3.1.3.11 Office of Catchment Management

The Office of Catchment Management (OCM) was established as the secretariat for the Integrated Catchment Management Coordinating Group. To date ICMCG and the Office of Catchment Management have focused on the development of catchment management plans in the south west of the State and there has been little involvement in the Avon River System.

However the Office of Catchment Management wants to become involved in

catchment planning in the area and has been promoting community involvement through the Ribbons of Blue Monitoring Programme in the Avon Basin.

This programme allows students to use government resources to monitor and compile scientific data on water quality in their locality. Not only does the programme develop an awareness of the environment within schools but it also serves as a mechanism though which information on water quality throughout the basin can be collected at a relatively low cost.

3.1.3.12 Soil and Land Conservation Council

The Soil and Land Conservation Council (SLCC) is a statutory body established under the Soil and Land Conservation Act. The council is made up of the Commissioner for Soil Conservation, and representatives of the Department of Agriculture, other relevant government departments, Country Shire Councils Association, Western Australian Farmers Federation, Pastoralists and Graziers Association, a member of a voluntary conservation organisation and members of the community actively engaged in agricultural pursuits.

The council advises and makes recommendations to the Minister for Agriculture on the condition of soil and land resources. It also coordinates soil and land conservation programmes and provides a forum for the Department of Agriculture and the Commissioner for Soil Conservation to meet with other land management agencies and land users.

The council's main tasks at present are to review the establishment and operations of land conservation district committees and to consider the allocation of funds them under the National Soil Conservation and State Assistance Programmes.

The Council is also currently developing policy on matters such as the pumping of saline groundwaters and is jointly supporting the development of a dryland and stream salinity strategy with the Western Australian Water Resources Council.

3.1.3.13 Agricultural Protection Board

The Agricultural Protection Board (APB) operates under the Agricultural Protection Board Act 1950 and is responsible for the coordination and administration of the control, prevention and eradication of noxious weeds and vermin.

For administrative purposes the Agricultural Protection Board has divided the State into eleven zones. Each zone is responsible for the effective control of declared plants and animals in their area. The Avon River System is covered by parts of Zone 4,5,7 and 8 with the main part of the Avon River between the Shires of Toodyay and Beverley lying in Zone 8.

The APB works closely with landowners and local government authorities to prepare management plans for the eradication of noxious weeds and feral animals. Although the legal responsibility for control of declared plants and animals lies with the landowner, the APB maintains strict supervision.

3.1.3.14 Western Australian Tourism Commission

The Western Australian Tourism Commission was set up to promote Western Australia as a tourist destination for local, interstate and international travellers.

In the Avon River Basin their efforts focus mainly on the Avon Valley where the proximity to Perth and the natural and cultural attributes of the area create a favourable tourist destination.

The role of the commission is to promote tourism by improving and developing tourist facilities, marketing tourist destinations and providing more efficient and effective utilisation of investment in tourism.

The management of tourism in the Avon River basin, although coordinated by commission ,is carried out by a number of organisations. These include tourist bureaus and travel centres located in numerous centres.

3.1.3.15 Heritage Council of Western Australia

The Heritage Council of Western Australia has recently been established under the Heritage of Western Australia Act 1990 and is responsible for the identification and conservation of European sites of cultural or historical significance.

The nine member council consists of a chairperson, a nominee of the National Trust, representatives of owners, local government and relevant professional bodies, and

members of the community. The council's functions include:

- Providing advice to the Minister for Heritage on heritage matters.
- Maintaining a Register of Heritage Places and a statewide heritage database.
- The recording and presentation of places of significance.
- Carrying out negotiations with individuals and bodies in relation to heritage agreements, and other strategies for the conservation and presentation of significant places.
- The provision of financial or technical assistance or other conservation incentives.
- Preventing destruction or damage to heritage places.
- The promotion of interest in and understanding of cultural heritage and its conservation.

In the Avon River Basin the council advises on the impact of development or management actions on heritage values.

3.1.4 Community Groups

3.1.4.1 Land Conservation District Committees

Provision to allow the formation of land conservation district committees (LCDCs) was introduced by an amendment to the Soil and Land Conservation Act 1982. Through the Committees landowners and users help to solve the problems of land degradation in their areas.

The primary role of the committees is to develop cooperation among land users and agencies to implement sustainable land management systems and to solve local and regional land degradation problems. To achieve this the committees carry out land conservation works, develop demonstration sites, and advise on appropriate land conservation techniques.

The land conservation district committees formed in each area are composed of representatives from producer organisations, the local government authority and local land users (being the majority). The Department of Agriculture supports the Committee's with technical advice.

A large number of Land Conservation District Committees have formed in the Avon River Basin and in many cases more than one exists within a local government municipality. The boundaries of the districts are determined by the local community, usually on the advice of the Department of Agriculture.

3.1.4.2 Catchment Groups

The Department of Agriculture is encouraging the development of catchment groups (CGs) in the Avon River Basin. These groups are community based collectives of land users in a particular catchment.

The role of the catchment groups is to develop and implement catchment plans and farm plans for their local area. The groups get technical advice and support through the local land conservation district committee and the Department of Agriculture.

3.1.4.3 Alcoa

Alcoa is one example of private enterprise being involved in the planning and management of the State's resources. In the Avon River Basin Alcoa has for the Avon Landcare Project.

The project is centred in the western section of the river basin and involves defining problems, monitoring, digging earth works, planting trees and sowing saltbushes. Alcoa is working closely with the Department of Agriculture to establish demonstration sites within the catchment.

The project also involves the development of picnic sites in the Avon Valley. These sites will not only be of value to local communities as recreation resources but they will also act as educational facilities for landcare in the district.

3.1.4.5 WA Sports Dinghy Association

The WA Sports Dinghy Association is the umbrella group for all river racing clubs in Western Australia and is responsible for the control of all power racing.

The Association takes responsibility for governing boat configuration, motor size, support crews and environmental issues in consultation with the relevant planning authorities.

In this way the impacts of power boat racing events on the river environment can be controlled.

3.1.4.6 Other Community Organisations

A large number of community organisations exist within the Avon River Basin. Organisations interested in conservation, recreation and agricultural issues supply local knowledge and expertise to State and local government agencies on planning and management of the river system. They provide an avenue through which the community can become involved in management issues and community views can be expressed.

3.2. Management Coordination

The large number of State and local government authorities and numerous individuals and companies with direct or indirect responsibility for planning and development in the Avon River Basin makes cooperation and coordination essential for effective management of the river environment and of the catchment area.

Currently the main responsibility for planning and management in the river environment is undertaken by the local government authorities in the area and the Department of Planning and Urban Development at State level.

The Avon River System Management Committee has focused on planning and management issues and has attempted to provide coordination and advice for local government authorities.

Although the committee's efforts and the efforts of the local governments of the area to protect and enhance the river system have been admirable, their ability to carry out effective management without legislative power or adequate funding is limited.

The Management Strategy therefore stresses the need for improved coordination to ensure that planning decisions are made with full knowledge of their implications for river management, and that management decisions are made in context of broad planning guidelines and policies. It recommends that a river management body (RMB) be established as the agency responsible for overall river management (See Chapters 8 and 9).

Currently the main responsibility for catchment management in the Avon River Basin lies with the land conservation district committees and catchment groups with the support of the Department of Agriculture.

Planning and management through these mechanisms at a local level is considered to be working well. Catchment groups are being set up in many areas and are beginning to develop catchment plans. However, there is a similar lack of coordination of planning and management in the catchment as there is in the river environment.

There should be a mechanism to coordinate catchment planning on a regional level and ensure the flow of information, advice and support to all local groups. This issue is further discussed in Section 7.2.

It is also essential to integrate catchment management with river management, since activities within the catchment can impact heavily and continuously on the river. This issue is further discussed in Section 7.3.

Management of conservation areas should be guided by management plans which allows permitted uses whilst ensuring conservation of flora and fauna

CHAPTER 4: MANAGEMENT ISSUES

4.0 Introduction

Issues addressed in the Management Strategy were identified by a variety of methods. These included literature reviews of information pertaining to the area, community consultation and discussions with government agencies, local government and other relevant organisations.

The identified issues were analysed and grouped into three broad categories, although all issues do not necessarily fit entirely into one category. The categories are:

- Foreshore and Waterway Management
- Catchment Management
- Management Framework

Only those issues requiring action have been addressed in the Management Strategy. They are introduced here and discussed more fully in Chapters 6, 7, 8 and 9. Obviously new problems may arise in the future which cannot always be foreseen.

4.1 Foreshore and Waterway Management Issues

It is convenient to consider the issues of Foreshore and Waterway Management under three headings:

- Conservation and Rehabilitation
- Land Use and Waterway Planning
- Recreation and Tourism

4.1.1 Conservation and Rehabilitation

Water Quality

The water quality of the Avon River has declined since European settlement. Pollution from salination, nutrient enrichment, pesticides, and other industrial pollutants is evident. The issues of water quality management, beneficial uses of the water, pollution control and emergency procedures are of concern when considering water quality.

River Processes

Natural river processes within the Avon River have been altered. Siltation of the remaining river pools and erosion of the river banks is occurring. Maintenance of weirs along the river as a measure to trap silt and prevent erosion of the river bed is also of major concern.

Flora and Fauna

Very little foreshore vegetation exists along the river. Protection of this resource is vital to ensure stability of the river banks, provide wildlife habitats and trap nutrients and pollutants. Maintenance of conservation values along the river in terms of representative flora and fauna is also essential. Effective fire and weed and feral animal management will help to protect flora and fauna.

European and Aboriginal Sites

A number of Aboriginal and European sites exist along the river. These need to be recognised and protected to ensure preservation of the cultural integrity of the area.

4.1.2 Land Use and Waterway Planning

Regional and Local Planning

It is important that regional and local planning occurs in a coordinated manner taking into consideration impacts on the waterway and its foreshores.

Public Access

The right of public access to the river and its foreshores is not always recognised. This right must be maintained in a manner which is compatible with protection of the natural environment and the rights of private landowners.

Foreshore Ownership and Management

Land along the river has varying ownership status and as a consequence inconsistent management can occur. The suitability of land ownership along the river needs to be addressed and appropriate forms of management determined.

Flooding and Flood Plain Management

Flooding of townsites along the river has been of major concern since European settlement. A balance needs to be found between maintaining the natural flow of the river whilst minimising flood damage and hazard.

Urban Development

Urban development along the river can exert various pressures on the river system. A concentration of people in any one locality can result in problems associated with lighting, noise, trampling, rubbish disposal, litter, domestic animals, exotic vegetation species, insecticides and other pollutants. Development must be appropriately sited and designed to reduce the impact on the river and its foreshores.

Industrial Development

Industrial development along the river can have a large impact on the water quality of the river system. Industrial effluent can pollute waters causing the death of vegetation and wildlife. Adequate pollution control mechanisms are required.

Landscape Protection

The waterway and its foreshores have a number of special landscapes and views which are worthy of protection. These should be maintained and enhanced to protect the uniqueness and character of the area.

4.1.3 Recreation and Tourism

Recreational Use and Facilities

The community of the Avon Region utilises the river and its foreshores as a recreational resource. Often facilities and opportunities for recreational activities are not in line with demand by users and are also not compatible with the natural environment.

Recreational Site Planning

Recreational facilities may be compatible with some areas of the riverine environment but not with others. Siting and design for recreational facilities should be planned to minimise their impact on the natural environment.

Special Events

A number of special recreational or tourist events are held on the Avon River which can impact on the river system. These events can cause the destruction of river banks, disturbance of wildlife habitats, pollution of the water and invasion of landowner's rights.

Tourist Facilities and Activities

The Avon Valley is a existing and future tourist destination. Tourist facilities need to be planned to promote and protect the local heritage, lifestyle and natural environment whilst keeping in touch with demand.

4.2 Catchment Management Issues

The issues of Catchment Management have been grouped into 6 broad categories. The first four of these categories relate to the use of the catchment and include the issues which arise from or affect those land uses. Again the issues do not entirely fit into one category. The categories are:

- Agriculture
- Drainage
- Conservation
- Recreation
- Catchment Planning
- Linking the Catchment with the Waterway

4.2.1 Agriculture

Agricultural production is of major importance to the community of the Avon River Basin. Soil and land degradation problems within the basin are affecting the level of this production to a large extent. It has however been recognised that agricultural production is compatible with land conservation and innovative changes to land management practices are being implemented. The problems facing the agricultural land use can indirectly or directly affect the condition of the river.

Dryland Salinity

Large areas of productive land are becoming salt affected as the water table rises following clearing of the catchment. This is also causing rises in salinity levels in lakes tributaries and the Avon River.

Water Erosion

Topsoil is being lost from cleared agricultural land through rainfall runoff, causing a dramatic reduction in land productivity. Silt lost from the catchment is contributing to silting problems within the Avon River and its tributaries.

Wind Erosion

Topsoil is also being lost from agricultural land by wind erosion. As a result fertility is greatly reduced and vegetation can be lost through sand blasting and inundation.

Waterlogging

Clearing of upland areas and modern agricultural methods have increased the incidence of waterlogging on agricultural land. Waterlogging is closely linked with other land degradation problems such as salinity, soil structure decline and water erosion.

Water Repellance

Water repellant soils are developing in areas of the river basin. These soils resist wetting when dry. Water repellant soils reduce farm productivity by hindering the even distribution of surface water essential for crop and pasture germination.

Soil Degradation

The degradation of soils throughout the river basin is reducing productivity. The three main problems are soil acidification, soil structure decline and soil compaction. All have a large impact on the soils capability to support crop and pasture.

4.2.2 Drainage

The drainage system within the Avon River Basin is complex in nature and contains lakes, tributaries and drainage lines. These waterways face problems such as pollution, flooding and general uncoordinated management. The amount and quality of water flowing through this drainage system has an impact on the condition of the river.

Pollution

Pollution is affecting the drainage system within the Avon River Basin. Lakes, tributaries and the river are experiencing nutrient enrichment problems and contamination from industrial waste and pesticides.

Flooding

Localised flooding within the river basin can occur as a result of intense rainfall over a short period of time. The outer parts of the catchment contribute to flooding of the Avon River .

Lakes and Tributaries

Lakes and tributaries within the river basin are experiencing pollution problems in the form of high salinity levels and nutrient enrichment. Salinity levels in the lakes are of concern to adjacent landowners as rises in lake levels can cause salt encroachment on to nearby productive land. The issue of recreation use of lakes is also of concern.

4.2.3 Conservation

Decline of Remnant Vegetation

Only small amounts of remnant vegetation now exist within the Avon River Basin. Protection of this valuable resource for wildlife habitat and conservation purposes will also contribute to the reversal of land degradation problems.

Conservation and revegetation must take into account the location of remnants in the river basin.

Conservation Areas

The protection of representative stands of remnant vegetation and the associated wildlife in conservation reserves can ensure the conservation of the genetic diversity of the Avon River System. These areas should be subject to special management to ensure their survival.

4.2.4 Recreation

Recreational pursuits are carried out on the lakes within the river basin and within townsites. Facilities and activities available are not always consistent with demand. Often too these activities conflict with the use of local agricultural land. A balance must be found between allowing

recreational activities to continue and protecting the rights of landowners.

4.2.5 Catchment Planning

Management of the catchment needs a coordinated and integrated approach. Planning mechanisms are required so that a consistent approach in addressing issues can be developed. This planning needs to be community based and consider all issues facing the catchment.

4.2.6 Linking the Catchment with the Waterway

As land uses in the catchment impact directly or indirectly on the river environment, management of the waterway and its foreshores can not occur in isolation. There must be a coordinated approach to management linking waterway issues to catchment issues to find solutions.

4.3 Management Framework Issues

4.3.1 Coordination

Successful management of the river system relies on the coordination of agencies involved in planning and management. Effective coordination will reduce inconsistencies and repetition in management actions and controls.

Legislation

Adequate State government legislation is needed to effectively manage the river system. Management agencies cannot carry out certain activities management which is beneficial to the river without statutory authority.

Roles and Responsibilities

Because of the large number of individuals and agencies in management of the Avon River and its catchment, the role and responsibilities of each must be identified to prevent overlap and inconsistency

Agency Cooperation and Communication

There must be effective cooperation and communication between all agencies involved in management of the river system so that they work towards the same goals.

Community Education and Participation

Through participation in decision making local people can ensure that management of the river system is consistent with community values, and can contribute their local knowledge and skills. Educating the community on various issues affecting the river system and how they can help is also a vital part of planning and management.

Staff and Funding

For effective management the river system an appropriate level of staff and funding must be supplied to the most suitable agencies.

CHAPTER 5: MANAGEMENT OBJECTIVES

5.0 Introduction

Before addressing issues facing the Avon River System and developing suitable solutions, it was necessary to decide what is to be achieved. The following objectives have been developed to cover the issues raised in Chapter 4 and they are divided into the same categories. They reflect the values of the community by highlighting the attributes of the river system on which importance is placed.

A hierachy of objectives has been developed to deal with the large number of issues. Firstly primary objectives for each category of issues and secondly specific objectives to further expand the primary objectives. It is considered that all objectives are necessary to manage the river system and listing should not be seen as indicating an order of priority.

5.1 Foreshore and Waterway Management Objectives

Conservation and Rehabilitation

The Avon River and its foreshores have unique natural resources which make it an area of special and distinct environmental significance. Conserving and protecting these natural resources is of utmost importance if the community is to enjoy the river environment in the future.

Over time the functioning of these natural resources has been degraded making restoration and rehabilitation necessary.

Primary Objective 1:

'To maintain a functioning healthy river environment by conserving, protecting and rehabilitating the river and its foreshores'.

Specific Objectives

- Maintain and improve the water quality of the river system to a level which is acceptable for its identified beneficial uses.
- Protect and improve the indigenous flora and fauna in foreshore areas of the river system in order to maintain its natural conservation values.
- Restore the sediment balance of the river and hence maintain the natural processes of siltation and erosion.
- Preserve and protect the historical and cultural integrity of the river system.

Land Use and Waterway Planning

The Avon River and its foreshores are recognised as a regional land use resource. The community use the river and its immediate environment for a range of activities. These uses should be evaluated for their effect on the natural environment so that the best and most desirable uses can be promoted.

Planning for land use and development in the area can be undertaken in such a way that the integrity of the natural river system is maintained and the impact of development is minimised. The Management Strategy does not and cannot restrict use and development of the river and its foreshores. It attempts to highlight constraints to development, so that current and future generations can enjoy the river.

Primary Objective 2:

'To balance existing and future land use and development in the waterway environment with the need to protect and enhance the river system'.

Specific Objectives

- Provide a regional and local planning framework which guides planning authorities and ensures a sensible and coordinated approach to waterway and foreshore management.
- Ensure that the public's right of access and use of the river and its foreshores is maintained whilst protecting the natural environment and the rights of private landholders.
- Determine appropriate land ownership of foreshore areas and address management of foreshore reserves, vacant Crown land and privately owned land.
- Maintain the natural flow of the river system and to promote the wise use of flood prone land while minimising flood risk, damage and hazard.

- Allow for the continuation and growth of urban areas which is compatible with protection and enhancement of the river environment.
- Provide opportunities for the continuation and establishment of industry which is compatible with the protection and enhancement of the river system.

Recreation and Tourism

The Avon River and its foreshores are a major recreation and tourism resource for the local community and the people of the Perth Metropolitan Area. There should be provision for appropriate recreation and tourism activities to meet the demand for that resource.

Primary Objective 3:

' To encourage and provide recreation and tourism opportunities and facilities that reflect the needs of the community and are compatible with the natural environment and the rights of local landowners.

Specific Objectives

- Ensure that a range of recreational facilities and opportunities are provided and users of the river environment can partake in a variety of recreational activities which are compatible with the natural environment.
- Appropriately site and design recreational facilities to minimise the impact of activities on the natural riverine environment.
- Ensure special recreational events held on the river are compatible with the protection of the riverine environment and undergo adequate environmental assessment.
- Promote the Avon River Region as a tourist destination by developing facilities and activities which complement local heritage, life style and the natural environment.

5.2 Catchment Management Objectives

It is not the aim of this Management Strategy to solve many land management problems facing the Avon River catchment. It is however the task of the Management Strategy to encourage coordinated catchment management and identify a mechanism through which this could occur. It is also necessary to ensure the linking of catchment management actions with waterway management actions.

For this reason objectives have not been set to cater for all the catchment issues discussed in Chapter 4. Objectives have however been developed for the issues of 'Catchment Planning' and 'Linking the Catchment with the Waterway'.

Catchment Planning

Because catchment issues vary from area to area, planning should be coordinated at a local level so that locally specific issues can be addressed and achievable solutions developed.

Catchment issues cannot be addressed in isolation of each other nor can they be addressed in isolation of the wider picture. Planning must therefore take an integrated approach and include regional coordination.

Primary Objective 4:

'To encourage integrated and coordinated catchment planning at a local and regional level which addresses all issues in the catchment'.

Specific Objectives

- Ensure that catchment planning considers the sustainability of the agricultural land use, productivity and maintenance of the natural environment.
- Ensure community involvement in the catchment planning process.
- Ensure that ther is technical and financial support for the catchment planning process.

Linking the Catchment with the Waterway

Many of the problems facing the Avon River are a consequence of activities occurring miles away in the catchment and solutions may also lie in appropriate catchment planning.

Mechanisms to achieve constructive cooperation and communication need to be developed in order to link catchment actions with waterway actions.

Primary Objective 5:

' To ensure that an integrated approach is taken to catchment and waterway management with the development of mechanisms which consider the impact the catchment has on the waterway and vice versa.'

Specific Objectives

- Provide a mechanism to adequately link catchment management with waterway management.
- Promote good communication and cooperation between those managing the catchment and those managing the waterway.'
- Prepare joint policies, plans and tasks to deal with issues in catchment and waterway management.

5.3 Management Framework Objectives

Management Coordination

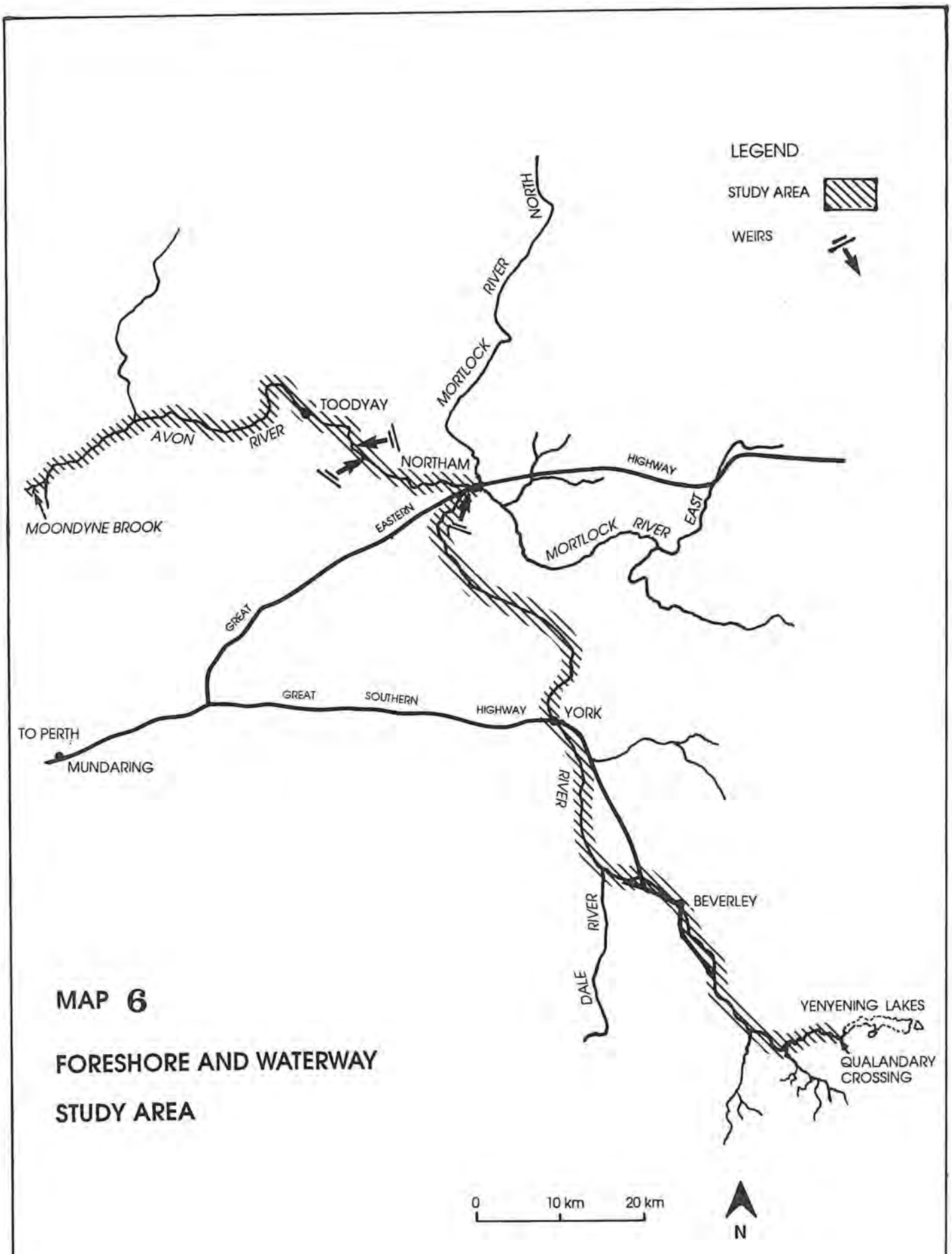
In order to achieve the other five primary objectives and the overall objective of this Management Strategy a workable management framework must be developed.

Primary Objective 6:

'To ensure the provision of a management structure including an adequate legislative and administrative base and funding to effectively achieve the other primary objectives of this management strategy'.

Specific Objectives

- Define roles and responsibilities in management of the river system.
- Ensure that management is coordinated and that adequate communication and liaison occurs between the agencies involved.
- Ensure that the community, local government and State government is adequately represented in management.
- Promote education of the community on waterway and catchment issues.
- Provide an adequate level of funding to effectively manage the river system.
- Ensure that the management structure takes into account the links between waterway management and catchment management.



MAP 6

FORESHORE AND WATERWAY

STUDY AREA

CHAPTER 6: FORESHORE AND WATERWAY MANAGEMENT

6.0 Introduction

This chapter deals more fully issues affecting the waterway and foreshores of the Avon River which were identified in Chapter 4. The area being considered is the part of the Avon River stretching from Qualandary Crossing (southeast of Beverley) downstream to the boundary of the Swan River Trust Management Area at Moondyne Brook . Map 6 shows the study area for the recommendations contained in this chapter.

Issues discussed here are complex in nature requiring both waterway and catchment initiatives. This section deals only with tasks to be undertaken in the foreshore and waterway environment.

The fifteen issues are considered under three headings:

- Conservation and Rehabilitation
- Land Use and Waterway Planning
- Recreation and Tourism

Each issue is considered individually and a Need for Action and Recommendations are developed. The recommendations form a summary of the actions that need to be undertaken to manage the Avon River. These recommendations are of a general nature guided by general principles of foreshore and waterway management.

Agencies responsible for implementation are indicated in brackets following each recommendations with the initiating agency in italics. Abbreviations for the agencies listed are provided on a foldout sheet at the back of the document.

As stated in Section 3.2 the agency responsible for overall river management is described as the river management body (RMB). The details of this body are outlined in Chapters 8 and 9.

6.1 Conservation and Rehabilitation

6.1.1 Water Quality

Five aspects of the issue of water quality are discussed below.

6.1.1.1 Water Quality Monitoring

Need for Action

The water quality of the Avon River has slowly declined over the past one hundred years since the clearing of vast areas of the catchment for agricultural land use. Three main water quality problems have emerged.

Salination of the river system has severely increased since clearing of the native vegetation and the planting of shallow rooted introduced crop and pasture species. The reduced water uptake from this change in vegetation cover has resulted in a rise in the water table and an associated mobilisation of salts usually stored in the saturated zone. Increases in water flow throughout the catchment have resulted in saline ground and surface waters reaching the river system.

Salinity levels in the river system have risen from their original levels of between 400 and 3000 mg/L to the extremely saline conditions of between 2000 and 17 000 mg/L observed today (Walker 1986). This has resulted in the loss of many species of flora and fauna that once inhabitated the river system and the colonisation of many new species, adapted to the saline conditions.

Nutrient enrichment has become a problem in recent years mainly as a result of the widespread use of phosphate fertilisers in the catchment. The increased level of nutrients entering the system has resulted in the remaining river pools experiencing algal blooms and associated odours during the summer months. Point sources such as stormwater and sewage discharge, runoff from rubbish tips and high effluent land use activities such as piggeries may also contribute to the river's nutrient load.

Pollution of the river system from toxins including pesticides, heavy metals and other industrial pollutants is also a potential

problem. These pollutants can enter the river system by means of spray drift, erosion of contaminated soils, careless disposal of chemical containers and direct discharge from industry. Actions in the catchment to control the use of fertilisers, pesticides and other pollutants and to change land use practices to minimise pollution of the river are discussed in further detail in chapter 7.

The Water Authority of Western Australia has in the past monitored salinity and water level changes in the Avon River. A more comprehensive water quality monitoring programme is required so that baseline data can be established and changes monitored. Existing data need to be collated into a data base so that analysis can take place, information can readily be exchanged between agencies and management actions determined.

The Ribbons of Blue Monitoring Programme developed by the Office of Catchment Management allows school students to use government resources to monitor and compile scientific data on water quality in their locality. This programme has been extremely successful in the Swan/ Avon catchment to date. Not only does the programme develop an awareness of the environment within schools but it also serves as a mechanism by which information on water quality can be collected on a large scale at a relatively low cost.

Recommendations

1. Develop a water quality monitoring programme to determine changes in water quality. (*RMB*, WWC, WAWA)

2. Establish a water quality data base using existing water quality data collected by the Water Authority of Western Australia. Link this data with water quality data collected for the Swan River to provide a better understanding of the relationship between the Swan and Avon River systems. (*RMB*, WWC, WAWA)

3. Continue and support the Ribbons of Blue Monitoring Programme as a means to aid overall water quality monitoring. (*OCM*, RMB, WWC, WAWA)

6.1.1.2. Beneficial Uses

Need for Action

Maintaining water quality at an acceptable level depends on the development of criteria, objectives and standards. These tools are based on the identified beneficial uses of the river system and its immediate environs. A beneficial use can be defined as any use of the environment that is conducive to public benefit, welfare, safety or health. Criteria, objectives and standards should be developed to ensure the protection of the water body for any stated beneficial uses.

At present the Water Authority of Western Australia indicates that use of the Avon River System as a potable water source is unlikely. The Avon River Community Workshops held in November 1990 identified a number of uses for the Avon River. These are documented in Appendix 1. The following beneficial uses of the river and the immediate foreshores have been chosen from this list.

- Conservation of native flora and fauna
- Drainage
- Recreational activities including
  - canoeing
  - bushwalking
  - birdwatching
  - picnicking
  - camping
  - swimming
  - fishing/yabbying
  - duck shooting
  - power boating
- Watering and grazing of stock
- Tourist activities including
  - heritage trails
  - interpretation sites
- Educational activities including
  - nature walks
  - faunal studies
- Water supply for non-potable uses
  - Effluent disposal
  - Sand supply

Recommendation

4. Develop water quality criteria, objectives and standards for the river system which reflect the identified beneficial uses. (*RMB*, WWC, WAWA)

6.1.1.5 Pollution Control

Need for Action

The Environmental Protection Act 1986 gives the Environmental Protection Authority statewide pollution control powers including control of water pollution. At present the Water Authority of Western Australia has delegated powers under the Environmental Protection Act 1986 to control pollution of surface and groundwaters of the Avon River.

The delegated powers involve the licensing of industry, pollution abatement, prosecution and the appointment of pollution control inspectors.

Industrial discharge to the river system is a potential problem. The powers discussed above include the control of industrial wastewaters discharged to the river system. Licences are required to discharge and conditions placed on the licences to control the volume and concentration of substances entering the river system. These licences must be kept up to date, conditions reviewed and monitoring of discharge points carried out to ensure compliance with conditions.

Should a river management body be established it would be appropriate if powers under the Environmental Protection Act 1986 be delegated to that body. A river management body would be concerned primarily with pollution control of surface water, a responsibility which it would share with the Water Authority of Western Australia. This should be in consultation with the Environmental Protection Authority.

Efficient pollution control depends on identifying all potential sources of pollution to the river system and their current management status. Surveys of all local government municipalities in the Avon River catchment to document the location and management of tips, town sewage treatment plants, stormwater, industry and the disposal of chemical containers etc. would provide an accurate register of all potential sources of pollution.

Recommendations

5. Minimise direct discharge of industrial wastewater to the river system by ensuring that industrial discharge licences are kept up to date, conditions reviewed and monitoring carried out to ensure compliance with licence conditions.(*RMB*,WAWA,EPA)

6. Delegate powers for pollution control under the Environmental Protection Act 1986 to the river management body.(*EPA*, RMB)

7. Develop an administrative arrangement between the river management body, Water Authority of Western Australia and Environmental Protection Authority to determine the lead agency for pollution control of surface waters.(*RMB*, WAWA, EPA)

8. Carry out surveys of all local government municipalities in the Avon River Catchment to determine all sources of pollution entering the river system.(*RMB*, LGAs, WAWA)

6.1.1.4 Emergency Procedures

Need for Action

Spillages of petrol, oil and hazardous chemicals into the river or drainage networks which lead into the river are a potential threat to the water quality of the river system. Road and rail networks which follow the river are major points at which these incidents may occur.

The control of petrol, oil and chemical spills involves several agencies. Poor communication may lead to delays in the treatment of spills and result in pollution of the river system which may otherwise have been avoided.

At present the procedure for managing spills of hazardous materials is defined in the 'Western Australian Hazardous Material Emergency Management Scheme' (WAHMEMS), produced by the Western Australian State Emergency Service. The scheme relies on the Police Department coordinating activities and communication and notifying the appropriate authorities to take action.

In the Avon Valley the Water Authority is the principle agency notified if a spillage occurs and pollution of the river system may result. It would be appropriate if any river management body established in the area take this role. The body should have responsibility for protecting the waterway from this type of incident and should prepare a contingency plan for the area which would operate as part of the WAHMEMS. The contingency plan would outline resources, staff equipment and step by step actions in case of an emergency.

Recommendations

9. Include any river management body established to coordinate management of the Avon River in the 'Western Australian Hazardous Materials Emergency Management Scheme' and give staff of that body responsibility for protecting the river system. (*WASES*, RMB)

10. Ensure that management agencies have adequate equipment and staff training to control oil and hazardous material spills

that may threaten the river system.(*RMB*, WAWA, WASES)

11. Develop a contingency plan for dealing with pollution of the river system from spills in the Avon River area. Update and modify this plan as required.(RMB, WASES)

6.1.2 River Processes

Three aspects of this issues are discussed below.

6.1.2.1 Pool Siltation

Need for Action

Siltation is a natural process occurring in any river. Major alterations to this process have occurred within the Avon River as a result of man made changes to the area. The Avon River which originally comprised a series of deep permanent pools separated by shallow sections, is today experiencing siltation of its valuable river pools.

Near total clearing of the catchment has substantially increased the concentration, and probably the volume of surface runoff from the catchment. Although no data is available on the silt loads entering the river system from the catchment, it is highly probable that clearing has contributed significantly to the accumulation of silt in the river bed (Hansen 1986).

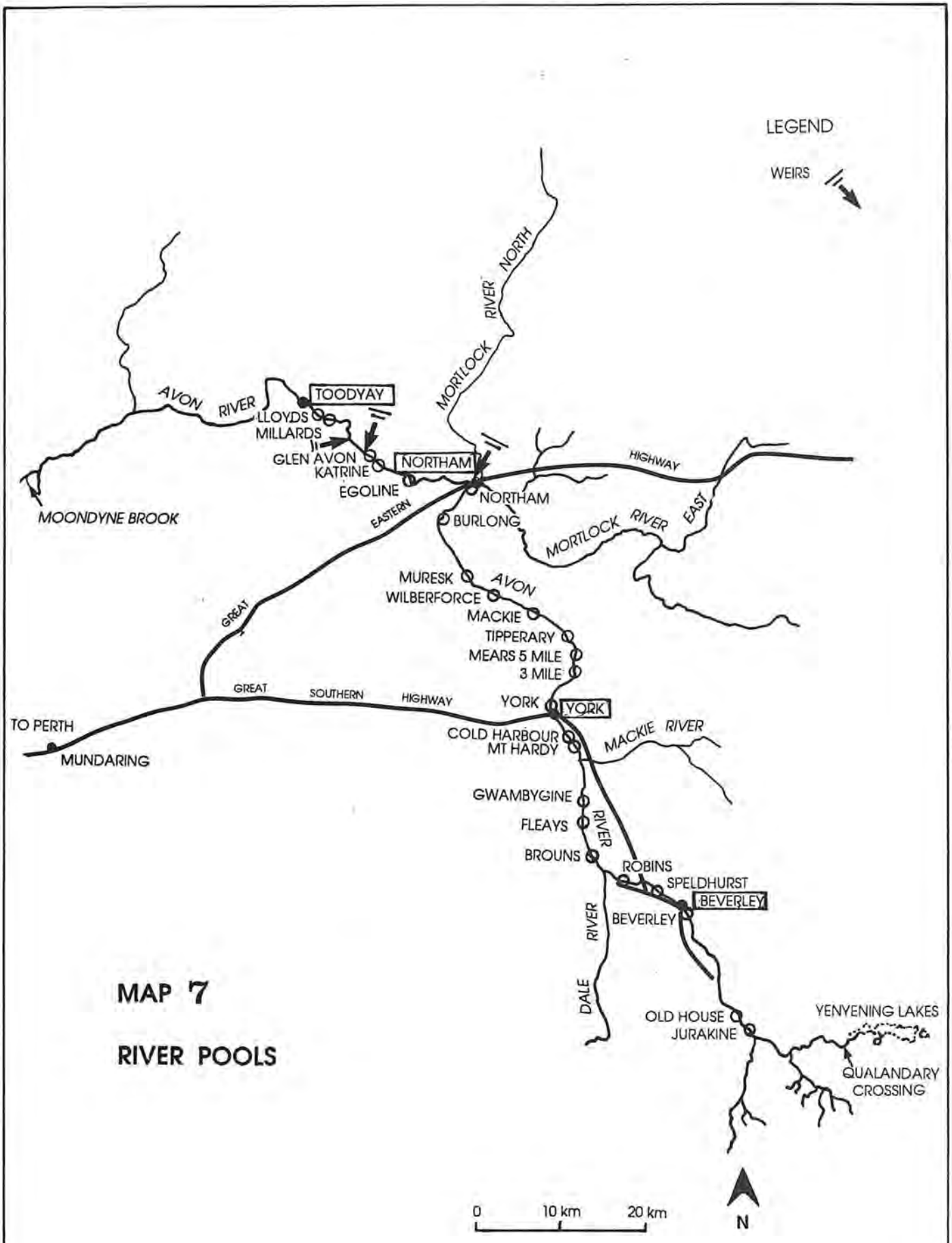
A second contributing factor to the siltation of the river pools has been the implementation of the River Training Scheme between 1956 and 1973. The scheme was carried out by the Public Works Department at the request of the local councils to alleviate the problem of flooding (see Section 2.4.1).

A recent studies on the sediment movements within the river in response to the clearing of the channel vegetation have been carried out. This study provides an understanding of how the river works and how it has been changed by the River Training Scheme. Further information is needed to properly understand the processes occurring within the river system and allow the development of planning measures to stabilise the river and prevent siltation of the remaining deep pools.

The study has also revealed the considerable amounts of information stored in past Public Works Department files which should be accessed and analysed to provide an better understanding of river processes.

The siltation of the river pools has upset the ecological balance of the river system. The pools provide the only permanent summer refuge and breeding area for waterfowl and water related fauna of the Avon River System. They also provide a valuable aesthetic and recreational resource for the area. Retention and rehabilitation of these river pools is of the utmost importance to the community of the Avon Valley.

The river pools of the Avon River are provide the only permanent summer refuge and breeding area for waterfowl and water related fauna


LEGEND
WEIRS
MORTLOCK RIVER NORTH
AVON RIVER
TOODYAY
LLOYDS
MILLARDS
GLEN AVON
KATRINE
EGOLINE
NORTHAM
HIGHWAY
NORTHAM
MOONDYNE BROOK
EASTERN
BURLONG
MORTLOCK RIVER EAST
MURESK
AVON
WILBERFORCE
MACKIE
TIPPERARY
MEARS 5 MILE
3 MILE
GREAT
GREAT SOUTHERN HIGHWAY
YORK
YORK
TO PERTH
COLD HARBOUR
MT HARDY
MACKIE RIVER
MUNDARING
GWAMBYGINE
FLEAYS
BROUNS
RIVER
ROBINS
SPELDHURST
BEVERLEY
BEVERLEY
RIVER
DALE
OLD HOUSE
JURAKINE
YENYENING LAKES
QUALANDARY
CROSSING
MAP 7
RIVER POOLS
0
10 km
20 km
N

Rehabilitation would involve regeneration of natural vegetation, revegetation if necessary and excavation of sediment from selected

pools.It is considered that establishment of vegetation upstream from river pools on the banks and within the channel may reduce the amount of silt accumulating in the pools (Hansen 1986). This idea should to be tested by establishing trial plots upstream of selected pools with monitoring of changes in pool depth and sediment transport rates to evaluate its success.

Rehabilitation of the natural vegetation along the river strongly conflicts with the needs of the community in towns along the Avon River who see flooding as a major disaster and something to be prevented and not increased. A balance however, may be possible in order to rehabilitate the river pools without a major increase in flooding. Advice on the impact of rehabilitation on flooding in the area should be obtained from the Water Authority of Western Australia prior to establishing trial plots.

Identifying suitable pool sites for rehabilitation will depend on a number of factors. Excavation can be an extremely costly and substantial justification will be required to undertake such an exercise. Local government authorities should determine the highest priority pools for excavation and or revegetation.This would depend on recreational use of the area, effect on flooding, support and cooperation of landowner and available funding.

Recommendations

12. Carry out further investigations into sediment transport and river hydrology to determine the behaviour of sediment within the river and silt loads from the catchment.(*RMB*, WAWA,WADA)

13. Collate and analyse information stored in Public Works Department files to gain a better understanding of river processes.(*RMB*, WAWA)

14. Carry out site assessment surveys of all river pools to determine the viability of rehabilitation and excavation in terms of:

    - their value to the community for aesthetic and recreational purposes
    - the support and cooperation of the landowner
    - available funding
    - effect of rehabilitation on flooding
    - support of local government

    Select pools for rehabilitation from this assessment. (*RMB*, LGAs, WAWA)

15. Develop regeneration and revegetation trial plots upstream of selected pools. Consult WAWA on effects of rehabilitation on flooding. Monitor pool depth and sediment transport rates to evaluate the success of rehabilitation techniques. (*RMB*, LGAs)

6.1.2.2 Weir Maintenance

Need for Action

Three stone weirs exist along the Avon River, namely Extracts Weir at Millard Pool, Glen Avon Weir near Katrine and Northam Town Weir in the centre of the Town of Northam. These weirs act as sediment traps to the large amounts of sediment being transported along the river. Section 6.1.2.1 provides further information regarding silt movement within the river.

Extracts Wier and Millard Pool near Toodyay

Two main problems have emerged regarding the weirs. Firstly, Northam Town Pool regularly requires ecavating to remove the massive amounts of sediment which build up behind the Northam Town Weir. The pool is a valuable asset to the Town of Northam and the community considers it of the utmost importance to continue excavation practices.

Secondly, Glen Avon and Extracts Weirs are in danger of failure due to erosion of the river bed downstream of the weirs. The loss of these weirs may result in the loss of Millard and Glen Avon Pools. It is considered by numerous members of the community that a major flood could cause failure of the weirs if ongoing maintenance is not carried out.

The weirs were originally maintained by the Public Works Department and since its cessation the Water Authority has been carrying out minor works to prevent their failure. The Water Authority, however, does not see this as its responsibility in the future. The Town of Northam has taken full responsibility for maintenance of the Northam Town Weir, however concern has arisen regarding responsibility for the Glen Avon and Extracts Weirs.

Any management body established to carry out management of the river should take responsibility for these types of river works in cooperation with local government. Funding and management responsibility for maintenance of the weirs is further discussed in Section 9. 3

The construction of further weirs to act as silt traps is not an economically viable solution to the problem of pool siltation. The annual cost of maintaining them and excavating silt from behind them soon becomes prohibitive. Even if it were not the case few sites exist that would not increase the potential for flooding.

Recommendations

16. Carry out environmental and engineering feasibility studies to determine the viability of excavating the Northam Town Pool. (*NTC*, WAWA, DMH, RMB)
17. Investigate action required to prevent further silting of the Northam Town Pool.(*NTC*, RMB, WAWA)
18. Carry out maintenance of the weirs along the river to ensure their stability and to ensure that the river pools are not lost through further erosion of the river bed and banks.(*RMB*, LGAs, WAWA)
19. Carry out geological surveys to locate the original bed rock of the river and hence determine the level to which the river bed may erode in the future. (RMB, LGAs, WAWA)

6.1.2.3 Erosion Control

Need for Action

Bank erosion has occurred at a number of sites along the Avon River. The areas of severe erosion coincide with the banks cleared of the most vegetation during the River Training Scheme. Other areas are beginning to erode as a result of stock damage and uncontrolled access to foreshore areas for recreational pursuits.

Investigations into bank stability should be carried out so that actions to prevent further erosion can be implemented. Investigations to identify those areas most prone to erosion would mean that priorities for rehabilitation can be set.

Erosion control methods may be required where erosion of the river banks has occurred or where future erosion is likely. Methods employed will depend on the causes and severity of the erosion.

Stabilisation of the river banks with natural vegetation is the preferable method of erosion control, however in some cases artificial bank stabilisation with rock and log walling may be necessary.

In areas of severe erosion it may also be necessary to restrict public access, restrict stock and limit boating activities or prohibit boating completely. The degree of control needed will vary from area to area.

Recommendations

20. Carry out investigations into the causes of erosion and undertake surveys to identify erosion prone areas along the river system to determine priorities for rehabilitation. Conduct rehabilitation trials to develop methods to stabilise erosion prone banks.(*RMB*, LGAs)
21. Develop an erosion control programme including:
    - restriction of stock in erosion prone areas
    - tree planting along banks
    - restriction of public access to erosion prone areas

River bank erosion is occuring along the Avon River as a consequence of the clearing of foreshore vegetation, the grazing of stock on river banks and uncontrolled public access

- provision of information to landowners on appropriate erosion control techniques

(*RMB*, LGAs)

22. Enter into agreements with landowners to carry out the erosion control programme.(*RMB*, LGA, LO)

6.1.3 Flora and Fauna

Four aspects of this issues are discussed below.

6.1.3.1 Foreshore Vegetation

Need for Action

Much of the land adjoining the Avon River has been cleared for agricultural purposes and in many locations only a single line of trees separates the river from the adjoining grasslands.

Foreshore vegetation along any waterway plays an important role in the natural functioning of the system. Fringing vegetation stabilises banks reducing the chances of erosion, provides wildlife habitats and traps nutrients and pollutants draining from surrounding land. Maintenance and enhancement of this valuable resource is essential to the survival of the river system.

In areas where foreshore vegetation is degraded the use of regeneration and revegetation techniques should be employed. Regeneration of the natural foreshore vegetation is preferable, however in areas where vegetation is severely degraded there may need to be replanting with local species.

Not all foreshore areas are appropriate for revegetation as the impact of flooding on surrounding land may be too great and the economic loss from flooding too large. Areas of the river suitable for re-establishment of vegetation should be selected and advice obtained from the Water Authority of Western Australia on the impacts on flooding. Flood management is discussed in more detail in Section 6.2.4.

As with pool rehabilitation, successful regeneration and revegetation depends on the support of the landowner. Management agreements should be made with landowners to enable continued farming practices while allowing tree and shrub regeneration. Agreements would involve fencing, restriction of stock and the employment of fire, weed and feral animal control methods. The issue of funding to carry out actions under agreement should also be addressed. Funding is discussed in detail in Section 9.6.

Also discussed in the section on pool rehabilitation was the use of trial plots for regeneration and revegetation. To date there has been little re-establishment of vegetation along the foreshores of the Avon River and trials to determine the most appropriate techniques and research into suitable techniques should be carried out.

Recommendations

23. Enter into agreements with local landowners to protect and allow regeneration of foreshore vegetation. These agreements would involve control of stock, fencing to allow regeneration and revegetation and control of fire, weeds and feral animals.(*LGAs*, RMB, LO)

24. Establish trial revegetation plots at appropriate points along the river and evaluate their success. Use these areas as demonstration sites.(*RMB*, LGAs)

25. Undertake research to determine the most appropriate techniques for foreshore revegetation.(*RMB*, WWC, CALM, LGAs)

26. Consult the Water Authority of Western Australia on the impact of revegetation on flooding.(*RMB*, WAWA)

27. Use local community groups and local land conservation district committees on a volunteer basis to carry out revegetation works. (*RMB*, LGAs, LCDC)

28. Seek funding for revegetation works from appropriate sources including the Road Side Conservation Committee, Greening Australia, Remnant Vegetation Protection Scheme etc.(*RMB*, LGAs)

29. Supply information to landowners to raise the level of awareness of the importance of retaining foreshore vegetation. (*RMB*, LGAs)

6.1.3.2 Conservation Reserves

Need for Action

Protection of the flora and fauna of the Avon River area can be enhanced by management of areas of conservation value as reserves. Reserve management plans may identify permitted uses and designate areas for specific purposes ranging from sensitive prohibited areas to recreational areas.

Areas which contain relatively intact remnant vegetation and provide habitats for native fauna should be considered for reservation and vested for the purposes of conservation, environmental protection or waterway management. When these areas have been identified and an assessment made of their conservation values and regional significance, recommendation for reservation under the Land Act can then be made and an appropriate vesting agency identified.

Reserves for the purpose of conservation are vested in the National Parks and Nature Conservation Authority and managed by the Department of Conservation and Land Management. Reserves for the purpose of environmental protection or waterway management may be vested in the local government authority or any other relevant agency. The Minister for Lands under the Land Act specifies the most appropriate agency for vesting.

The Department of Conservation and Land Management is obliged under the Conservation and Land Management Act to prepare and release for public comment management plans for all conservation reserves for which they are responsible. These management plans are required to be released for public comment and should be prepared in consultation with all agencies who have responsibilities along the river. The Minister for Lands may also require the preparation of a management plan for any other Land Act Reserve under Section 30A of the Land Act.

Agreements may also be entered into between agencies and landowners to manage private lands for specific purposes. This option may be appropriate where the cost of acquiring reserves is high and management can be achieved with the support of the landowner.

Recommendations

30. Identify areas of high conservation value and assess their regional significance. Recommend suitable areas for reservation under the Land Act and vest in the appropriate authority.(*CALM*, DOLA, RMB, LGAs)

31. Develop agreements between landowners and management agencies to manage areas of private land for specific purposes.(*LGAs*, RMB, CALM)

32. Prepare and release for public comment management plans for all areas reserved

for the purposes of conservation.(*CALM*, RMB)

33.Prepare management plans for other reserves in accordance with Section 30A of the Land Act 1933.(*DOLA*, RMB, LGAs)

6.1.3.3 Fire Management

Need for Action

Problems arise when attempting to protect indigenous flora and fauna, especially in highly developed agricultural areas, from the risk of fire. Uncontrolled fires represent a severe threat to both farmland and foreshore areas with the potential to destroy large areas of bushland and displace native animals.

Fire management plans should be prepared by local government in cooperation with the Bush Fires Board and landowners. Effective wild fire management would include the maintenance of low fuel zones and fire breaks, and the supply of information to landowners. Management plans should address these issues, identify responsibilities and determine management actions.

Recommendation

34.Develop a fire management plan to protect foreshore areas of the Avon River in cooperation with local government, the Bush Fires Board, and landowners. Incorporate management actions into agreements developed with landowners.(*RMB*, LGAs, BFB,LO)

6.1.3.4 Weeds and Feral Animals

Need for Action

Weeds are successful opportunistic plants which displace native species in a disturbed or semi-disturbed habitat. Introduced grasses which spread from adjacent farmlands are the major concern along the Avon River. Feral animals such as rabbits, cats and foxes also upset the natural ecological balance by destroying natural vegetation and competing for food with native species.

Management plans for the control of weeds and feral animals should be prepared by the Agricultural Protection Board in consultation with landowners, however the responsibility of carrying out recommended measures should remain with the landowner.Weed control methods should employ the use of physical and biological methods before any use of chemicals is considered. In severe cases low toxicity low residual herbicides may be necessary.

Recommendation

35.Develop an active weed and feral animal management programme for foreshore areas. Incorporate management actions into agreements developed with landowners. (*RMB*, APB, LGAs, LO)

6.1.4 Aboriginal and European Sites

Need for Action

There are a number of Aboriginal sites which are in close proximity or part of the Avon River itself. Waterways are often of mythological significance and this means that any direct impact on the Avon River or its tributaries is likely to be of concern to Aboriginal people. The river is also likely to be significant because of its use as a routeway across the Darling Scarp and wildlife and for other resources found along its banks.

All sites are protected by the Aboriginal Heritage Act 1972-1980 and should not be disturbed without the consent of the Minister for Aboriginal Affairs.

The Avon River has been a focus for European settlement since the early 1800s. A number of sites along the river are either listed or registered with the State's Register of Heritage Places or National Estate Register. These sites are protected under the Heritage of Western Australia Act 1990 or the Australian Heritage Commission Act 1975 respectively.Under the State legislation the Heritage Council of Western Australia provides advice to planning authorities on heritage values.

In processing development applications along the river, all impacts on the physical, biological and cultural environment should be considered including the impact of development on European and Aboriginal sites.

Information on Aboriginal sites is confidential and kept at the Aboriginal Sites Department

of the Western Australian Museum. By referring all development proposals and management actions to this department, disturbances to any places of Aboriginal heritage can be avoided.

Information on European sites is generally more easily accessible. However disturbance to cultural and historic sites can be minimised by referring all developments and management actions to the Heritage Council of Western Australia and recommending further sites of high value for listing on the the Register of Heritage Places or the National Estate Register.

Recommendations

36. Consult with the Department of Aboriginal Sites,WA Museum, to determine if proposed development or management actions concerning the Avon River and surrounds will have adverse impact on Aboriginal sites or heritage values.(*LGAs*, DPUD, EPA, RMB, WAM)

37. Identify and protect all European sites of cultural and historic significance by consulting the Heritage Council of Western Australia on all proposed developments and recommending for registration on the Western Australian Register of Heritage Places or the National Estate Register those sites of high cultural value.(*LGAs*, DPUD, EPA, RMB, HCWA)

38. Incorporate historic sites into planning considerations for recreation and tourist facilities. Develop historic attractions where educational information can be provided to raise public awareness of local history.(*LGAs*, RMB,WATC)

Disturbance to historic sites can be minimised by consultation with the Heritage Council of Western Australia

6.2 Land Use and Waterway Planning

6.2.1 Regional and Local Planning

Need for Action

Regional planning in Western Australia is coordinated by the Department of Planning and Urban Development. Local planning along the river is coordinated by the local government authorities within which the river flows. Four shires and one town council have planning authority for the river and its foreshores, namely the Shires of Toodyay, Northam, York and Beverley and the Town of Northam.

At present no regional plan exists for the Avon Region and so planning at a regional level is guided by the Department of Planning and Urban Development's Rural Land Use and Urban Development Policies. These policies apply to planning throughout the State and are not specific to the Avon River area. Local government authorities in country areas are encouraged to prepare town planning schemes and local rural strategies, however, there is no legal requirement to do so. In local authorities where there is pressure for change or development these documents are generally prepared as they provide the authority with more control over development.

To ensure consistency in planning along the river and its foreshores a regional plan should be prepared for the Avon Region by the Department of Planning and Urban Development in consultation with the local authorities in the area. Local government authorities should review any existing plans to be consistent with this regional plan and other plans prepared by local authorities in the region.

Local rural and urban land use planning can provide a mechanism to protect and enhance the river and foreshore environment. Town planning schemes, local rural strategies and local government policy are mechanisms through which the issue can be addressed. Planning considerations which should be addressed include:

- Restrictions on intensive agriculture in close proximity to the waterway.
- Location and design of sewage disposal systems.
- Location of industrial sites and control of discharge.
- Clearing of vegetation.
- Location of rubbish disposal sites including both individual farm and council sites.
- Use of fertilisers on gardens.
- Location and design of stormwater disposal systems.
- Water sensitive design for urban and special rural subdivisions.

Town planning schemes and local rural strategies may also include zoning of specific areas of the river and foreshores, whether in private or public ownership, which require special protection may be zoned for foreshore protection. Provisions can then be applied to these zones. Management provisions may cover vegetation protection, erosion control, aesthetics etc.

Guidelines for these planning considerations and suitable management provisions should be developed in consultation with local government authorities, Department of Planning and Urban Development, Waterways Commission, Environmental Protection Authority, Water Authority and Department of Agriculture. If distributed to all local government authorities along the river system, these guidelines should encourage coordination in addressing these issues through planning mechanisms.

Recommendations

39. Encourage local government authorities and Department of Planning and Urban Development to prepare regional plans for the Avon River System. (*RMB*, LGAs, DPUD)

40. Encourage local government authorities to prepare town planning schemes and local rural strategies which are consistent with DPUD's Rural Land Use Policy and any future regional plan. Refer all town planning schemes and rural strategies to the appropriate agencies for comment.(*DPUD*, LGAs, RMB)

41. Promote and encourage the consideration and integration of appropriate waterway and foreshore management issues in town planning schemes and local rural strategies and local government policy.(*RMB*, LGAs, DPUD)

42. Develop guidelines for the protection and enhancement of waterways in consultation with DPUD, EPA, WWC, WAWA, WADA and LGAs for consideration in local planning and management.(*RMB*, LGAs, DPUD, WWC, WAWA, WADA)

43. Zone all foreshore areas needing special protection as foreshore protection zones in town planning schemes and local rural strategies. Include management provisions for these areas to ensure the protection and enhancement of the waterway environment.(*LGAs*, RMB, DPUD)

6.2.2 Public Access

Need for Action

A major theme of river management planning is to ensure that a level of public access to foreshore areas compatible with the needs of the community is maintained. In any community people want to use the river environment for pleasure and recreation activities. This demand should be provided for in a way which is compatible with protection of the river and the rights of private landowners.

A large proportion of foreshore along the Avon River is in private ownership with titles extending to the centre of the river and restricting public access It would not be feasible to provide public access in these areas as landowners wish to maintain their right to private use of the land.

A balance must be reached by developing of access nodes along the river. Townsites are obvious locations for these nodes because of the concentration of population. Some sections of the river within townsites are already well equipped with barbeque and picnic facilities. These areas, however, need to be improved and further areas developed to provide for the increasing demand for public access.

Reserves and vacant Crown land along the river are potential access nodes, and suitable sites which could be developed with the provision of recreational facilities, walk trails and the like should be identified. Site identification should take into account protection of the natural environment and be compatible with private ownership and use of adjacent land. Care should also be taken to avoid environmentally sensitive areas. Public access may not be compatible with the protection of conservation areas unless carefully managed.

In some areas it may be appropriate to provide public access to privately owned land. This may occur where there are unique landscape features or vantage points for special river events. When reservation or acquisition of these areas is not feasible, management agreements with landowners may achieve the desired result. If subdivision of these areas occurs, reservation to provide for public access should be considered. The obtaining of foreshore reserves through the process of subdivision is discussed further in Section 6.2.3.

The provision of public access nodes minimises the impact of access on the natural environment and the rights of landowners

Recommendations

44. Carry out surveys to determine the level and type of public access required by the local and tourist communities. (*RMB*, LGAs, WATC, LO)

45. Identify suitable public access nodes and develop for these purposes. Consult authorities responsible for river management when identifying sites. (*LGAs*, RMB)

46. Restrict public access in environmentally sensitive areas. (*RMB*, LGAs)

47. Enter into agreements with landowners to provide public access to private land where appropriate. Agreements should protect the rights of the landowner and provide public liability cover.(*LGAs*, RMB, LO)

48. Acquire foreshore reserves at subdivision to provide for public access where necessary.(*DPUD*, LGAs, RMB)

6.2.3 Foreshore Ownership and Management

Need for Action

Foreshore areas along the Avon River contain land of varying status. A large majority of the land is in private ownership with titles extending across the river or to its centre. Vacant Crown land and reserves vested in specific authorities also exist. This variety of ownership causes problems when attempting to manage the river system as it results in inconsistencies in management.

There are three main problems. Firstly some privately owned land is mismanaged, secondly there is often no responsible management agency for vacant Crown land and thirdly the vesting authority for reserves may be inappropriate.

Privately owned land can be properly managed for the purposes of conservation and waterway and foreshore protection through management agreements and the zoning of land in town planning schemes for these purposes. It is the general view that the majority of landowners along the river are keen to see the river protected and their willingness to enter into agreement should be reasonably high. Management agreements would be between the relevant local government authority and the landowner.

Vacant Crown land should be assessed for its value in terms of conservation, foreshore and waterway protection and recreation. Authorities should be approached to take responsibility for the land and if in agreement land should be reserved and vested in that authority. Vacant Crown land which is not requested by any authority should be vested in the local government authority or the river management body. The authority then has the option of managing the land itself if funds are available or entering into a lease agreement with adjacent or nearby landowners. A lease agreement would involve the use of the land by the lessee landowner under management conditions outlined in the lease. Conditions should include the control of stock, protection of vegetation, erosion control etc.

Management of reserves along the river should also be assessed. Many reserves are inappropriately vested and hence mismanaged. A decision on the appropriate vesting of reserves should be made and the vesting changed if necessary. Change of vesting will depend on the willingness of the appropriate authority to take the vesting and the available funding for management.

Through the process of subdivision foreshore reserves can also be slowly obtained. Section 20 A of the Town Planning and Development Act provides for the resumption of land free of charge to the Crown at time of subdivision. For some areas of the Avon River this may not be appropriate as land may be better managed by the landowner through management agreement. In cases where there is significant public interest , however, an authority may request or be approached to take vesting of resumed land.

At the time of subdivision an assessment of foreshore reserves and their suitability for reservation should be made by the Department of Planning and Urban Development. Authorities concerned with the protection and enhancement of waterway and foreshore areas should be consulted at this time. The assessment should consider factors such as the nature of the area, the suitability for recreation, appropriate vesting and funding to manage the reserve.

Recommendations

49. Carry out a foreshore study to determine the current ownership and management of all foreshore areas along the Avon River.(*RMB*, LGAs)

50. Develop management agreements with local landholders of foreshore areas to ensure the adequate protection and management of the foreshores.(*RMB*, LGAs)

51. Identify all areas of vacant Crown land needing specific management actions and vest in a willing authority for the purposes of conservation, environmental protection or waterways management. (*RMB*, DOLA, LGAs)

52. Vest all other vacant Crown land in the local government authority. The authority should have the power to lease to adjacent or nearby landowners through lease agreements. (*DOLA*, RMB, LO)

53. Assess the necessity of resuming a foreshore reserve at subdivision under Section 20A of the Town Planning and Development Act. Consult with the relevant authorities.(*DPUD*, LGAs, RMB)

6.2.4 Flooding and Flood Plain Management

Need for Action

Flooding is a natural process of any river which occurs during periods of peak water flow. Historically the Avon River has experienced peak flow levels every 10 to 11 years. Past flood levels and changes in flooding since the implementation of the River Training Scheme are detailed in the Avon River Flood Study (Binnie & Partners 1985). This scheme is discussed in detail in Section 6.1.2.1

Flooding is an important part of the functioning of the Avon River System. Much of the vegetation along the river is dependant on regular flood waters and would not survive without them. Flood problems, however, have arisen as a result of settlement taking place in flood prone areas along the river. Much of the settlement within the major towns along the river lies directly in the path of flood waters. A balance needs to be found between the natural process of flooding and protecting property from flood damage.

The Water Authority of Western Australia is the agency best placed for flood control and flood plain management. At present the Authority carries out flood prediction, flood studies and plays a part in flood warning procedures. It also provides advice on flood plain management. The Water Authority is the only agency presently equipped with the resources and the expertise to carry out such a task. The Authority has no powers to control matters affecting the passage of flood waters or the flood plain, so its role is purely one of investigation and advice.

A Flood Study for the Avon River was completed for the Public Works Department in 1985 by Binnie and Partners Pty Ltd Consulting Engineers. The study concentrated on the four towns along the river, Toodyay, Northam, York and Beverley. Currently little documented information is available regarding the flooding characteristics of rural land along the river and the effect flooding may have on properties in these areas.

In order to predict flooding more accurately a comprehensive flood study for the whole of the Avon River is required. Information obtained in this study would allow the determination of actions required to reduce the effect of flooding on the natural and manmade environments.

Inappropriate development within the floodway can obstruct the passage of flood waters and as a result increase the risk of flooding in upstream areas. Permanent structures should be discouraged from the floodway to allow the natural flow of flood waters. The flood fringe, however, is considered appropriate for development if conditions are applied covering building heights, setbacks and effluent disposal. Filling of the flood plain is also inappropriate as it too may obstruct the natural passage of flood waters. Consideration of the ecological importance of flood plain areas must also be taken into account when filling is proposed.

The Water Authority of Western Australia advises on the impact of development along the river on flooding. Planning authorities including the Department of Planning and Urban Development and local government authorities, however, have the final decision making powers. Planning authorities should be encouraged to consult the Water Authority on all development along the river to determine its impact on flooding and hence protect the river system from inappropriate development.

Any measures to restore the river environment to its pre - river training conditions should take into account the impact on flooding. Rehabilitation of the river environment was discussed in Section 6.1.2.1. The scheme achieved its objective in reducing flood levels and restoration of the river may increase flood levels once more. To minimise the effect of flooding on populated areas it is appropriate to leave areas downstream of townsites along the river clear of vegetation to allow the rapid flow away of water. Advice on the impact of revegetation proposals should be sought from the Water Authority of Western Australia.

Recommendations

54. Regularly review flood studies carried out for the four towns Toodyay, Northam, York and Beverley.(*WAWA*)

55. Carry out flood studies for rural areas outside townsites. Identify 1 in 100 year flood levels, define the river's floodway and flood fringe and estimate the impact development may have on flood waters in these areas.(*WAWA*)

56. Prepare flood study maps including definition of floodway, flood fringe and flood plain for use by planning authorities

when assessing development proposals.(*WAWA*)

57.Prepare guidelines for planning authorities for consideration in planning and management of flood prone areas.(*WAWA*, DPUD, LGAs)

58.Refer all development proposals or management actions to the Water Authority of Western Australia for advice on the impact the proposals may have on flooding.(*LGAs*, DPUD, EPA, RMB, WAWA)

59.Discourage the construction of permanent buildings within the floodway and the filling of any area of the flood plain. Assess proposals for the building of weirs, bridges, crossings and the like for their potential effect on flooding. Apply special conditions to structures within the flood fringe as advised by the Water Authority.(*LGAs*, DPUD, EPA, RMB, WAWA)

60.Prepare an information booklet for landowners adjacent to the river to improve knowledge of the need for planning approvals for works along the river.(*RMB*, WAWA, LGAs)

61.Limit the activities within the floodway to recreation, agriculture and conservation.(*LGAs*, DPUD, RMB)

6.2.5 Urban Development

Need for Action

Urban development along the Avon River is concentrated in the four local centres of Toodyay, Northam, York and Beverley. These four towns provide essential services for the surrounding farming community.

Urban areas exert various pressures on the river and its foreshores. The concentration of people in any one locality can result in problems associated with lighting, noise, trampling, rubbish disposal, litter, domestic animals, exotic vegetation species and insecticides and other pollutants. These problems have the potential to affect the integrity of the river system.

Uniform development controls and the appropriate zoning and reservation of lands in town planning schemes can minimise the impact of development on the river system. Early consultation with authorities responsible for management of the river system during the preparation of town planning schemes will ensure adequate consideration of river issues.

Planning for urban development should focus on compatibility with the river environment. This will involve such factors as proximity to conservation areas, availability of river access and recreation areas, appropriate design and future maintenance of developments. Particular attention should be paid to nutrient input to the river system and the minimising of residential densities on land abutting the river.

Appropriate planning to address the suitability of higher density rural areas (special rural subdivisions) along the river is also extremely important. There is increasing demand for smaller lots along the river for hobby farming purposes, especially in the Shires of York and Toodyay. Subdivisions should be appropriately designed and sited away from environmentally sensitive areas.

Within an urban areathe inappropriate siting of rubbish disposal sites, sewage disposal facilities and public facilities such as public toilets may contribute to increases in nutrient load to the river system. Ensuring these services are located away from the river and are of suitable design can protect the river system.

Recommendations

62.Use local town planning schemes to plan for urban development which is compatible with the river system. Consult with authorities responsible for river management in preparing town planning schemes.(*LGAs*, DPUD, RMB)

63.Prepare overall concept plans for urban and special rural development adjacent to the river. Include these plans in town planning schemes and local rural strategies. Plans to include factors such as:

- protection of environmentally sensitive areas.
- identification of development nodes.
- provision of public access and recreation areas.
- retention of natural vegetation.
- minimising of residential densities abutting the river.
- use of water sensitive design.
- improvement of the quality of stormwater entering the river system.
- impact of flooding.

(*LGAs*, RMB, DPUD)

64.Assess all future development proposals with regard for the above factors.(LGAs, EPA, DPUD, RMB)

65.Design and locate services associated with urban development so that they will not impact on the river system.(*LGAs*, RMB)

6.2.6 Industrial Development

Need for Action

Industrial development is generally considered to be incompatible with the riverine environment. Discharge of industrial wastewaters to the river system can cause deterioration in water quality and threaten the ecological balance of the river ecosystem. Industry should be appropriately located and designed to minimise its impact on the river system. Mechanisms to minimise industrial discharge to the river are discussed in Section 6.1.1.3.

Appropriate zoning for industrial development can ensure the protection of the river system. Zones for future industrial development should be identified in regional plans and in local town planning schemes. Local government authorities should consult with WAWA, EPA and WWC when designating areas for industrial development. Attention should be paid to siting industrial development zones away from the river system and drainage networks. All future industrial development should also undergo adequate environmental assessment to ensure that environmental impacts are minimised.

Recommendations

66.Use town planning schemes to zone appropriate areas for future industrial development. Consult with agencies responsible for river management on suitable areas.(*LGAs*, DPUD, RMB)

67.Refer all proposed industrial developments along the river to the Environmental Protection Authority and other responsible agencies for environmental assessment.(*LGAs*, DPUD EPA, RMB)

68.Formulate guidelines for industrial development to minimise the potential impact on the river system.(*RMB*, WAWA, LGAs)

6.2.7 Landscape Protection

Need for Action

Foreshore environments contain a large variety of landscapes, both natural and man made. These landscapes are worthy of protection as they provide a visually attractive backdrop to the river and often contain places of historic, scientific or aesthetic interest.

The Avon River has a distinctive rural landscape which should as far as possible be retained. Any form of development along the river should harmonise with the landscape taking into account factors such as scale, height, colours and materials. The formulation of a policy or set of guidelines by local government authorities outlining acceptable standards and site criteria is one way of ensuring that development along the river is compatible with the landscape. Attention should also be paid to the protection of viewpoints to and from the river including roads, scenic drives and public recreation areas.

Many areas worthy of protection along the Avon River are in private ownership. A means to provide protection to such areas while avoiding the need for acquisition from public funds is the incorporation of landscape protection zones in town planning schemes. Local government authorities along the river should also be encouraged to prepare landscape plans for their localities which identify and protect valuable features of the landscape.

Recommendations

69.Formulate policies or guidelines outlining acceptable standards and site criteria to ensure that development along the river is compatible with the landscape. (*LGAs*, DPUD, RMB)

70.Include landscape protection zones in town planning schemes to protect landscape features on privately owned land. (*LGAs*, DPUD)

71.Develop landscape plans for river areas to protect unique features and the general character of the river landscape. (*RMB*,LGAs)

6.3 Recreation and Tourism

6.3.1 Recreational Use and Facilities

Need for Action

A variety of recreation activities are carried out in the Avon River area. The Avon River Community Workshops undertaken in November 1990 identified eight main activities. These are canoeing, bush walking, barbeque and picnics, bird watching, camping, duck shooting, swimming and educational activities such as nature walks and flora and fauna studies.

Recreational activities can exert pressure on the natural environment if not properly provided for or managed. Disturbances to the river bed and banks and flora and fauna may result if activities are allowed to take place in sensitive areas. Conflict may also arise between users where incompatible recreation activities are allowed to occur at the same place. Any recreational development or activity proposed for the river should be subject to environmental assessment.

Community opinion is divided on the desirability of further recreational and tourist access to the river environment. River landowners are naturally concerned about fire hazards, stock losses, rubbish and property damage. Local business on the other hand is keen to attract more people into the area whenever possible. Careful planning and coordination of recreation and tourist facilities and activities can minimise conflict between users, local landholders and the natural environment.

Recreational use of the few remaining river pools on the river can cause special problems. These pools provide valuable wildlife habitats and are essential to the breeding cycle of numerous waterbirds. The use of these pools for recreation may cause disturbance and hence threaten the survival of birdlife in the area. It has been suggested by a long term resident on the river, Jim Masters, that restrictions on recreational use should be placed on these pools especially during the summer months when the pools provide the only summer refuge for waterbirds in the area. An assessment of the impact of recreation on the conservation value of these pools should be undertaken and if necessary restrictions placed on timing and type of recreation use.

Recreational activities can exert pressure on the natural environment if not properly provided for or managed

In determining the most appropriate recreational activities and facilities for the Avon River and its foreshores it is important to recognise that the community has a variety of expectations regarding the waterway's capability to provide for their recreational needs. Planning must consider these expectations, provide suitable facilities and identify areas of the river where activities can occur with minimal disturbance to the natural environment. Changes in recreational use of the river in terms of numbers of users, activities being undertaken and areas being used should be regularly monitored. Monitoring should include surveys, observation of recreation activities and public consultation.

Recommendations

72. Encourage recreational activities and facilities which are compatible with the protection of the natural riverine environment and the legitimate rights and uses of adjacent landowners.(*RMB*, LGAs)

73. Ensure that recreational developments and activities in the riverine environment undergo adequate environmental assessment.(*RMB*, LGAs)

74. Carry out an assessment of the impact of recreation on the conservation value of the river pools along the river taking into account the type of activity and the time of year at which it occurs.(*RMB*,LGAs)

75. Monitor trends in recreational use of the riverine environment through survey, observation and consultation and ensure the provision of facilities for the needs of future generations.(*LGAs*, RMB)

6.3.2 Recreational Site Planning

Need for Action

Recreation activities may be compatible with some areas of the riverine environment but not with others. Sites should be identified where recreation activities can be undertaken and an appropriate level of facilities and management provided.

In order to minimise the impact on the natural environment, recreation activities should generally be directed into recreation nodes. Nodes should be sited in areas where the demand for recreational use is high, where the natural environment is capable of sustaining that use and where landowners' rights are not interfered with. These areas should provide facilities and activities for both the local and regional community. As people often wish to access the river environment for recreation reasons, these areas should correspond closely with access nodes discussed in Section 6.2.2

One major advantage of developing recreation nodes is that limited management resources can be concentrated in these areas instead of spread over a wider area. Management should involve the preparation of management plans and detailed works programmes to allow for development of the sites. Management plans should be referred to all agencies responsible for river management for comment and released for a public review period. To save on resources these management plans should be simple in nature containing a brief description of the area, identification of issues and recommendations for ongoing management and provision of facilities.

Recreational activities and facilities should be directed into recreation nodes

Recommendations

76.Identify recreational nodes where future recreation facilities can be provided with minimal disturbance to the natural environment.(*LGAs*,RMB)

77.Provide for a range of recreational activities for the local and regional community at these sites. Supply appropriate facilities and undertake appropriate management.(*LGAs*,RMB)

78.Develop management plans for recreation nodes in consultation with local government authorities, local landowners and other affected parties.(*RMB*, LGAs,LO)

79.Ensure that management plans for recreation nodes are released for public comment and referred to the appropriate authorities.(*RMB*,LGAs)

80.Prepare a brochure which identifies recreation areas and facilities and encourage the public to use those areas most suitable for particular activities.(*RMB*, LGAs)

6.3.3 Special Events

Need for Action

Special recreation events held on the Avon River involve mainly boat racing events. A great deal of concern exists about the impact these events may have on the river system and the need for proper management if they are to continue.

The environmental impacts of these events are usually a consequence of the spectator crowds which come to see them. People park alongside roads, clamber over fences and across paddocks, and climb down river banks to reach vantage points to view the events. The country is usually wet at this time of the year and damage to the river banks and fringing vegetation can occur. The Avon Descent for example, a canoe and power boat race from Northam to Bayswater, attracts hundreds of people to the area every year.

Other potential environmental impacts from the event include the impact of race craft on the river bank at launching and finishing sites, the potential for erosion of the banks from boatwash, disturbance of waterbird habitats, management of litter and potential pollution of the river water from oil spills.

The continuation of these events on the river is dependant on careful management and assessment of the impacts associated with the events. The Avon Descent is organised by the Northam Avon Descent Association which is obliged to refer the proposal for the race to the Environmental Protection Authority and the Swan River Trust for approval each year. Recently the EPA has required the preparation of a management plan by the organisers to address management issues. This mechanism, if properly prepared, will ensure that impacts of the event are minimised.

Provision of guidelines to organisers of such events will improve the quality of management provided. These should be prepared by all agencies who have an interest in such events on the river. This may include the Environmental Protection Authority, Swan River Trust, Department of Conservation and Land Management, Water Authority, local government authorities in the area and the WA Sports Dinghy Association.

An assessment should be made after such events. This would involve monitoring to ensure that organisers complied with conditions of approval and the requirement to carry out any repair work needed.

The WA Sports Dinghy Association is responsible for all power boat racing in the State and is an umbrella body for all river racing events. A strict set of rules to govern boat configuration, motor size, support crews and environmental issues has been set up by the association. It also prepares a plan of races each year to ensure races are not held in the same area. This mechanism should be continued as it represents a further control over special events which will reduce the impact on the environment. The association however should refer their set of rules to the relevant authorities for comment.

Recommendations

81.Ensure that special events on the river are adequately assessed for their environmental impact by referring to relevant management bodies for approval. (*RMB*, WASDA, LGAs, EPA)

82.Require organisers of events to prepare management plans to address all aspects of the event and identify means to minimise environmental impacts. Consult with all relevant authorities in preparation of the plans. (*EPA*, WASDA,RMB)

83. Prepare guidelines for the preparation of management plans for special events including all aspects of environmental impact, monitoring and the responsibilities of organisers. (*EPA*, WASDA, RMB, LGAs)

84. Support the establishment of rules by the WA Sports Dinghy Association to govern river racing events. Ensure that this set of rules is referred to the relevant authorities. (*RMB*, LGAs, WASDA)

6.3.4 Tourist Facilities and Activities

Need for Action

The Avon Valley is within easy reach of the Perth Metropolitan Area, making it an obvious tourist destination. Tourist facilities and activities that promote the lifestyle, local heritage and the natural environment of the area should be developed if the local community is to benefit from tourism. They must be compatibile with the riverine environment.

The majority of tourist attractions in the Avon Valley are centred around York and Toodyay and concentrate on the local heritage of the area. The Avon Ascent, however, is one initiative presently being developed which incorporates a landcare educational package with local heritage and appreciation of the natural environment. The project is being developed by Alcoa in conjunction with local government authorities. This type of tourist development should be supported because not only is it of financial benefit to the local community by bringing tourists to the area but it also raises public awareness of the natural environment.

Often the local communities think that tourist facilities and activities reduce their ability to use local resources. Wherever possible tourist facilities and activities should cater for both the local and tourist community.

In order to coordinate tourist facilities and activities along the Avon River it is essential to take a regional approach and make a detailed assessment of what exists in the area and what is required. The Tourism Commission should prepare a tourism development plan for this region which would address the question of tourism objectives for the river environment. Such a plan would be useful in river management and all relevant agencies should have input at early stages of preparation.

Recommendations

85. Support tourist developments which are compatible with the riverine environment and promote awareness of the natural environment. (*WATC*, LGAs, RMB)

86. Ensure that tourist facilities and activities cater for the local and regional communities. (*WATC*, LGAs, RMB)

87. Develop a tourism plan for the Avon River Region and consult all relevant authorities and local landowners in its preparation.(*WATC*, LGAs, RMB, LO)

88. Ensure that all tourist developments undergo adequate environmental assessment. (*LGAs*, RMB, WATC, EPA)

Tourist facilities should be planning to raise public awareness of the natural environment

Clearing of large areas of the Avon River Basin for agriculture has been a major contributor to land degradtion problems

CHAPTER 7: CATCHMENT MANAGEMENT

7.0 Introduction

Land management issues in the Avon River Basin impact heavily and continuously on the river system. Many require urgent attention for the protection of both the river and the catchment.

This Management Strategy is not designed to solve the land management problems of the Avon River Basin. It addresses issues in the catchment as far as they affect the river and develops links between catchment management actions and river management actions. It also suggests mechanisms through which effective catchment management can be carried out.

Land management problems in the Avon River Basin are a consequence of the land use practices in combination with the natural characteristics of soils, landforms, climatic conditions and drainage. The predominant land use in the area is agriculture. Conservation, drainage and recreation are other major uses of the catchment. Characteristics of the river basin and the land uses mentioned were discussed in Chapter 2.

The purpose of this chapter is to identify the land management problems facing the Avon River Basin and highlight how these issues may impact on the river system. The chapter does not make specific recommendations for solutions to land management problems. It does however identify the need for coordinated planning within the river basin to address these problems.

In many cases the problems experienced in the catchment are similar to those experienced along the river which were discussed in Chapter 6, Foreshore and Waterway Management.

7.1 The Issues

The land management issues facing the Avon River Basin are briefly described below. Catchment management is discussed in Sections 7.2 and 7.3.

7.1.1 Agriculture

Agricultural production is of great importance to communities in the Avon River Basin but problems of land degradation are decreasing productivity and in some cases greatly restricting the continuation of traditional agricultural pursuits.

The continuation of the agricultural land use depends on land conservation. Changes in land management practices are required to make agricultural production compatible with land conservation. Recently some inovative changes have been introduced.

The land management problems experienced in the river basin differ from area to area. In the drier eastern parts of the river basin the predominant issues facing the land are salination and wind erosion. To the west issues such as waterlogging and water erosion are more prominent.

7.1.1.1 Dryland Salinity

Clearing of large areas of the the river basin for agriculture has caused the salination of areas of productive land throughout the river basin.

It is estimated by the Western Australia Department of Agriculture that in the three advisory districts of Northam, Merredin and Lake Grace, 155 107 ha of previously productive land is now salt affected. The most severely affected areas are within the Shires of Goomalling, Tammin and Dowerin having 9.26, 7.93 and 7.06 % respectively of their arable land affected (SCLC 1990).

The Western Australian Department of Agriculture considers the solutions to salinity problems lie in addressing the landscape water balance. This involves consideration of groundwater recharge and discharge areas. The Department is developing a number of strategies for these areas which include integration of vegetation, drainage and agricultural practices (SCLC 1990).

Control of Saline Water Flow

The incidence of dryland salinity has a dramatic effect on the salinity of lakes and tributaries in the River Basin and ultimately the Avon River (see also Section 6.1.1).

Inundation of land by saline water in close proximity to lake systems often occurs as a result of a rise in the water table in the area causing the lake to flow out onto surrounding land. It may also occur as a consequence of the employment of man made barriers at the outlet of lake systems put in place to retain

the lake level at its highest for recreational activities such as water skiing.

Through inundation the surrounding land often suffers dramatically and productivity is greatly reduced. Solving this problem may only require the employment of land conservation techniques to lower the water table but in some instances a balance will need to be reached between the need for recreational facilities and the rights of the adjacent landowner. This issue is further discussed in Section 7.14 .

The contribution of the inland salt affected areas to salinity levels in the Avon River depends on the level of saline water flow entering the river from the surrounding catchment areas. Water from these catchment areas is known to flow through the Yenyening Lakes to enter the Avon River at Qualandary Crossing.

The issue of saline water flow through the Yenyening Lakes and its effect on the Avon River has been considered by the Yenyening Working Group. This group is a made up of technical officers from a number of government departments with expertise in the area. The aim is to make recommendations on appropriate management. At present the flow of saline water from the lakes system is controlled via a flood gate at the lake's outlet. The Yenyening Working Group will make recommendations on the most appropriate operation of these gates.

Recommendations

89. Review the recommendations of the Yenyening Working Group for control of saline water flow from the Yenyening Lake system into the Avon River (*RMB*, YLWG, WAWA).

90. Ensure that management actions for Yenyening Lakes are implemented and carefully monitored for their effectiveness. Monitoring should include changes in salinity levels within the river and their impact on the flora and fauna of the river system (*RMB*, YLWG, WAWA).

91. Ensure that appropriate land management initiatives to combat dryland salinity are employed and continuing study on these matters carried out to reduce the levels of salt being transported to the Avon River and its tributaries (WADA, LCDCs, CGs, RMB).

The flow of saline water from Yenyening Lakes into the Avon River is presently controlled by flood gates

7.1.1.2 Water Erosion

Land clearing for agricultural purposes and the employment of inappropriate tillage practices have increased the rate of topsoil loss due to rainfall runoff (water erosion) within the Avon River Basin.

The productivity of affected land is dramatically reduced by water erosion because the thin layer of fertile soil capable of supporting crop and pasture is lost. The

western part of the Avon River Basin is more susceptible to water erosion as it has sloping loamy soils and a higher rainfall. The most severe forms of erosion are known to occur during infrequent intense rainfall events (SCLC 1990).

Three types of water erosion are evident in the Avon River Basin namely sheet, rill and gully erosion. The extent of sheet and rill erosion is hard to estimate as it is easily disguised by cultivation for crop and pasture. Gully erosion, however, is highly visible and permanent and is most common on landscapes with slopes >2%. Solutions to water erosion problems as considered by the Department of Agriculture include a combination of modified tillage methods, contour farming and the use of earthworks (SCLC 1990).

Priority areas for erosion control should be selected

Sediment Loads

Increased water erosion of agricultural land also affects the Avon River and its tributaries. Heavy rainfall events causing soil erosion in cultivated paddocks can wash large amounts of sediment into the waterways. This increased silt movement within the river system may be partly responsible for the silting of the valuable Avon River pools (see also Section 6.1.2.1).

The amount of silt from agricultural lands entering the river system is at present unknown. The levels of silt entering the river from different catchment areas should be carefully monitored to determine the contribution silt from the catchment is having on siltation of the river pools and to select areas for erosion control.

Recommendations

92. Monitor sediment loads entering the Avon River and its tributaries from different catchment areas within the Avon River Basin (*WADA*, RMB, WAWA).

93. Establish areas of priority for erosion control according to sediment loadings (*WADA*, RMB, WAWA).

7.1.1.3 Wind Erosion

Wind erosion is the removal of topsoil by wind from bare soil surfaces. Resulting from this is a reduction in topsoil fertility and a loss of vegetation through sand blasting and inundation. Sandy soils of the river basin are naturally prone to wind erosion. These soils are more dominant in the eastern parts of the river basin.

The incidence of wind erosion is highly dependant on climatic factors and land management practices. Solutions include adopting appropriate grazing management, modifying tillage and other agricultural practices, farming to soil type and revegetation to create windbreaks (SCLC 1990).

Wind erosion on agricultural land can also increase the silt loads of the Avon River and its tributaries. By introducing appropriate control measures, the impact of wind erosion on the river and its tributaries will be reduced.

7.1.1.4 Waterlogging

Waterlogging is occurring within the Avon River Basin as the continued clearing of upland areas and modern agricultural practices reduce water infiltration. In the Avon River Basin waterlogging is most severe in areas where rainfall levels are between 400 mm and 600 mm (SCLC 1990). This area is indicated on Map 2).

Waterlogging exacerbates other forms of land degradation such as salinity, soil structure decline and water erosion. Solutions include protection of remnant vegetation, revegetation strategies and modification to agricultural practices.

7.1.1.5 Water Repellance

Water repellant soils have the potential to develop on most classes of sandy soils in the Avon River Basin. These soils can be defined as those which resist wetting when dry. Water repellant soils develop when a high level of organic matter exists which coats sand particles with water repellant plant residues. The problem is most severe in the eastern parts of the river basin (SCLC 1990).

The problem of water repellance is becoming increasingly evident where legumes in cropping rotations are resulting in the accumulation of large amounts of organic matter in the soil. Its effect on farm productivity is significant as it greatly reduces the even distribution of surface water essential for crop and pasture germination.

Water repellance is also a significant contributor to various other forms of land degradation. Surface runoff is significantly increased by water repellant soils hence increasing the chance of water erosion. Runoff from water repellant areas can also contribute to waterlogging in down slope areas.

The Department of Agriculture considers that there are no economically feasible methods currently available to overcome the problem of water repellancy. Control methods that can be utilised do however include the use of effective soil wetting agents, cultivation in the rain and deep ploughing and furrow seeding. Further research is required to find an economically feasible alternative (SCLC 1990).

7.1.1.6 Soil Degradation

Soil degradation includes a number of problems, soil acidification, soil structure decline and subsoil compaction.

Soil acidification is the process whereby soils become increasingly acid over an extremely long period of time. The Avon River Basin has a high frequency of topsoil acidification which reflects agriculturally induced soil acidification. A portion of these soils are becoming too acid for good growth of wheat and sub-clover and wheat-lupin systems (SCLC 1990). Topsoil acidification can be economically treated with lime or gypsum applied to the soil surface. There is however a lack of information on the appropriate frequency and timing of application.

Soil structure decline is the loss of the physical properties of the soil, particularly surface soils. It can result in a reduction in rainfall infiltration, restrict crop emergence and reduce plant growth. Soil structure decline results from land clearing, mechanical disturbance of agricultural soils due to continued cultivation and loss of organic matter in the soil.

It is very difficult to estimate the area affected by soil structure decline due to the invisible nature of the problem. Solutions to reverse soil structure decline involve a combination of modification to agronomic practices, incorporation of gypsum into the soil and vegetation strategies (SCLC 1990).

Subsoil compaction refers to the development of a compaction pan within subsoils which can seriously affect plant growth. This problem tends to develop on sandplains in the eastern areas of the river basin. Although this problem can not be eliminated altogether, the rate at which it develops can be minimised by a reduction in the frequency and weight of farm machinery travelling over soils (SCLC 1990).

7.1.2 Drainage

The Avon River Basin is a natural drainage system which contains lakes, tributaries, and drainage lines (see Section 2.2.3). Issues of concern have arisen regarding pollution of this drainage network, flooding of the townsites within the catchment and the general management of these parts of the catchment.

The drainage function of the river basin is essential to the agricultural land use in that it removes water from the land which would otherwise hinder the activities on the land. In many areas farmers depend on this drainage network for stock water and therefore maintenance of a high standard of water quality is essential.

7.1.2.1 Pollution

Pollution of the drainage system within the river basin may come from a number of different sources. Nutrient enrichment of the tributaries and lakes may result from fertiliser use on agricultural lands, the undertaking of high effluent output agricultural activities such as piggeries, sewage and stormwater drainage from town sites and the inappropriate siting of rubbish disposal sites.

Nutrient enrichment of the drainage system within the Avon River Basin ultimately affects the water quality of the Avon River causing algal blooms within the river pools. Farmers say that farm dams, lakes and tributaries suffer from similar problems. Section 6.1.1 discusses nutrient enrichment further.

Management actions to reduce nutrient sources in urban areas are outlined in Section 6.2.5. They should also be applied to areas in the river basin. Combined with a modified approach to fertiliser use and management of high effluent agricultural activities within the catchment they should reduce pollution. Management actions must address type, rate and timing of fertiliser application and test soil to in determine the amount of fertiliser required for particular soils.

Industry is also a considerable source of pollution within the catchment. Industry located within the river basin is associated with the agricultural land use and includes abattoirs, tanneries and flour mills. These industries should be carefully monitored for their impact on the drainage system and ultimately the Avon River. Management actions to deal with the impact of industrial development are outlined in Section 6.2.6.

The use of agricultural pesticides in the river basin also poses a threat to the water quality of the drainage network. At present little is known regarding the levels of organochlorines and organophosphates within the drainage system. Monitoring should be undertaken to identify changes in levels of these chemicals in response to changes in land use and the use of pesticides.

Recommendations

94. Monitor levels of nutrients, pesticides and other pollutants entering the Avon River from different catchment areas within the Avon River Basin. (*RMB*, WADA, ROB)

95. Identify sources of pollution within the Avon River Basin and apply appropriate waterway and foreshore management techniques (*RMB*, LGAs, LCDCs, WADA).

96. Improve fertiliser management practices with regard to type, rate and timing of fertiliser application. (*WADA*, LGAs, LCDCs, RMB)

7.1.2.2 Flooding

Localised flooding in the river basin was documented in Binnie and Partners. Flooding tends to be irregular and a result of intense rainfall events. In February 1978 a thunderstorm of six hours duration falling on an already wet catchment caused extensive flooding and considerable damage. This flood affected an area extending west to east from Kellerberrin to Southern Cross and north to south from Mukinbudin to Hyden (Binnie and Partners 1985).

Management of these events is extremely difficult. Flood plain management in inland areas which are relatively flat and have poorly defined drainage lines is almost impossible. Where defined flood plains do exist the principles discussed in Section 6.2.4 for flood plain management of the Avon River should be applied. Flood prediction techniques and flood warning procedure should also be used to minimise the damage to property and townsites.

A major solution to the problem of flooding within the Avon River Basin can also be found in changes to soil conservation techniques. It is estimated that clearing of the river basin has increased runoff from the land by a factor of between 2 and 30 (Binnie and Partners 1985). Soil conservation techniques to increase infiltration of rainfall where it falls would help reduce runoff and therefore reduce the effects of flooding.

Given the correct set of circumstances the potential exists for inland salt affected areas to produce large volumes of water which could

contribute to flooding of the Avon River. Water from these areas flows through the Yenyening Lakes System and into the Avon River on average once every five years. These years do, however, tend to occur consecutively and then dry up for a drought period (Hansen 1986).

The Dale and Mortlock catchments together with the Upper Avon between Brookton and Corrigin are considered to be dominant sources for flood flow to the Avon Valley. These rivers flow in most winters and contribute large amounts of water to the Avon on a year to year basis. Retaining rainfall on the land through soil conservation techniques is especially important in these areas.

Recommendations

97. Monitor changes in water flow rates entering the Avon River and its tributaries from different catchment areas within the Avon River Basin.(*WAWA*, RMB)

98. Apply appropriate land conservation techniques in catchment areas to increase infiltration of rain where it falls and hence reduce the rate of water discharge into the Avon River and its tributaries.(*WADA*, LCDCs, CGs)

7.1.2.3 Lakes and Tributaries

A large number of lakes exist in the Avon River Basin and most of them are hypersaline. Their increasing level of salinity is causing the death of the vegetation that surrounds them and salt encroachment of surrounding lands (see also Section 7.1.1.1).

The Yenyening Lakes System for example has suffered from large amounts of saline water entering from eastern parts of the river basin. This has resulted in the degradation of nearly all fringing vegetation and the diminishing of the lakes' value as a wildlife habitat.

Within the Avon River Basin there are a number of major and minor tributaries of the Avon River. These are found predominantly in the western part of the river basin and include the Mortlocks, Dale, Spencers Brook and Spice Brook (see Section 2.2.3).

Management of these parts of the river system should be included in catchment management initiatives undertaken. The degree of managment required for these tributaries will depend on the problems they encounter. Appropriate management of agricultural land along these tributaries will of course have a significant effect on the quality of the water of these tributaries and ultimately the Avon River. Land use changes along these rivers should be carefully assessed for their impact on the river system.

Recommendations

99. Identify problems associated with lakes and tributaries within the Avon River Basin and apply appropriate catchment management techniques. (*LCDCs*, CGs, RMB)

The death of fringing vegetation from high salinity is reducing the value of Yenyening Lakes as a wildlife habitat

7.1.3 Conservation

Conservation of the natural ecosystems within the Avon River Basin not only serves to preserve the conservation values of the basin for future generations but also plays a large role in conserving the soil and land that support the agricultural land use.

7.1.3.1 Decline of Remnant Vegetation

The decline of native vegetation occurs directly through clearing for agricultural purposes and indirectly through poor land management techniques and grazing. In both cases small areas of uncleared vegetation remain in a cleared landscape

There is a definite lack of native vegetation throughout the River Basin. The problem is somewhat less severe in newer farming areas where clearing for agriculture has occurred in the last 30 years in a more coordinated manner. Nature Reserves tended to be set aside throughout the agricultural areas to maintain vegetation. This is demonstrated in a comparison between the recently developed Shire of Lake Grace and the older agricultural areas of Pingelly and Tammin. In 1984 the Shire of Lake Grace had retained approximately 31% of its native vegetation and in contrast the Shires of Pingelly and Tammin had only 14% and 7% respectively (SCLC 1990).

Maintenance of remnant vegetation is of high priority in the Avon River Basin not only because of its conservation values but also because it is linked with solutions to other land degradation problems. One major objective of the land conservation district committees is to ensure that native vegetation is conserved. The Department of Agriculture is also mapping the location of remnant vegetation and recording the information on the Geographic Information System. This information can be used to target high priority areas for revegetation.

Conservation of remnant vegetation is proving a difficult task because of the varying status of land on which it exists. Some areas are Nature Reserves managed by the Department of Conservation and Land Management, however the majority is found on private land. In protecting remnants on private land the cooperation of the landowners is required. The Remnant Vegetation Scheme was developed by the State Government in 1988 as a means of encouraging landowners to protect and manage areas of remnant native vegetation. The scheme provides a subsidy for the protective fencing of such areas and the additional provision of management advice.

Land clearing is currently controlled under the Soil and Land Conservation Act through the requirement of all land users to give notice to the Commissioner for Soil Conservation of their intent to clear land. If local soil and landscape features are adequately assessed this mechanism should protect remnant vegetation not only for conservation purposes but also for preventing land degradation problems.

Problems are also encountered when protecting native vegetation from feral animals, weeds, pests and fire. Management practices to deal with these problems were discussed in Sections 6.1.3.4 and 6.1.3.5. These should apply throughout the Avon River Basin.

7.1.3.2 Conservation Areas

Conservation areas in the Avon River Basin are outlined in the Conservation Through Reserves Committee's System 4 Recommendations (1974). There are some 600 Nature Reserves representing 6.7 % of the area of the system, a relatively small percentage in comparison to the vast areas of cleared agricultural land (SCLC 1990). The existing conservation reserves in the Avon River Basin are inadequate both in terms of their ecological viability and in terms of conserving and representing the range of vegetation systems within the river basin. With a few exceptions, the reserves within the basin fall into the category of remnant vegetation in that the pattern of land clearing rather than ecological criteria has determined their location.

It is unlikely that the system of reserves in the Avon River Basin will be extended because most land is already cleared and in private ownership. For this reason when reestablishing native vegetation for soil conservation purposes, these areas should be linked with existing reserves to provide a corridor of native vegetation for native fauna.

7.1.4 Recreation and Tourism

The many lakes located in the Avon River Basin are the main focus for recreational activities such as water skiing, boating, picnicking and barbecuing. Most other recreational activity occurs within townsites.

Facilities for recreational and tourist activities should be provided to meet the demands of the local community and visitors. Management of recreation and tourism within the river basin should follow the principles discussed in Section 6.3 for the waterway and foreshore environment.

Reestablishment of native vegetation for soil conservation purposes is occurring throughout the Avon River Basin. This should be linked with existing reserves to provide corridors for native fauna

The issue of compatibility of recreational activity with the lake systems is becoming more and more controversial. Water skiing activities require the maintenance of high lake levels which conflict with the interests of adjacent landowners. Section 7.1.1.1 discusses problems which may arise as a result of high lake levels. A balance must be reached between the rights of the landowners and the rights of the water skiiers.

Resolution of these conflicts should be left to the local government authority in the area which is responsible for the provision of recreational facilities. Situations will obviously differ depending on the use of the lake as a recreational resource and the degree of impact that the recreational activity has

on the adjacent land use. The local government authority should approach the relevant authorities for advice. In some cases resumption of the land may be necessary.

7.2 Catchment Planning

The range of issues discussed above illustrates the complex and integrated nature of the tasks of catchment management. Addressing the issues of catchment management and finding appropriate solutions involves a coordinated planning approach and the cooperation of all parties involved.

In the Avon River Basin the Department of Agriculture is encouraging the development of local catchment groups. The function of these groups is to prepare local catchment management plans for their defined local catchment. These plans would establish interconnections between different land degradation problems and find appropriate solutions on a catchment basis. Farm plans to identify actions required on farms would be developed for individual farms.

Catchment management planning should also be carried out on a whole catchment basis. The development of a regional catchment plan for each of the three catchments of Avon, Yilgarn and Lochardt would be desirable. A mechanism to facilitate the preparation of these plans is further discussed in Chapters 8 and 9.

Regional catchment management plans should identify all the resources, expertise and constraints of catchment management within a technical, social and economic framework. They should also take into account the needs and wants of the community and the land users. Development of the plans should be a community based project involving land conservation district committees, catchment groups and other relevant interest groups.

As the major agency responsible for assisting in the formulation of catchment plans the Department of Agriculture should continue to provide advice to catchment groups for this

purpose. Adequate staffing and resources is also required.

At present very little assistance is being provided from other government agencies to the formulation of catchment plans. Catchment groups and land conservation district committees should be informed of the roles of other government agencies and how they can be of assistance.

Recommendations

100.Encourage the development of catchment plans at a local and regional level to coordinate catchment management planning in the Avon River Basin.(*WADA*, CGs,LCDCs)

101.Ensure that catchment management plans consider all issues affecting the catchment including land and soil degradation, conservation, drainage and recreation.(*WADA*, CGs, LCDCs)

102.Involve the community, local government authorities and other affected parties in the development of catchment management plans.(*CGs*, LCDCs, WADA)

103.Ensure that the Department of Agriculture continues to support and provide technical advice to land conservation district committees and catchment groups. Ensure that adequate staffing and finances are provided for this task.(*SLCC*, WADA, LCDCs, CGs)

104.Encourage government agencies other than the Department of Agriculture to provide information towards the formulation of catchment management plans. Provide an information package for land conservation district committees and catchment groups to inform them of the role of these agencies in catchment planning and what assistance they can offer.(*WADA*, RMB)

105.Prepare guidelines for catchment groups and land conservation district committees to aid in the preparation of catchment management plans. Consult with agencies responsible for catchment and waterway management when developing these guidelines. (*WADA*, RMB)

7.3 Linking the Catchment with the Waterway

It has been identified that many of the problems facing catchment management in theAvon River Basin have a large impact on the river environment.

To ensure the health of the Avon River planning and management of the river should not occur in isolation from what is happening in the catchment. A clear link should therefore be developed between the two areas of management.

The agency responsible for overall management of the river should be required to have formal linking arrangements with the catchment groups and land conservation district committees. These arrangements could include formal representation, joint operational roles and common policies and plans. These formal arrangements are further discussed in Chapters 8 and 9.

Coordination of catchment management planning also should be linked with waterway planning through the preparation of a whole river basin plan.

This plan would be prepared by the agency responsible for overall river management in combination with agencies involved in catchment management. The plan would integrate the activities of both groups to provide a blueprint for management of the river basin.

Figure 2 outlines the different levels of planning proposed for the catchment (see also Section 7.2). It should be noted that these plans would become broader and less specific from the farm plans through to the whole river basin plan. The preparation process would begin with the farm plans and work through to the whole river basin plan.

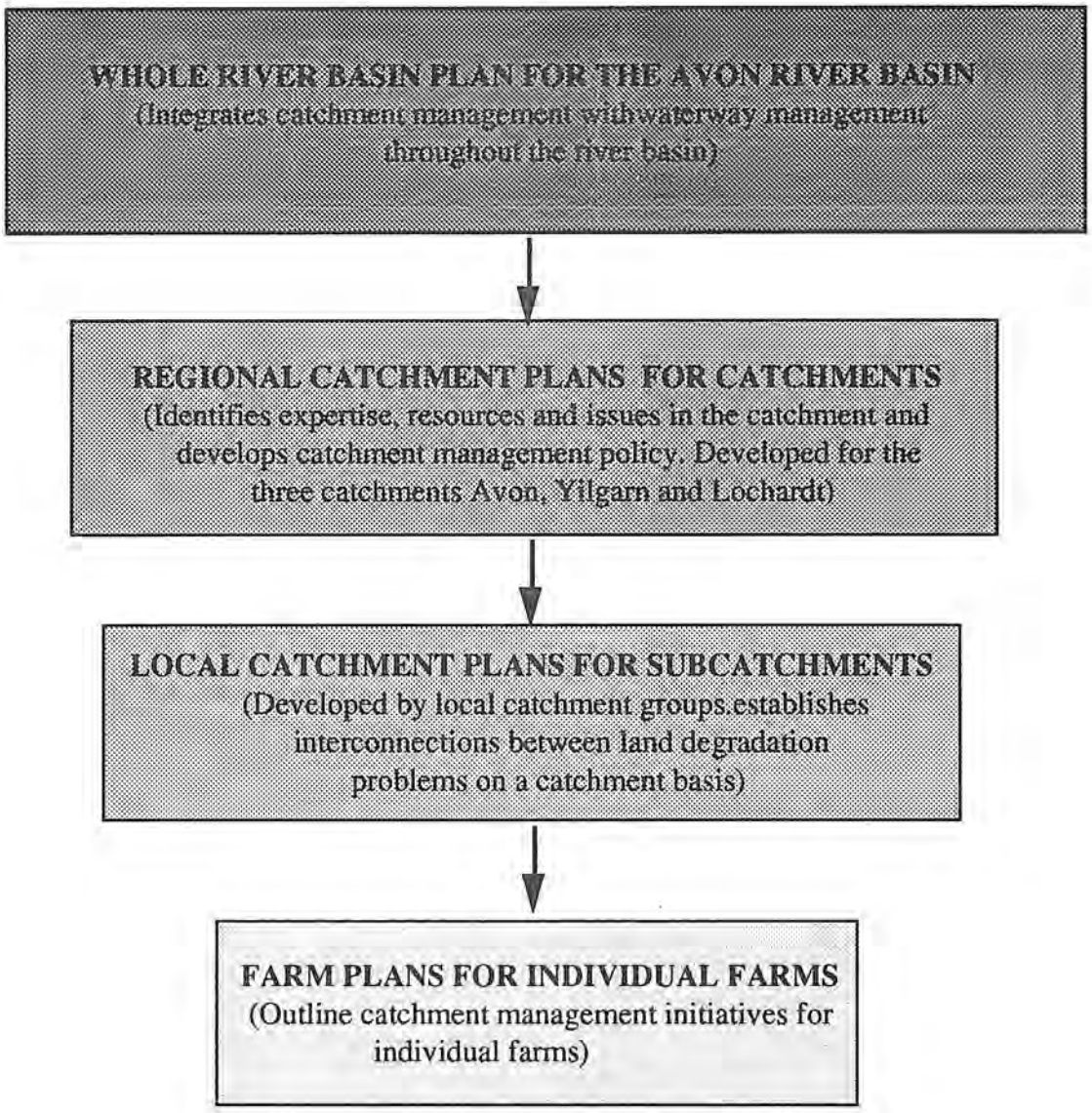
Recommendations

106.Encourage the development of a mechanism through which catchment groups and land conservation district committees can interact with waterways management agencies (RMB, WADA, LCDCs, CG).

107.Ensure that the mechanism facilitates effective communication, development of common policy and implementation of joint tasks. (*RMB*, WADA, LCDCs, CGs)

108.Prepare a whole river basin plan to link catchment management initiatives with waterway management initiatives. (*RMB*, LCDCs, CGs)

Figure 2: Catchment Planning Mechanisms



CHAPTER 8: MANAGEMENT FREMEWORK OPTIONS

8.0 Introduction

One major aim of this Management Strategy is to identify a workable management framework within which coordination of management for the Avon River System can occur.

Chapter 3 identified the current roles and responsibilities of the large number of agencies involved in management. Section 3.2 identified the need for more formalised coordination for river management and an appropriate mechanism to link this management with catchment management.

This chapter explores the options available for an agency with overall responsibility for river management. Such an agency would need to be responsible for coordinating river management and ensuring its interaction with catchment management initiatives. Management through the current Avon River System Management Committee has been included as one of the five options.

An evaluation of the options in terms of their advantages and disadvantages has been made to determine the most suitable framework for management and a preferred option has be chosen. The details of this option are discussed in Chapter 9.

8.1 Management Framework Options

The five options for an agency with overall responsibility for river management are discussed below. The order in which they are discussed gives no indication of preference.

Option 1:

Do nothing - continue management through the existing Avon River System Management Committee

Legislative Base

The Avon River System Management Committee has no legislative base and operates under its own constitution.

Area of Jurisdiction

The Avon River System Management Committee is concerned with the management of the river system throughout the Avon River Basin. This area includes a total of 24 local government authorities.

Aims and Objectives

The aim of the Avon River System Management Committee is to manage the Avon River System for social, economic and environmental reasons. The objectives of the committee are outlined below:

- To reduce the rate of water discharged into the river system by actively encouraging all recognised methods of soil conservation on rural land and to extend these concepts to the beds of the rivers.
- To enhance the quality of water flowing into the river system.
- To collect, collate and make available to the public all existing information on the river system.
- To seek financial and scientific assistance with which to further these objectives.
- To establish and review through the medium of an annual general meeting policies for implementation of the objectives of the committee.

Powers

The Avon River System Management Committee has no formal legislative powers to manage the Avon River System. Its constitution, however, outlines the following charter which enables the committee to operate on an informal basis:

- Do such things as are necessary, incidental or conducive to the attainment or execution of its objectives.
- Advise and disseminate knowledge.
- Consult, make arrangements and agreements with relevant local government authorities, residents and other persons affected.
- Provide administrative and coordinating services.
- Employ labour for the purposes of the committee.

Membership

The Avon River System Management Committee is at present solely composed of local government authority representatives. Its constitution provides for membership of not less than five members or more than eleven of which not less than one more than half of the members should be elected from municipalities within the Avon River System. No more than one representative from each municipality is to be elected.

At present councillors from eleven municipalities out of twenty four are represented on the committee. The committee also has the power to co-opt additional members if it wishes. Members are elected at an annual general meeting from nominations made by each local government authority which wants representation on the Committee.

Funding and Administrative support

Funding for the Avon River System Management Committee is made up of small subscriptions paid by the represented local government authorities. Administrative support is supplied by the local government authority in which the chairman resides. Technical support is supplied in kind by the Waterways Commission, the Department of Agriculture and the Water Authority of Western Australia whose representatives attend the committee meetings.

Links to Catchment Management

The Avon River System Management Committee has links with local government authorities within the catchment through its members. However it has no formal links with land conservation district committees, although most of its members are involved with LCDCs. The committee's area of concern covers the entire Avon River Basin and although it has no formal link with catchment management it attempts to involve itself in catchment issues.

Option 2:

Establish a waterways management authority

A waterways management authority could be established to play a part in the management of the Avon River System. The authority's main focus would be on the river and its immediate foreshores, however it would work closely with landowners, community groups, and catchment management agencies to improve land management and water quality. The authority would have a direct and active management role in close cooperation with landowners, local government, State government agencies, and other local interests.

Legislative Base

An Avon River Management Authority would be established under the Waterways Conservation Act 1976-1982. The authority would have delegated powers and responsibilities from the Waterways Commission and would have jurisdiction over a declared management area under the Act. The authority would be provided with administrative, technical and coordinating support from the Waterways Commission.

Extent of a declared Waterways Management Area

There are several options for management area:

1. The management area could be limited to the Avon River and its foreshores. This would most appropriately run from the boundary of the Swan River Trust management area at Moondyne Brook to Qualandary Crossing southeast of Beverley. The Shires of Toodyay, Northam, York and Beverley would be included in the management area.

2. The management area could incorporate the whole of the Avon River Basin as defined in Map 1.

3. The management area could incorporate the whole of the Avon River Basin as defined in Map 1 and including the catchments of Avon, Yilgarn and Lochardt.

No matter which management area option is chosen the authority would need to take an integrated catchment management approach by working directly with the lead agency involved with catchment management (see Section 7.3).

Aims and Objectives

The aim of the management authority would be to conserve, restore and manage the waters and associated lands of its declared management area. The objectives of the authority would be to:

- Ensure that planning and development of the waterway is compatible with their conservation, protection and enhancement.
- Provide advice to planning authorities which results in the conservation and good management of the waterway.
- Increase community awareness of the values of waterways and their appropriate uses.
- Maintain the quality of water in the waterway for a range of uses and improve the community's understanding of its waterway.
- Protect the waterway to minimise the loss of habitat, aesthetic quality or function through the effects of erosion or human activity.
- Provide and promote facilities for public use of the waterway, which will allow the community access to the waterway whilst protecting their environment and the rights of local landowners.
- Integrate its activities with the management of the river catchment.
- Support and work closely with landowners, community groups and catchment management agencies to improve land management and therefore its impact on the river.
- Provide links between the catchment and the river to facilitate an integrated catchment management approach.

Powers

The powers delegated to the Avon River Management Authority would cover:

- **Pollution Control**

  Under the Environmental Protection Act the authority would license industry, carry out pollution abatement, prosecute and appoint pollution control inspectors.

- **Advice on planning and development matters**

  Request details of town planning schemes, subdivisions, developments or any changes to land use within its management area and make recommendations to the planning authority.

- **Development Control**

  Control certain activities, including damage or alteration to the bed, banks or foreshores of the river, building of structures on or over the beds or banks, waste disposal and drainage.

- **Coordinated Management**

  Liaise with other agencies and individuals to achieve its objective of good waterway management.

- **Research**

  Conduct or promote relevant research, publish reports and provide information for the purposes of increasing public awareness.

- **Agreements**

  Enter into management agreements with local landowners for the management of their land.

- **Inspectors**

  Appoint inspectors and honorary inspectors to carry out investigation, inspection and prosecution for the purposes of the Waterways Conservation Act.

- **Works**

  Carry out or cause to be carried out works for the preservation or enhancement of amenities and facilities along the river.

- **Management plan**

  Under the Waterways Conservation Act 1976-1982 the management authority would be obliged to prepare a management plan for its declared management area and carry out a review of that management plan within a specified time.

Membership

The Waterways Conservation Act outlines the membership requirements of a waterways management authority It would be composed of a Chairman and not less than five nor more than eleven members. Members should be selected so far as practicable from amongst persons resident in the local community or who are representatives of local government or State government agencies having responsibility for and knowledge of local affairs. Members would be selected by the Minister for the Environment from a panel of

nominations and recommended for appointment by the Governor.

Because the Avon River system faces a wide range of issues the Authority should represent a wide range of interest groups. Permanent membership of the major local organisations which have a direct involvement in the river is essential. The authority should also be community based and should have at least half community representative members.

Funding and Administrative Support

An Avon River Management Authority would require funding to carry out its tasks to an acceptable level. Effective functioning would require a small secretariat, probably one environmental officer and a part time secretary. The secretariat could be housed in one of the local shire offices or State government department offices. Administrative and technical support would be supplied by the Waterways Commission.

Links to Catchment Management

The Avon River Management Authority should have a number of links with catchment management. This could be achieved through three main means:

- Permanent membership on the management authority of persons or agencies involved in catchment management. This could be achieved by having two land conservation district committee representatives and one representative from the Department of Agriculture.
- Undertaking tasks jointly with agencies concerned with catchment management.
- Arranging meetings with representatives involved in catchment management to discuss common policy and strategy.

Option 3:

Amend the Waterways Conservation Act to enable the delegation of powers to a locally based management body

Legislative Base

A locally based management body would be established under its own constitution. The Waterways Conservation Act would be amended to give it powers without it being an established Waterways Management Authority.

The Extent of a Declared Management Area

The three options for the management area discussed in Option 2 are available.

Aims and Objectives

The aims and objectives of the established management body would be outlined in its own constitution but it is suggested that these be similar to those discussed in Option 2.

Powers

The powers outlined in Option 2 may be available to the management body. It would however be up to the Commissioner of Waterways to delegate the powers deemed necessary for management of the Avon River and its associated lands.

Membership

The membership of the locally based management body would be outlined in its own constitution. The composition of membership would have to be satisfactory to the Minister for the Environment and the Commissioner for Waterways and could be similar to what is outlined in Option 2. Members would most likely be appointed by the Governor on recommendation by the Minister for the Environment.

Funding and Administrative Support

Before delegating powers to a locally based management body, the Commissioner for Waterways and the Minister for the Environment would need to be assured that it had sufficient funds to exercise its powers. These funds would be State Government Consolidated Revenue supplied to the Waterways Commission and then to the management body. The Waterways Commission would provide the technical advice and guidance. Administrative support and member fees would be outlined in the Constitution. Works and management of the river would be jointly funded from the State and local sources.

Links to Catchment Management

A locally based management body would need to develop similar links with catchment management groups as outlined in Option 2.

Option 4:

Establish a Statutory Body under its own Act to manage the Avon River System

Legislative Base

Legislation would be enacted specifically for this body.

Area of Jurisdiction

The body would coordinate management activities throughout the Avon River Basin.

Aims and Objectives

The management body would aim to promote wise management of the Avon River and its catchment. Its major objectives would be to ensure coordination in management activities.

Powers

The management body would have powers determined under its own statute. These could include powers to :

- Advise planning authorities on the impact of development and changes in land use on the river system.
- Employ labour to carry out works on the river and in the catchment.
- Act as conciliator or arbitrator in matters relating to waterways and land use within the area.
- Enter into agreements with landowners within the catchment for the purposes of the Management Strategy.
- Control pollution of the river system.

Membership

Membership of the management body could be similar to the existing Avon River System Management Committee. Members would be elected from local government authorities in the catchment with each LGA restricted to one member each. Alternatively the legislation could require a different mix of representation.

Funding and Administrative Support

Operational and administrative expenses of the organisation could be met by (a) Consolidated Revenue for a part time secretary through the budget of the portfolio under which the Act was proclaimed and (b) LGAs meeting the expenses of their representatives. Technical advice could be provided to the management body by Waterways Commission, Dept of Agriculture, Water Authority of Western Australia and the Department of Conservation and Land Management.

Links to Catchment Management

As the management body's jurisdiction would include the whole of the Avon River Basin it would have the power to coordinate matters of catchment management as well as river management.

Option 5 :

Charge the Water Authority of Western Australia with all management of the Avon River and its foreshores

Legislative Base

Management of the Avon River and its foreshore by the Water Authority would involve the use of their responsibilities and delegated powers under a number of Acts. These Acts include Water Authority Act 1984, Land Drainage Act 1925, Rights in Water and Irrigation Act 1914, Public Works Act 1902, and the Environmental Protection Act 1986 (delegated powers for pollution control).

Area of Jurisdiction

The Water Authority of Western Australia would exercise its powers mostly in the river environment from Moondyne Brook to Qualandary Crossing. It may exercise powers outside this area however these would probably be restricted to pollution control powers.

Aims and Objectives

The Water Authority's main responsibility is the supply of water resources to the State. It

would need to develop a aim to conserve, restore and manage the waters and associated lands of the Avon River. Its objectives would therefore be:

- To ensure the maintenance of water quality of the Avon River.
- To control pollution of the waters of the Avon River.
- To carry out necessary works on the Avon River in order to maintain the river system.
- To provide advice on planning matters in relation to the river and its foreshores.

Powers

Under existing legislation the Water Authority of Western Australia would have the power to:

- Control Pollution
  The Water Authority has delegated powers under the Environmental Protection Act 1986 including the licensing of industry, pollution abatement, prosecution and appointment of inspectors.
- Carry out Works
  The Water Authority has 'inherited' legislation from the Public Works Department which gives it the power to carry out river management works.
- Provide Advice
  The Water Authority has the power to provide advice to planning authorities on the impact of development and land use changes on flooding and water quality.
- Control Activities
  The Water Authority has the power to control activities such as the diversion or abstraction of water from public waterways, the construction of structures and the alteration of the bed and banks of the river.

Membership

The Water Authority of Western Australia would carry out management through its employed staff. A community advisory body would ensure community input into management and make recommendations to the Water Authority.

Funding and Administrative Support

The Water Authority of Western Australia is at present self supporting, obtaining its funds from rates for the supply of water resources. Funding for the management of a river system which is not a viable water supply would be inadequate unless special Consolidated Revenue funding was provided. Administrative support would be from within the Water Authority. Technical support would come from the Water Authority and other State government departments.

Links to Catchment Management

The Water Authority of Western Australia would be empowered to control certain activities in the catchment. Its formal link with catchment management initiatives would be through consultation with the Department of Agriculture. No formal links would exist between the authority and the land conservation district committees.

8.2 Evaluation of Management Options

Following identification of the five management options available a preferred option has been selected for recommendation to the Minister for the Environment. An evaluation process was undertaken to identify the advantages and disadvantages of each option and decide which option was the most workable. Figure 3 lists the advantages and disadvantages. The preferred option is detailed further in Chapter 9.

Linking waterway and foreshore management with catchment management is an important element of management of the Avon River System.

Figure 3: Evaluation of Management Framework Options

Option	Advantages	Disadvantages
1. Do nothing continue management through the existing Avon River System Management Committee	• Large level of community support. • Supported with technical advice from three State government departments. • Encourages LGAs in the area to come together to discuss isssues of concern to the river system.	• No formal powers or administrative arrangements to carry out management of the river system. • Restricted in its activities because of limited budget. • Restricted in its membership(LGA members only) to consider the vast number of issues facing the river system. • Consideration of both river and catchment issues over such a large area is considered too large a task for one body.
2.Establish a waterways management authority	• Provided with the delegated powers under the Waterways Conservation Act to effectively manage the river. • Provided with a State Government budget and administrative support through the Waterways Commission. • Strong community membership to allow community input into the management of the river. • Community based body with on site staff to carry out its functions. • Advisory role regarding planning matters and therefore would not jeopardise the control of LGAs and DPUD. • Forces liaison between other agencies through its advisory role. • Form of management would be based on cooperation and community participation	• Powers pertaining mostlyto management of the river and therefore could be perceived to be ignoring the catchment. • Members appointed by the Governor on recommendation by the Minister for the Environment. • Advisory role in most matters so would not be able to direct other agencies to act.

Option	Advantages	Disadvantages
3. Amend the Waterways Conservation Act to enable the delegation of powers to a locally based management body	• See advantages for Option 2. • Locally based management body with its own constitution therefore would probably gain a high level of community support. • Would not involve the establishment of a full blown management authority.	• See disadvantages for Option 2. • Powers of the body would most likely be more limited than those of a management authority. • Amendment to the Waterways Conservation Act to allow this option to be implemented is expected to take some time.
4. Establish a statutory body under its own Act to manage the Avon River System	• Powers specified by its own Act which could include powers to manage land and water issues. • All details of the body's operations could be designed to suit the Avon River System specifically.	• The design of new legislation specifically for the Avon River System would overlap with existing legislation. • Consideration of both river and catchment issues over such a large area is considered too great a task for one body. • Drafting of new legislation would be expected to take some time.
5. Charge the Water Authorityof WA with all management of the Avon River System	• Powers to carry out management of the Avon River to a certain level. • Expertise to manage the river and its foreshores exists within the Department. • Staff and office already operating in the local area. • Ability to establish a community advisory committee to have community input to management.	• Community advisory body would have no direct powers and would have to operate through WAWA. • WAWA powers outside the river environment would be limited. • Funding may be limited as WAWA has recently become self sufficent.

CHAPTER 9: THE PREFERRED MANAGEMENT FRAMEWORK

9.0 Introduction

Following a review and evaluation of the management framework options available for the Avon River System,

Option 2: To establish a waterways management authority

has been identified as the most appropriate option. The five options considered are outlined in Chapter 8 and evaluated in Table 3.

The key determining factors in selecting Option 2 include:

- reliability in providing effective management in terms of available powers, finance and community involvement.
- feasibility of implementation by the State Government.

This chapter outlines the details of the preferred management option. This includes details of how the management authority would operate, how it would link with catchment management and the roles and responsibilities of other agencies in relation to the waterways management authority.

9.1 The River Management Body

It is recommended that a waterways management authority be established under the Waterways Conservation Act 1976-1982 to take overall responsibility for management of the Avon River.

Under Section 10 of the Waterways Conservation Act a waterways management area would be declared. This area would define the area of jurisdiction of the waterways management authority. The most suitable area for the waterways management area has been determined to include the waters and lands of the entire Avon River Basin. Map 1 defines the Avon River Basin boundary. The following shires or part thereof would be included in the waterways management area.

Beverley	Mukinbudin
Brookton	Narembeen
Bruce Rock	Northam
Chittering	Town of Northam
Corrigin	Nungarin
Cuballing	Pingelly
Cunderdin	Quairading
Dalwallinu	Swan
Dowerin	Tammin
Dumbleyung	Toodyay
Goomalling	Trayning
Kellerberrin	Victoria Plains
Kent	Wandering
Kondinin	Westonia
Koorda	Wickepin
Kulin	Wongan-Ballidu
Lake Grace	Wyalkatchem
Merredin	Yilgarn
Moora	York
Mt Marshall	

This area has been determined so that a whole of catchment approach can be taken. Due to the vast size of the area, however, it is recommended that the activities of the waterways management authority focus on the western or Avon catchment and this area be given priority for management. The key factors for determining this priority are as follows:

- The western Avon Catchment is the major contributor to problems faced by the Avon River.
- the problems facing the outer two catchments of Yilgarn and Lochardt are primarily land management problems and can be effectively managed by existing catchment management mechanisms with links to a waterways management authority.

Once established the waterways management authority would coordinate conservation, management and restoration of the Avon River. The main focus would be the waterway and its foreshores where the authority would have a direct and active management role in close cooperation with local government, State government agencies and other local interest groups. The authority would carry out the following activities:

- Control and wherever practicable prevent pollution of the waters and lands of the management area. This will be undertaken in conjunction with the Water Authority of Western Australia.
- Request details of proposed town planning schemes, subdivisions, developments or changes in land use in the management area and make recommendations to the appropriate planning authority.
- Provide advice and disseminate knowledge on the conservation and good management of the Avon River and its catchment.
- Carry out works on the river to improve the riverine environment i.e. erosion control works, revegetation of river beds and banks etc.
- Carry out water quality monitoring of the Avon River to determine changes in water quality.
- Liaise with other agencies and individuals to achieve the objective of good waterways management.
- Prepare and review a management programme for the management area to guide future planning and activities in the area.

The authority would work closely with local government and other agencies responsible for day to day management of the river system. It would aim to develop good cooperation between agencies for the benefit of the river system. Works carried out along the river would be a cooperative effort between local government and the authority and much of this work will be jointly funded. Funding is further discussed in Section 9.6.

Membership of the waterways management authority would attempt to represent the wide range of interests in the Avon River environment. The Waterways Conservation Act specifies details of the membership however this can be adapted to suit local circumstances. Local government plays an important role in the area and therefore a large representation of local government is recommended. A suitable composition for the waterways management authority is outlined below:

- One Chairperson
- Two State government representatives (Water Authority of WA and WA Department of Agriculture)
- Six local government representatives (at least two representatives from shires abutting the river and at least two from within the catchment)
- Three Community Representatives (suggested that two represent land conservation district committees and one represent recreation interests)

Under the Waterways Conservation Act the members of the authority are appointed by the Governor on recommendation from the Minister for the Environment. The large number of local government authorities in the area would require a mechanism to appoint the six representatives in a fair and equitable manner. It is recommended that all shires in the river basin nominate a representative and between themselves six representatives be recommended to the Minister for the Environment for appointment. The Minister may advertise for expressions of interest for community appointments.

Under the Waterways Conservation Act the authority can establish committees to deal with specific subject areas of concern to the river system. It may be appropriate to establish committees to deal with the issues of planning and development, river works and interactions with catchment management. These committees would only meet as often as the work dictates.

Recommendations

109. Establish a waterways management authority under the Waterways Conservation Act 1976-1982 to manage the Avon River and its foreshores and to play a part in the management of the catchment of the Avon River. (*GOVT*, WWC)

110. Define the management area over which the management authority will carry out its activities as the lands and waters of the entire Avon River Basin. (*EPA*, *GOVT*, WWC)

111. Ensure that the waterways management authority is representative of all interests and areas within its management area and that local government has a strong representation. (*GOVT*, WWC)

9.2 Links to the Catchment

In the catchment the management authority will work with and support landowners, catchment groups and land conservation district committees to improve land management and water quality. This is proposed to be achieved through the development of a catchment coordinating group with which the authority can interact.

The Western Australian Department of Agriculture has indicated that there is a need for coordination of catchment management in the Avon River Basin. Through the development of catchment coordinating groups for the three catchments of Avon Yilgarn and Lochardt this could be achieved. These groups would be LCDC based but may also include the involvement of other interest groups to deal with the wide range of issues facing the catchment.

The objectives of the catchment coordinating groups would be to:

- Prepare regional catchment management plans with economic, social and environmental objectives. The plans must consider physically and economically sustainable agricultural systems, conservation of the natural environment and provision of financial support for implementation.
- Coordinate the implementation of regional plans through a strategy which encourages and assists LCDCs in promoting catchment planning at the local catchment group level.
- Form links, liaise and plan with the waterways management authority, particularly in the preparation of a whole river basin plan which integrates both river and catchment issues.

The catchment coordinating group representing the Avon catchment should develop closer links with the waterways management authority. The authority and the catchment coordinating group should deal with management of the river and catchment as separate tasks. Their activities, however, should be combined into a whole river basin plan considering both the river and the catchment. This concept is further discussed in Section 7.3.

The Avon River Management Authority should have a number of formal links with the Avon Catchment Coordinating Group These links would include:

- Permanent membership on the management authority of persons representing the catchment coordinating group (i.e. land conservation district committee representatives).
- Undertaking common tasks jointly with the catchment coordinating group.
- Arranging meetings with the catchment coordinating group to discuss common policy and strategy.

Recommendations

112. Encourage the parallel development of catchment coordinating groups for the three catchments within the Avon River Basin i.e. Avon, Yilgarn, Lochardt. Ensure that these groups are LCDC based but include all interest areas within the catchment. (*WADA*, RMB)

113. Develop a mechanism to facilitate links between the waterways management authority and the catchment coordinating group formed within the Avon catchment. (*RMB*, WADA)

9.3 Roles and Responsibilities of other Organisations

The current roles and responsibilities of other organisations involved in management of the Avon River System are set out in Chapter 3. With the establishment of a waterways management authority these roles and responsibilities would not alter to any great extent. The waterways management authority would be an advisory and coordinating body which through cooperation with other agencies would effect management of the river system.

The Management Strategy makes recommendations for management of the river system. Responsibility for implementation of these recommendations is identified in brackets following each recommendation and further discussed in Section 9.7. The majority

of these responsibilities are based on current legislative and administrative arrangements. It would be the responsibility of the waterways management authority to ensure that these recommendations are implemented by the responsible agencies and to coordinate and advise on management issues.

A number of recommendations have been made the responsibility of the waterways management authority (identified as the RMB). Some of these responsibilities overlap with current responsibilities of other agencies. The Water Authority, for example, has since the cessation of the Public Works Department continued to carry out river works and foreshore maintenance. With the establishment of a waterways management authority these responsibilities would become primarily the responsibility of the authority.

The waterways management authority should carry out day to day management of the river and its foreshores including revegetation, erosion control and maintenance of weirs. Much of this work would be carried out in cooperation with landowners, local government authorities and other agencies. The authority should work in conjunction with other agencies to effect management of the river and its foreshores and depending on the nature of the work required develop cost sharing arrangements for works to be carried out.

Recommendations

114. Encourage local government authorities and State government agencies involved in management of the river system to implement recommendations outlined in this document for which they have been identified as the initiating agency. (*RMB*)

115. Ensure that there is liaison and effective communication between agencies where joint responsibilities are recommended. (*RMB*)

116. Share responsibility for foreshore management and maintenance between the waterways management authority, local government authorities and other relevant agencies according to the following criteria:

- Works along the river which are a normal municipal responsibility should continue to be the responsibility of the local government authority.
- Works on vested land should be the responsibility of the vestee.
- Works for the purposes of improving and maintaining the condition of river waters and associated lands should be approved by the waterways management authority. These works could be carried out by the waterways management authority but may be in conjunction with the local government authority.
- Works carried out by local government authorities, vestees or private landowners for the purposes of improving or maintaining the condition of river water and associated land should be specified in a management plan developed in conjunction and agreement with the waterways management authority.

(*RMB*, LGAs, all other responsible agencies)

9.4 Agency Coordination and Cooperation

A major role of the waterways management authority would be to coordinate management and planning for the Avon River and its foreshores. This coordinating role can not be achieved without effective communication between and cooperation of agencies involved in management and planning.

Successful coordination of management can be achieved through administrative arrangements between agencies. In the case of approvals for development which may impact on the river system, it is essential that a system exists for all agencies to refer documentation of these developments to the approving bodies. It is important that conditions on development are not issued without consideration of other bodies. Wherever possible agencies should consult with each other prior to making management or planning decisions. Under Section 36 of the Waterways Conservation Act a waterways management authority may request the referral of any development application or town planning scheme that may impact on the river system for their consideration.

Under Section 35 of the Waterways Conservation Act a waterways management authority is required to prepare a

management programme for the management area under its control. It is also required to keep the management programme under review.

The management authority is bound to ensure that its decisions and advice are consistent with the programme. The programme does not, however, bind other government or non government organisations but guides them in planning and development decisions which are consistent with the protection of the waterway. The management programme will provide a blueprint for the operations that will be undertaken by the management authority in relation to waters and associated lands. It will contain specific area recommendations and the Authority's policies, objectives and strategies for management of the river system.

It is a requirement of the Waterways Conservation Act that during preparation of this management programme the many players involved in management be consulted for their views on management of the river system. This requirement should ensure the support of other agencies and result in recommendations which are achievable.

To coordinate management of foreshore areas management plans should be prepared in conjunction with local government authorities. Recognising the cost of preparing such documents, these plans should be keep short and simple. These should describe the area, the problems and detail management actions required.

Recommendations

117. Develop administrative referral and approval procedures with local government and State government agencies to ensure that all agencies involved in management are consulted on planning and management issues. (*RMB*, all other relevant agencies)

118. Prepare and review a management programme for the waterways management area to guide river planning and management actions. Consult with affected persons and agencies during its preparation. (*RMB*, WWC)

119. Prepare management plans for foreshore areas in conjunction with local government authorities and local landowners. (*RMB*, LGAs, WWC)

9.5 Community Participation and Education

It is important that the community is involved in planning and management for the Avon River System. Members of the community can identify issues and ensure that use and management of resources is equitable and appropriate.

With the establishment of a waterways management authority, the community will have a number of avenues to become involved in the management process. These are outlined below:

- **Membership on the authority**

  Under Section 14(3) of the Waterways Conservation Act 1976 -1982 membership of a waterways management authority shall be selected from amongst persons resident in the local community. The composition of the waterways management authority recommended in Section 9.1 provides three representatives from the community and six from local government to be appointed to the Authority. The Chairman should also be a community representative.

- **Management programme preparation**

  The community has the opportunity to make comment during the preparation of the management programme. Invitations to prepare submissions on a draft management programme would be advertised in the general and local press. The waterways management authority should also invite public comment on all management plans for specific areas of the river foreshores.

- **Development approval**

  The public has the opportunity to comment on proposed developments on and around the waterway through submission to the EPA or the waterways management authority. Submissions can also be made to local government authorities on the preparation of or amendment to town planning schemes.

  Under Section 38 of the Waterways Conservation Act any person or body may refer to the waterways management authority any matters which gives rise to concern as a possible cause of pollution affecting the waterways. The waterways

management authority may then consider the matter and report to the relevant Minister if necessary.

Community education is also an important principle in waterways management and planning. Broad scale education programmes to raise the level of awareness of issues relating to the management of the river and its foreshores should focus on all age groups and types of users such as school groups, tourists and adjacent landowners.

Education programmes or information leaflets could be prepared for the following:

- River Pollution
  - Causes and Preventative Measures
- Causes of River Bank Erosion
- Preservation of Fringing Vegetation
- Recreation Guide to River Use
- Conserving Environmentally Sensitive Areas
- Development Approvals
  - When, What and How?
- Waterbirds - Habitat and Protection

Recommendations

120. Ensure that the community is adequately represented on the waterways management authority. (*GOVT*, WWC)

121. Ensure that all proposals for development and management actions on and around the river are available for public comment before approval is given. (*RMB*)

122. Implement community education programmes to promote awareness, appreciation and understanding of the riverine environment. (*RMB*)

9.6 Staff and Finance

The waterways management authority will be funded by State Government Consolidated Revenue through the budget of the Waterways Commission. Funding should be sufficient for effective and efficient management of the river system and should keep pace with the changing community pressure on the river and its foreshores.

Funding for the waterways management authority should cover:

- Employment of one full time environmental officer
- Employment of one part time secretary
- Accommodation, vehicle and office expenses
- Members' sitting fees and expenses
- Works budget (maintenance of the river and its foreshores)
- Projects budget (preparation of management programmes and plans)

Administrative support and technical advice would be supplied to the authority by officers of the Waterways Commission. The works and project budgets of the authority would be determined each financial year after identification of the works and projects required.

The Authority would make arrangements with local government and State government agencies in the area to jointly fund certain projects and works along the river. River works for example may be carried out as a joint project where the local government authority may provide labour through its works staff and the management authority may provide the funds for materials. Similar arrangements may be made with developers, private landowners or other State government agencies.

Recommendations

123. Ensure that funding provided to the waterways management authority is adequate to allow it to carry out its functions and effectively manage the river system.(*GOVT*, WWC)

124. Develop appropriate funding arrangements for river maintenance. This may include cost sharing between local government, the State, developers and private landowners.(*RMB*, LGAs, DEV)

9.7 Implementation of Recommendations

The implementation of the recommendations contained in this Management Strategy is the responsibility of a number of organisations. The large number of recommendations and the complex nature of some of them will mean that implementation will take a number of

years. Similarly staff, financial resources and Government budget restraints in the current economic situation will also delay implementation of some recommendations. Priorities must therefore be decided so that the available resources and funding can be allocated.

The recommendations have been divided into two categories: on-going activities and one-off projects. The recommendations for on-going activities should be implemented as soon as possible. Priority has been assigned to these recommendations to determine to urgency of implementation. For one-off projects a time schedule has been applied to indicate priority. Figure 4 and 5 outlines the status of the recommendations.

Figure 4: Implementation of One-Off Project Recommendations

Recommendation Numbers	Responsibility for Implementation	Strategy for Implementation	Time Schedule	Action following Initiation
1	RMB, WWC, WAWA	Define objectives and design a programme	1 -2 years	Day to day monitoring
2	RMB, WWC, WAWA	Collect existing data	5 -10 years	Update as necessary
4	RMB, WWC, WAWA	Develop criteria, objectives and standards	2 - 5 years	Update as necessary
6	EPA, RMB	Advertise in Government Gazette	1-2 years	No further action
7	RMB, WAWA, EPA	Liaise with WAWA and EPA	1-2 years	Ensure necessary actions are taken
8	RMB, LGAs, WAWA	Liaise with LGAs, develop surveys	1-2 years	Act to reduce sources
9	WASES,RMB	Integrate RMB into scheme	5 - 10 years	Update as necessary
11	RMB,WASES	Identify players, develop plan	5 - 10 years	Update as necessary
13	RMB, WAWA	Review files	5 - 10 years	Act on information obtained
14	RMB, LGAs, WAWA	Liaise with LGAs, identify criteria	1 - 2 years	Rehabilitate selected pools

Recommendation Numbers	Responsibility for Implementation	Strategy for Implementation	Time Schedule	Action following Initiation
16	NTC, WAWA, DMH, RMB	Liaise with relevant authorities	1 - 2 years	Carry out recommended action
19	RMB, LGAs, WAWA	Employ geological survey team	2 - 5 years	Act on information obtained
34	RMB, LGAs, BFB, LO	Liaise with LGAs	2 -5 years	Carry out recommended action
35	RMB, APB, LGAs, LO	Liaise with APB	2-5 years	Carry out recommended action
42	RMB, LGAs, DPUD, WWC, WAWA, WADA	Develop guidelines, circulate for comment	2-5 years	Incorporate into local planning and management
49	RMB, LGAs	Collect cadastral information	2-5 yeasrs	Determine appropraite ownership and management
55	WAWA	Collect information	5 - 10 years	Utilise information in development proposal process
56	WAWA	Prepare maps	5-10 years	Circulate to planning authorities
57	WAWA, DPUD, LGAs	Develop guidelines, circulate for comment	2-5 years	Incorporate into local planning and management
60	RMB, WAWA, LGAs	Develop information leaflets	2 -5 years	Circulate to landowners adjacent to river

Recommendation Numbers	Responsibility for Implementation	Strategy for Implementation	Time Schedule	Action following Initiation
68	RMB, WAWA, LGAs	Develop guidelines, refer to relevant authorities	2-5 years	Incorporate into planning approval process
69	LGAs, DPUD, RMB	Liaise with RMB when preparing TPS	2-5 years	Incorporate into local planning and management
80	RMB, LGAs	Prepare brochure, liaise with LGAs	2-5 years	Make available to public
83	EPA, WASDA, RMB, LGAs	Prepare guidelines, refer to relevant authorities	2-5 years	Incorporate into planning approval process
87	WATC, LGAs, RMB, LO	Liaise with all relevant authorities, prepare plan	5-10 years	Implement plan
89	RMB, YLWG, WAWA	Liaise with YLWG	1-2 years	Carry out recommendations if appropriate
106	RMB, WADA, LCDCs, CGs	Liaise with WADA	1-2 years	Review and monitor success of mechanism
108	RMB, LCDCs, CGs, RMB	Liaise with LCDCs, CGs and WADA, prepare plan	5-10 years	Implement recommendations of plan
109	GOVT, WWC	Approve establishment of Authority	1 - 2 years	Finalise details
110	EPA, GOVT, WWC	Identify boundary, gazette area	1 -2 years	Review boundary of management area

Recommendation Numbers	Responsibility for Implementation	Strategy for Implementation	Priority	Action following initiation
112	WADA, RMB	Liaise with LCDCs	1 - 2 years	Support groups
113	RMB, WADA	Identify and establish links	1 - 2 years	Ensure links are sustained
117	RMB, all other relevant agencies	Develop procedures	1 - 2 years	Ensure procedures are carried out
118	RMB, WWC	Prepare programme	1 - 2 years	Implement programme

Table 5: Implementation of On-Going Recommendations

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
3	OCM, RMB, WWC, WAWA	Liaise with schools and RMB	Medium
5	RMB, WAWA, EPA	Develop assessment and monitoring programme	High
10	RMB, WAWA, WASES	Identify equipment and training required	Low
12	RMB, WAWA, WADA	Identify objectives, carry out investigations	Medium
15	RMB, LGAs	Select pools, carry out rehabilitation	High
17	NTC, RMB, WAWA	Liaise with relevant authorities	High
18	RMB, LGAs, WAWA	Identify necessary works	High
20	RMB, LGAs	Identify suitable methods	Medium
21	RMB, LGAs	Develop programme	Medium
22	RMB, LGAs, LO	Identify actions, liaise with landowners	Medium

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
23	RMB, LGAs, LO	Identify actions, liaise with landowners	Medium
24	RMB, LGAs	Identify suitable methods, establish plots, monitor	High
25	RMB, WWWC, CALM, LGAs	Liaise with CALM	High
26	RMB, WAWA	Liaise with WAWA	High
27	RMB, LGAs, LCDCs	Liaise with relevant groups	Medium
28	RMB, LGAs	Liaise with funding groups	High
29	RMB, LGAs	Develop information leaflets	Medium
30	CALM, DOLA, RMB, LGAs	Carry out conservation assessments	Medium
31	RMB, LGAs CALM	Identify actions, liaise with landowners	Medium
32	CALM, RMB	Prepare and advertise	Medium

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
33	DOLA, RMB, LGAs	Negotiate with vesting body	Medium
36	LGAs, DPUD, EPA, RMB, WAM	Refer planning proposals to WAM	High
37	LGAs, DPUD, EPA, RMB, HCWA	Refer planning proposals to HCWA	High
38	LGAs, RMB, WATC	Liaise with WATC	Medium
39	RMB, LGAs, DPUD	Liaise with LGAs and DPUD	Medium
40	DPUD, LGAs, RMB	Liaise with LGAs	Medium
41	RMB,LGAs, DPUD	Liaise with LGAs	Medium
43	RMB, LGAs, DPUD	Identify areas, liaise with LGAs	High
44	RMB, LGAs, WATC, LO	Liaise with LGAs, design survey	Medium
45	LGAs, RMB	Identify sites	Medium

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
46	RMB, LGAs	Identify sensitive areas	High
47	LGAs, RMB, LO	Identify areas, liaise with landowners	Medium
48	DPUD, LGAs, RMB	Refer subdivisions to relevant authorities	Medium
50	RMB, LGAs	Liaise with landowners	High
51	RMB, DOLA, LGAs	Liaise with DOLA	Medium
52	DOLA, RMB, LO	Liaise with LGAs	Medium
53	DPUD, LGAs, RMB	Refer subdivisions to relevant authorities	Medium
54	WAWA	Collect information, update flood studies	Medium
58	LGAs, DPUD, EPA, RMB, WAWA	Refer development proposals to WAWA	High
59	LGAs, DPUD, EPA, RMB, WAWA	Refer all development proposals to WAWA	High

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
61	LGAs, DPUD, RMB	Assess proposals in floodway	High
62	LGAs, DPUD, RMB	Liaise with RMB when preparing TPS	High
63	LGAs, RMB, DPUD	Consult with RMB, develop concept plans	High
64	LGAs, EPA, DPUD, RMB	Refer development proposals to relevant authorities	High
65	LGAs, RMB	Liaise with RMB	High
66	LGAs, DPUD, RMB	Liaise with RMB when preparing TPS	High
67	LGAs, DPUD, EPA, RMB	Refer proposals to EPA	High
70	LGAs, DPUD	Liaise with RMB when preparing TPS	High
71	RMB, LGAs	Liaise with LGAs, prepare plans	Medium
72	RMB, LGAs	Liaise with LGAs	High

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
73	LGAs, RMB	Refer proposals to relevant authorities	High
74	RMB, LGAs	Investigate impact of all activities	High
75	LGAs, RMB	Carry out surveys, consult with other agencies	High
76	LGAs, RMB	Liaise with RMB	High
77	LGAs, RMB	Provide facilities and activities where necessary	High
78	RMB, LGAs, LO	Identify areas, consult with relevant authorities	Medium
79	RMB, LGAs	Refer to relevant authorities, advertise	Medium
81	RMB, WASDA, LGAs, EPA	Refer proposals to relevant authorities	High
82	EPA, WASDA, RMB	Refer all proposals to EPA	Medium
84	RMB, LGAs, WASDA	Liaise with WASDA	Medium

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
85	WATC, LGAs, RMB	Liaise with RMB	Medium
86	WATC, LGAs, RMB	Carry out surveys at both local and regional level	Medium
88	LGAs, RMB, WATC, EPA	Refer all proposals to relevant authorities	High
90	RMB, YLWG, WAWA	Liaise with YLWG	Medium
91	WADA, LCDCs, CGs, RMB	Prepare local and regional catchment plans	High
92	WADA, RMB, WAWA	Design monitoring programme	High
93	WADA, RMB, WAWA	Analyse data, identify areas	High
94	RMB, WADA, ROB	Design monitoring programme	High
95	RMB, LGAs, LCDCs, WADA	Identify sources, apply management techniques	High
96	WADA, LGAs, LCDCs, RMB	Carry out research	High

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
97	WAWA, RMB	Design monitoring programme	Medium
98	WADA, LCDCs, CGs	Identify techniques, apply where appropriate	Medium
99	LCDCs, CGs, RMB	Identify problems, liaise with RMB	Medium
100	WADA, CGs, LCDCs	Liaise with and support CGs and LCDCs	High
101	WADA, CGs, LCDCs	Liaise with and advise CGs and LCDCs	High
102	CGs, LCDCs, WADA	Liaise with relevant authorities, consult public	High
103	SLCC, WADA, LCDCs, CGs	Recommend appropriate level of funding	High
104	WADA, RMB	Liaise with relevant authorities, prepare leaflets	Medium
105	WADA, RMB	Prepare guidelines, circulate to authorities	High
107	RMB, WADA, LCDCs, CGs	Liaise with WADA	High

Recommendation Number	Responsibility for Implementation	Strategy for Implementation	Priority
111	GOVT, WWC	Consider recommendations from WWC and ARSMC	High
114	RMB	Liaise with relevant authorities	High
115	RMB	Liaise with relevant authorities	High
116	RMB, LGAs, relevant agencies	Identify actions, determine responsibility	High
119	RMB, LGAs, WWC	Liaise with LGAs and LO	High
120	GOVT, WWC	Appoint community members	High
121	RMB	Advertise developments and management actions	High
122	RMB	Design education programmes	Medium
123	GOVT, WWC	Provide adequate funds	High
124	RMB, LGAs, DEV	Liaise with LGAs and DEV	High

Glossary

Avon River	For the purposes of this document is defined as the section of the river from Qualandary Crossing (southeast of Beverley) downstream to the boundary of the Swan River Trust Management Area at Moondyne Brook
Avon River Basin	The study area of the Management Strategy defined by the Water Authority of Western Australia as the area which contributes water to the Avon River and defined as River Basin No. 615 with the South West Drainage Division (V1) of Western Australia.
Avon River System	The Avon River Basin and all its interrelated physical, biological and social components and processes.
Beneficial Use	Use of the environment, or of any portion thereof, which is conducive to public benefit, public safety, public health or aesthetic enjoyment and which requires protection from the effects of discharge of wastes or of emissions of noise, odour or other despoilation.
Catchment	A region which collects all the rainfall that falls on it, apart from that removed by evaporation, directing it into a river or stream which then carries the water to the sea or to a lake. The Avon River Basin contains three catchments, Yilgarn, Lochardt and Avon.
Conservation	The management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilisation, restoration and enhancement of the natural environment.
Conservation Area	This document uses the term conservation area to describe any land to be set aside or used for the protection of the environment. This includes Conservation Reserves vested with the Department of Conservation and Land Management for purposes of conservation of flora and fauna.
Development	For the purposes of this document development refers to any use of land which includes construction of buildings, or any earthworks or landscape modification.
Eutrophication	Over enrichment of water by dissolved minerals particularly nitrates and phosphates which lead to excessive growth of aquatic plants.
Fauna	The animal life of a geological period or a region.
Flood 100 Year	Refers to the most severe flood which has a statistical probability of occurring once in a 100 years. The 100 year flood level is generally defined as a contour through the flood plain to which this flood will rise.
Flood Fringe	The area of the flood plain, outside the floodway, which is affected by flooding but where development could be permitted providing appropriate measures are taken. Theses areas are generally covered by still or very slow moving waters during the 100 year flood.
Flood Plain	The portion of a river valley adjacent to the river channel which is covered with water when the river overflows its banks during floods.
Floodway	The river channel and portion of the flood plain which forms the main flow path of flood waters once the main channel has overflowed.
Flora	The plant life of a geological period or region.
Groundwater	Water which occupies the pores and crevices of rock and soil as opposed to surface water which runs off into streams.

Habitat	The native environment or place where a plant or animal naturally grows or lives.
Hypersaline	Refers to water with a salinity level greater than sea water (35 ppm).
Integrated Catchment Management	The planning and management of our natural resources on a river or groundwater catchment basis to achieve sustainable use which provides for social and economic development.
Natural Attributes	The natural characteristics of a particular area worthy of preservation including physical and biological features.
Node	For the purpose of this document a node refers to a control location which contains the concentration of leisure, recreation, access or conservation activities, servicing the surrounding area.
Nutrients	Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorous (phosphate). Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
Pollution	Any direct or indirect alteration of the environment to its detriment or degradation; includes any effluent, litter, refuse, sewage or waste, or any other matter or thing, of whatever form, that impairs or is likely to impair the environment.
Preservation	Keeping in existence unchanged, natural resources, structures or situations which have been inherited from the past.
Remnant Vegetation	The parts of the natural vegetation still existing after major change to the environment.
Riverine Environment	The water and foreshores, including reserves, vacant Crown land and privately owned land and their physical, biological and social components and processes.
Salinisation	An increase in salinity levels in soils or waters which impairs its quality.
Salt Lake System	A series or chain of inland water bodies which form in depressions in the landscape and are characterised by their high level of salinity.
Siltation	The process by which sediment is deposited in waterways.
Stormwater	Natural water from the surface of the ground, paved areas or roofs.
Swan River Trust Management Area	The area managed by the Swan River Trust under the Swan River Trust Act 1988 including all of the waters of the Swan River upstream of the Fremantle Port Authority boundary to the confluence of Moondyne Brook on the Avon River, up to the lower diversion dam on the Helena River, along the Southern River to Allen Road crossing and the Canning River to its confluence with Stinton Creek and land areas adjoining these waters that are reserved as Parks and Recreation Reservation areas under Clause 12 of the Metropolitan Region Scheme .
Tributary	A stream or lesser river which flows into a major river.
Vacant Crown Land	The land under the control of the Minister for Lands which is not reserved and vested in an authority for specific purposes, contracted to be granted in fee simple or subject to the right of purchase.
Waterways Management Area	An area managed by a waterways management authority and declared under the Waterways Conservation Act 1976-1982.

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Appendix 1

Avon River Community Workshops

Summary of Findings

Community Workshops held at:

Kellerberrin, WA	**November 1, 1990**
Wickepin, WA	**November 8, 1990**
Beverley, WA	**November 19, 1990**

Conducted by the Waterways Commission on behalf of the Avon River System Management Committee for community input towards preparation of the Avon River System Management Strategy

Introduction

The Avon River Community Workshops were conducted by the Waterways Commission on behalf of the Avon River System Management Committee in November 1990. The workshops formed part of tthe public consultation process in developing the Avon River System Management Strategy.

Three workshops were held in Kellerberrin, Wickepin and Beverley which allowed a wide cross-section of the community concerned with not only river issues but also catchment issues to voice their concerns.

The invitation to contribute to the proposed Strategy produced an overwhelming result with close to 100 people attending the three workshops. People from a broad cross- section of the community and the full extent of the Avon River Catchment produced a wealth of information, ideas and suggestions. This information was invaluable in developing a future management framework for the Avon River System.

Participants at each workshop were firstly addressed by government representatives on the nature and extent of the Avon River System and the details of the proposed strategy. Participants then came together in groups to identify the uses and issues affecting the river and its catchment, and attempted to produce solutions to the problems.

Participants were ask to identify the following:

- Uses of the Avon River System
- Issues of concern associated with the identified uses.
- Solutions to deal with the identified issues.
- An appropriate managment framework for the Avon River System.

The report that follows summarises the findings of the three workshops. The findings will now be used as a starting point in preparing the Avon River System Management Strategy to make recommendations to the Minister for the Environment.

Section 1:Uses

The following uses of the Avon River System were identified:

Agriculture

- cropping and grazing
- horticulture
- aquaculture
- shelter and water for stock
- hobby farms

Recreation/Tourism

- picnicking
- power boating/sailing/canoeing/skiing
- duck shooting
- swimming
- fishing/yabbying
- camping
- heritage trails
- scenic values

Drainage

- flood mitigation
- water supply- stock/ irrigation domestic/gardens/industry
- effluent disposal

Conservation

- preservation of flora and fauna
- wildlife habitats and corridors
- retention of remnant vegetation
- breeding grounds for birdlife
- landscape resource
- fire break/hazard

Settlement/ Urban Uses

- economic base
- town sites
- housing and services
- transport - road and rail

Industry

- tanneries
- abbatoirs

Mining

- gypsum
- salt
- sand

Forestry

- firewood
- seed collection

Education

Section 2: Issues

The following issues of concern to the Avon River System were identified:

Agriculture

- sustainability - economically and environmentally
- soil degradation - salinity/erosion/compaction/ acidification/waterlogging
- agricultural practices
- productivity
- revegetation - type of tree/ appropriate placing/ technique
- water management
- ownership of river
- grazing and watering of stock along river
- farm rubbish dumps
- inappropriate use of fertilisers
- vermin and noxious weeds
- crossings for stock
- pollution from intense farming
- fencing of the river
- economic factors involved in conservation
- disposal of chemical containers
- tax incentives
- encroachment of hobby farms
- lack of information

Recreation/Tourism

- increasing recreational use
- lack of facilities
- destruction of the natural environment - removal of vegetation/trampling/erosion from boating/disturbance of wildlife habitats
- pollution - litter/ diesel from boats
- private ownership
- public access
- trespassing
- vandalism
- disruption of natural river flow by water sports

Drainage

- quantity and continuity of flow
- flood mitigation especially in town sites
- coordination of drainage
- mobilisation of silts
- desnagging vs revegetation
- effects of River Training Scheme
- control of saline water flow
- changes to lake levels and the effect on adjoining lands
- weirs and other obstructions

- sewage treatment and effluent disposal
- potential water supply for non-potable uses

Conservation

- degradation of river system - salinity/erosion/siltation/nutrient enrichment
- preservation of flora and fauna- remnant vegetation/ wildlife habitats
- interaction between conservation areas and adjoining farmlands
- pollution - nutrient enrichment/ chemicals/litter
- bank stability
- insects
- vermin and noxious weeds
- fire
- spread of disease
- management of foreshore reserves
- revegetation
- recreation vs conservation
- responsibility for conservation areas

Settlement/ Urban Uses

- use of fertiliser on gardens
- sewage treatment
- rubbish tips
- building on the flood plain
- lack of knowledge and communication between the rural and urban communities

Industry

- effluent disposal
- need for industrial control
- siting of industry
- clearing for sites
- provision of infrastructure - water supply etc.

Management

- cooperation between those who manage
- lack of appropriate legislation
- need for coordination
- need to identify responsibilities
- lack of communication
- need for dissemination of information
- lack of a management plan
- the need for a vision for the river system

Education

- need for enthusiasm and involvement
- lack of awareness of problems/ environmental impacts/ and who is responsible
- need for a school education programme
- need to inform farmers of new techniques

Funding

- cost of maintaining the waterways
- financial burden on farmers
- economic situation
- funding for on the ground activities
- need for tax concessions and incentives

Section 3: Solutions

The following solutions to issues of concern were identified:

Agriculture

- develop appropriate land management techniques and inform farmers
- establish better crop management practices to improve water uptake
- revegetate appropriate areas of the catchment
- establish land management technique demonstration areas in the catchment
- compile a current inventory of the catchment including land capability studies and develop criteria for improvement
- prioritise areas needing land management actions and provide funding
- develop an awareness programme for farmers regarding the river
- fence the river where possible to prohibit stock
- lobby for tax write offs for land management actions
- develop a soil testing programme prior to fertiliser application
- carry out tree planting in the catchment and supply information to farmers
- regarding tree types/ placing and technique
- provide trees to farmers from State or Federal funding projects
- use Whittington banks as a salinity control measure
- discourage overstocking and encourage appropriate cropping
- maximise use of rainfall on farms where it falls
- control vermin and noxious weeds and define responsibility for this
- control uses on hobby farms e.g. stock rates
- ensure farmers and LCDCs develop catchment plans
- carry out research into land management and salt tolerant vegetation
- identify the effects on farmlands of changing lake levels

- carry out research into the impact of long term groundwater pumping to aid in salinity control
- identify landownership responsibilities

Recreation /Tourism

- designate certain areas for recreation with the provision of access, facilities and controla
- develop workable plans for recreation ares
- survey and plan to designate suitable areas for recreation
- restrict vehicles and boats from certain areas and at certain times
- increase recreational facilities
- increase public awareness of recreational facilities and the public's responsibilities
- develop a user pays system for recreation
- develop agreements with private landowners for public access
- identify areas which are most suited to public access
- hold Shire responsible for control of recreational use of the river
- identify historic and cultural sites and set up more heritage trails
- develop guidelines for power boat racing
- rehabilitate river pools to create recreation areas
- protect river banks against erosion from power boats
- encourage people to visit recreation areas and therefore spend money in the community
- research the impact of boating activities
- carry out research on current and future recreational needs

Drainage

- give priority to natural flow of the river
- improve drainage and waterflow in insect prone areas
- develop sensible land management practices to stabilise soils and prevent erosion
- carry out necessary engineering repairs to save existing river structures
- control effluent discharge from industry
- define historic flood levels and carry out flood management studies
- control flooding in town sites
- carry out research into control of saline waters
- investigate the release of water from Yenyenning Lakes
- maintain clearing of main river channel
- coordinate drainage on a subcatchment basis

Conservation

- re-establish the natural environment by tree planting and developing wildlife corridors between pockets of remnant vegetation
- improve management of conservation reserves
- acquire foreshore reserves for the purposes of conservation and foreshore management
- fence parts of the river to protect remnant vegetation
- ensure farmers consult with LGAs prior to burning off
- use native vegetation to minimise fire risk
- increase pollution control enforcement
- monitor water levels and quality and establish a data base of information
- support the continuation of Ribbons of Blue
- analyse existing water quality data held by the Water Authority
- link water quality data with Swan River data
- identify valuable flora and fauna and protect
- restrict access to valuable conservation areas
- implement suitable town planning to take account of the conservation value of identified areas
- use the resources of the Ministry of Defence to undertake rehabilitation works
- control nutrient input from the catchment
- decrease salinity in the river
- revegetate the banks of the river to protect against erosion
- control vermin and noxious weeds

Settlement/ Urban Uses

- develop an overall landscape plan for towns considering redesign of roads, tree planting, reducing grassed areas and better water use
- resite rubbish tips away from the river
- ensure towns are deep sewered or septic tanks are appropriately placed
- investigate current rubbish and effluent disposal methods in regard to pollution of the river
- restrict development in the flood plain
- discourage housing along the banks of the river
- develop uniform building by-laws with respect to building in the flood plain
- develop guidelines in regard to river management and incorporate into town planning schemes

Industry

- develop appropriate new industries
- site industry in appropriate locations away from the river
- control effluent discharge from industry
- develop guidelines for industrial discharge

Management

- establish a coordinating management body for the Avon River System
- ensure this management body deals with flood mitigation, overall planning, river structure,building in the flood plain, financing, community involvement, coordination of all agencies involved in management
- define management responsibilities and review existing legislation
- adequately represent all interest groups in management decisions
- learn management techniques from past experiences elsewhere
- use expertise of Govt bodies such as WAWA, WADA and WWC in management
- introduce an Avon River land tax for management
- develop good management planning guidelines
- ensure community participation in management
- ensure a good communication flow
- introduce regulations on land use and activities in regard to the river
- provide incentives for the improvement of the river
- hold landowners responsible for management control
- coordinate information dissemination
- ensure urban dwellers are aware of issues confronting rural dwellers and develop interaction and cooperation between the two groups
- develop an appropriate composition and constitution for a coordinating body
- identify a vision for the river in the future and base management on this vision

Education

- educate the public on the extent of management issues and viable solutions
- utilise the press to raise public awareness
- disseminate information to community groups
- educate landowners adjacent to waterways to ensure good land management
- improve public awareness by education, sign posting and rate notices
- increase public awareness of recreation facilities and the public's responsibilities
- develop a school education programme
- ensure feedback of research reaches schools to develop a vision
- distribute information to farmers and all other interest groups
- develop small newsletters relevant to local areas
- develop an extension service for information
- take advantage of information networks e.g. local newspapers, LCDC newsletters and radio stations

Funding

- identify existing sources of funding and any alternative sources such as provision of goods and services rather than dollars
- identify who benefits and therefore who pays i.e. user pays system
- increase funding for research and development
- introduce tax incentives for land management actions
- ensure funding is used for on the ground works

Section 4: Management Framework

The following management framework was identified as being appropriate for managing the Avon River System:

- one coordinating body was required needing technical staff and a base
- the body should be represented by both geographical area and various users
- representation by LCDCS, LGAs and State govt agencies was stressed
- the body needs some sort of power
- the body would :
  - coordinate all other agencies involved in management
  - disseminate information
  - carry out research
  - implement management actions
  - carry out revenue raising
  - advise on development controls and determine land use
  - acquire and resume lands
  - raise public awareness
- other agencies would do the ground work

For the outer catchment the following suggestions were made:

- Land management would be better achieved through LCDCs not LGAs.
- A three part management body would be appropriate as the catchment is too large for one body i.e. Lochardt, Yilgarn and Avon catchments would be handled by separate bodies with links.
- A number of groups at the Beverley Workshop suggested the option of a Waterways Management Area under the Waterways Conservation Act with the establishment of a Waterways Management Authority. The Authority would coordinate management using powers under existing legislation. Feeling was that the extent of the management area should be the waterway itself.
- It was also suggested that the existing Avon River Systems Management Committee would be a suitable management body, however it required some sort of staffing, funding and powers to act.

Appendix 2
List of Submissions

Submissions towards the Avon River System Management Strategy were received from the following agencies and organisations. A summary of these submissions is available by contacting the Waterways Commission.

1. The Western Australian Farmers Federation (Inc.) - Bally Bally Balkuling Branch - Alan Smith
2. Toodyay Naturalists' Club - J.M. Masters
3. Brookton Shire Council - G.R. Thoan
4. The Western Australian Farmers Federation - Glen Thompson
5. Avon River Land Owners Group
6. The Western Australian Farmers Federation - Avon Valley Zone Council -C.P Richardson and R.J.Coniley
7. Greening Australia - Martine Sheltema
8. Department of Mines - CD Branch
9. Muresk Institute of Agriculture, Curtin University - John Jones
10. Town of Northam - D.S. Burnett
11. Department of Conservation and Land Management, Northern Forests Region - Syd Shea
12. Agricultural Protection Board of Western Australia - Roger O'Dwyer
13. River Conservation Society (York)
14. Department of Land Administration - P. McAdam
15. Department of Marine and Harbours - J.M. Jenkin
16. Office of Catchment Management - Sally Robinson
17. The York Society (Inc.) - Mrs P. Inkpen
18. The Shire of Northam - K.J. Higgs
19. Department of Land Administration - D. White
20. Water Authority of Western Australia - Peter Verschuer
21. Department of Aboriginal Sites - Robert Reynolds
22. Shire of Victoria Plains - F. B. Cooper
23. Western Australian Department of Agriculture - Darrel Brewin
24. Department of Planning and Urban Development - Jeff Barham
25. Western Australian Tourism Commission - Terry McVeigh
26. Water Authority of Western Australia - Jeff Waddington

Abbreviations

APB	Agricultural Protection Board
ARSMC	Avon River System Management Committee
BFB	Bush Fires Board
CALM	Department of Conservation and Land Management
CGs	Catchment Groups
DMH	Department of Marine and Harbours
DOLA	Department of Land Administration
DPUD	Department of Planning and Urban Development
EPA	Environmental Protection Authority
GOVT	State Government of Western Australia
HCWA	Heritage Council of Western Australia
ICMCG	Integrated Catchment Management Coordinating Group
LCDCs	Land Conservation District Committees
LGAs	Local Government Authorities
LO	Landowners
LRS	Local Rural Strategy
NPNCA	National Parks and Nature Conservation Authority
NTC	Northam Town Council
OCM	Office of Catchment Management
ROB	Ribbons of Blue
SLCC	Soil and Land Conservation Council
TPS	Town Planning Scheme
WADA	Western Australian Department of Agriculture
WAHMEMS	Western Australian Hazardous Materials Emergency Management Scheme
WAM	Western Australian Museum
WAWRC	Western Australian Water Resources Council
WASDA	Western Australian Sports Dinghy Association
WASES	Western Australian State Emergency Services
WATC	Western Australian Tourism Commission
WAWA	Water Authority of Western Australia
WWC	Waterways Commission
YLWG	Yenyening Lakes Working Group