



WATER AND RIVERS
COMMISSION

Supporting Information to
Draft Statewide Policy No. 4
Waterways WA
2000



Natural Heritage Trust
Helping Communities Helping Australia

WATER AND RIVERS COMMISSION

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1 Introduction

1.1 Preamble

Western Australia is poorly endowed with permanent lakes and flowing rivers. There are many issues facing our waterways and it is an enormous challenge for all Western Australians to work together to protect and enhance these precious assets.

The Draft Policy forms the basis for the first statewide discussion of waterways management. To date, the management of our waterways has been largely confined to specific waterways and has been in response to community or environmental pressure. It has not taken place within a statewide framework. A framework would increase certainty in relation to waterways management and enable the development of agreed management structures for achieving sustainable waterways management.

The Draft Policy does not propose any particular management framework. It is expected that discussions and submissions will begin to formulate the basis of a waterways management framework that can be developed with community support.

The Draft Policy allows the community as a whole to discuss priorities, management options and administrative structures. It provides an open and debateable process for considering waterways management in Western Australia. It aims to provide a common understanding of the issues facing waterways. It explains that, because of the diversity of State's waterway environments, we need a coordinated, multi-levelled and flexible management approach.

The Draft Policy assists in the sustainable management of waterways. It enhances environmental quality and reduces conflict between competing uses by articulating the management principles that sit behind many management decisions.

There are over 300 groups and organisations within Western Australia that have some interest in waterways management and use. It was not possible to consult all groups before the release of the Draft Policy. In order to gain some feedback on the direction of the Policy, the Water and Rivers Commission identified three key

stakeholder groups and a number of government departments to provide some initial, limited input to the Draft Policy. These included:

- Natural Resource Management Regional Chairs Group.
- Water and Rivers Commission (WRC) Stakeholder Council (composed of representatives of users and uses of water).
- Rivers and Estuaries Council, a sub committee of the Water and Rivers Commission Board.
- State Government Agency (NRM) Senior Officers Group.

These groups acted as a reference panel to gain community feedback on the direction and intent of the Draft Policy prior to its release. The Draft Policy will act as a launching pad for community discussion about how waterways should be managed in the State.

1.2 Background

Western Australia has 208 major waterways with a combined length of more than 25 000km. Many of these waterways and associated catchments are degraded as a result of human activities. Water quality is generally declining across the State, with many waterways carrying high loads of nutrients, sediment, and organic matter, and in some cases toxic chemicals. A large number of rivers are also becoming increasingly saline. There is growing community concern about the deteriorating condition of our waterways.

Western Australia's waterways are an integral part of our heritage, and a significant State asset with important social and economic values. Many waterways are important water and food sources for Aboriginal peoples, and places of spiritual and cultural significance for which they often have custodial responsibilities. Early explorers and settlers relied on good water supplies, and settlements were generally located close to rivers. Waterways still supply water for agricultural and pastoral uses and are a resource for commercial and amateur fishers. They are a focus for recreation in our predominantly dry landscape. Popular riverine activities include swimming, boating, picnicking and bushwalking.

Waterways also have important ecological functions. They provide important linkages between landforms and are home to a wide range of plants, animals and microorganisms, many of them unique to a particular region. The watercourse with its surrounding fringing vegetation provides habitat for in-stream and land-based wildlife. Permanent pools within a river system are an important refuge for fauna during prolonged dry seasons, and estuarine basins provide unique conditions for fresh and marine species. Often a riparian corridor is the only connection between remnant bush habitats.

A healthy waterway has a stable channel, which is supported and maintained by vegetation. This vegetation has a number of roles including habitat, holding the banks in place (reducing erosion), filtering material washed from the catchment and slowing water flow. Transportation and storage of water is one of the most significant functions of waterways. Floodplains and estuary basins help to carry floodwaters during major floods when rivers burst their banks and floodwaters spill out onto the land. Floodplains reduce the amount of water the river channel must carry during the height of a flood. This helps to protect the channel from incision and widening. This part of a waterway can be highly productive as a result of sediment which is deposited by the slow moving waters across the floodplain (Pen, 1999). Appendix 1 provides further information on the significance and function of the riparian zone.

1.3 Why is improved waterways management important?

In Western Australia, the need for sustainable management of waterways is vital. The State has very few permanently flowing rivers and lakes, even in the relatively cool and wet southwest. There are many degradation issues facing our waterways including loss of riparian vegetation, erosion, sedimentation, eutrophication, filling of the floodplain and salinisation. Only a few of the 208 rivers are unaffected by at least one of these issues.

It is predicted that Western Australia's population will increase from 1.8 million in 1998 to 2.7million in 2029 (WAPC; 1999). All regions of the State are expected to undergo moderate to sustained population growth,

with the majority of growth in the Perth and Peel regions. Increasing population growth, and associated economic development, will lead to changes in the environment, increasing demand for water and increasing pressure from activities such as recreation.

Waterway systems are the means by which the land is drained. They collect water and carry it through a landscape that has been predominantly shaped by water. Waterways are the natural drainage "infrastructure" of the State and therefore have a real asset value that requires maintenance.

Western Australians like to live around waterways and are attracted to them for recreation. In this sense rivers have real asset value, often reflected in crowds of people at leisure, property values and water supply potential. However, when they become flooded, eroded, clogged with sediment or infested with weeds and feral animals, they can become a liability.

Changes in rainfall and vegetation alter the relationship that water has with the land and in turn this will affect the waterway system. Not only is the amount of water leaving catchments increasing, creeks and rivers are still losing their supportive vegetation. Greater flows on exposed watercourses will result in serious erosion, and in some cases, especially during floods, catastrophic channel widening and channel shift, possibly resulting in the loss of property. In some areas floodplains, which are needed to contain floodwaters and dampen their damaging power, have been lost through landfill and levees, reducing the capacity of rivers to cope with floods.

Secondary salinisation of soils in agricultural areas and the consequent salinisation of waterways and wetlands is a widespread and growing problem in heavily cleared inland areas of the southwest. Whether drainage is carried out or not, rising groundwater will eventually intercept the land surface and begin increasing the amount of water flowing over the land, forming new watercourses and increasing the prevailing flows of existing creeks and rivers. Essentially, rising groundwater will cause increased flows in our rivers, mostly of brackish and saline water. The WA Government launched the revised State Salinity Strategy in April 2000 to address this problem. However it is acknowledged that salinisation

will get a lot worse before it is stabilised or reversed (SSC, 2000).

The widespread loss of fringing vegetation on foreshores and wetlands is most strongly demonstrated by the loss through clearing of approximately 70 per cent of the perennial native woody vegetation of the South West of Western Australia (Commonwealth of Australia, 1999a). This loss is mostly due to direct clearing, but in recent years salinisation, waterlogging and passive clearing by livestock have become increasing causes of concern (Govt of WA; 1998). With the loss of perennial native vegetation has come erosion and sedimentation along watercourses which, together with eutrophication, have led to a general change in ecosystem function in most rivers in the southwest.

With increasing population and the resultant degradation of inland waterways, estuaries have become increasingly important to the mainly coastal population of the southwest. Their main uses are for recreation, lifestyle pursuits and fishing (commercial and recreational). The management and protection of estuaries and inlets is directly tied to the stability of catchments and the healthy functioning of their river ecosystems.

In the north of the State, waterways are important as stock watering points, for agricultural and domestic water supply and, increasingly, for recreation and tourism. The State of the Northern Rivers Report (WRC, 1997) identifies erosion as a major impact affecting northwest waterways.

Increasing urbanisation particularly in coastal areas, brings management pressures on waterways, such as loss of riparian vegetation, filling of the floodplain and pollution of waterways from nutrient and chemical contaminants that are discharged via artificial stormwater systems.

It is clear that our waterways need effective management. The benefits of improved waterways management include:

- the direct values that waterways provide, such as drainage, water supply, recreation, landscape, enhanced property values, food supply (fish); and

- the prevention of the very negative outcomes generated by inappropriate management, such as erosion, sedimentation, eutrophication, stagnation and even flooding.

The size and variability of waterway systems, combined with a wide range of land uses and tenure within catchments, make it difficult for any one group to achieve effective on-ground management. The continuous nature of most waterway systems means they need to be managed cooperatively between all individuals, businesses, agencies and groups that live and work in the catchment.

This cooperative approach has been evolving in Western Australia for the past decade and particularly in the past five years. Natural Resource Management (NRM) has developed in response to the need for a more cooperative management of natural systems. Many natural resource management groups have formed in Western Australia. Their focus ranges from urban drains, to river catchments and regional basins. These groups are not just dealing with waterways management, they are often aiming to tackle environmental degradation while balancing social and economic considerations of all the resources in the area. This integrated approach is also needed in relation to waterways.

In recent years regional natural resource management groups have considered waterways issues and management options as part of an overall sustainable resource management framework. In December 1999 the Government of Western Australia endorsed the Natural Resource Management Framework Policy, which describes how government and the community will develop partnerships to coordinate and implement natural resource management (Government of WA, 1999). Section 5 provides more detail on natural resource management in Western Australia.

Despite widespread degradation of rivers, wetlands, estuaries and inlets, these features remain some of the State's most cherished natural resources. There is growing pressure from the community to increase the protection and restoration of waterways throughout the State.

The challenge is finding a way to spread the available resources equitably and efficiently across the State so

that waterways systems are managed effectively for current uses while maintaining a wide range of options for the future. Sustainable waterways management means taking a long-term view of resource use and degradation. In order to maintain the integrity and function of waterways in the long term there may be instances where short-term uses of the resource cannot be supported or where significant restoration of the resource is required to reopen future options.

1.4 Structure of this Document

This document has the following structure;

Section 1	Introduction – setting the scene for waterways management
Section 2	Discussion of the issues and values, management problems and solutions, associated with waterways
Section 3	Policy content – setting the direction for waterways management
Section 4	Roles and responsibilities relating to waterways management
Section 5	Natural Resource Management in Western Australia.

1.5 Definition of a Waterway

The definition of a waterway may vary in relation to land-use, administrative or legal requirements or from an ecosystem perspective of the land influencing the stream.

In the Policy, the following definition is used;

A waterway consists of:

- a stream system and its associated banks;
- wetlands that overflow to a stream or are predominantly stream fed (ie. limited groundwater contribution); or
- the receiving lake, estuary or inlet at the base of the system; and
- the floodplains associated with these features.

The management response to waterways will vary with the locality in Western Australia. For example, consideration of floodplain issues and management are more easily incorporated into management strategies where the floodplain is only a couple of hundred

metres wide. Where a floodplain is a few kilometres to hundreds of kilometres wide floodplain issues take on a different dimension. Figure 1. describes the typical areas in and around a waterway ie the riparian zone.

1.6 Timeframe of the Policy and Comment Period

The aim of improved waterways management is not to reproduce pristine conditions or to prevent variability; it is to ensure sustainability and to reinstate stability where necessary. Waterway processes occur in time spans from seconds to years. Long-term processes are particularly difficult to manage because human perceptions are often relatively short-term and it may take from several years to generations for management solutions to show any impact (Prosser, et al, 1999). In some cases, the causes of problems no longer exist today but the symptoms remain. In other situations, the full impact of some current practices have not have yet been reached (eg salinity in the southwest).

The intent of the Draft Policy is to establish a long-term vision and objectives for managing waterways within Western Australia. It has been prepared to enable the community to have input and influence the direction of the State's waterways management. The comment period is open until the end of January 2001. The comment period will also enable more detailed discussion on waterways management and assist in the development of an associated to identify key actions required.

It is expected that some form of statewide strategy will be required to address issues such as statewide research, on-ground management options and administrative structures. However, the intent is not to duplicate work already undertaken by natural resource management groups in managing waterways.

Having a say enables you to influence the direction of waterways management in Western Australia. All comments, whether relating to the whole state or regarding a local waterway, can help the Water and Rivers Commission to understand the community's desires, expectations and priorities for waterways management.

The comments received will be reviewed and a final Waterways WA Policy released in 2001. For the Policy to maintain its relevance it requires review so that progress can be assessed, new information incorporated and relevance maintained. In this context the Waterways WA Policy will be reviewed and updated every five to seven years. Measurement of

progress could include milestones, targets and feedback. Many of these aspects will be developed during the comment period and others, as it is implemented.

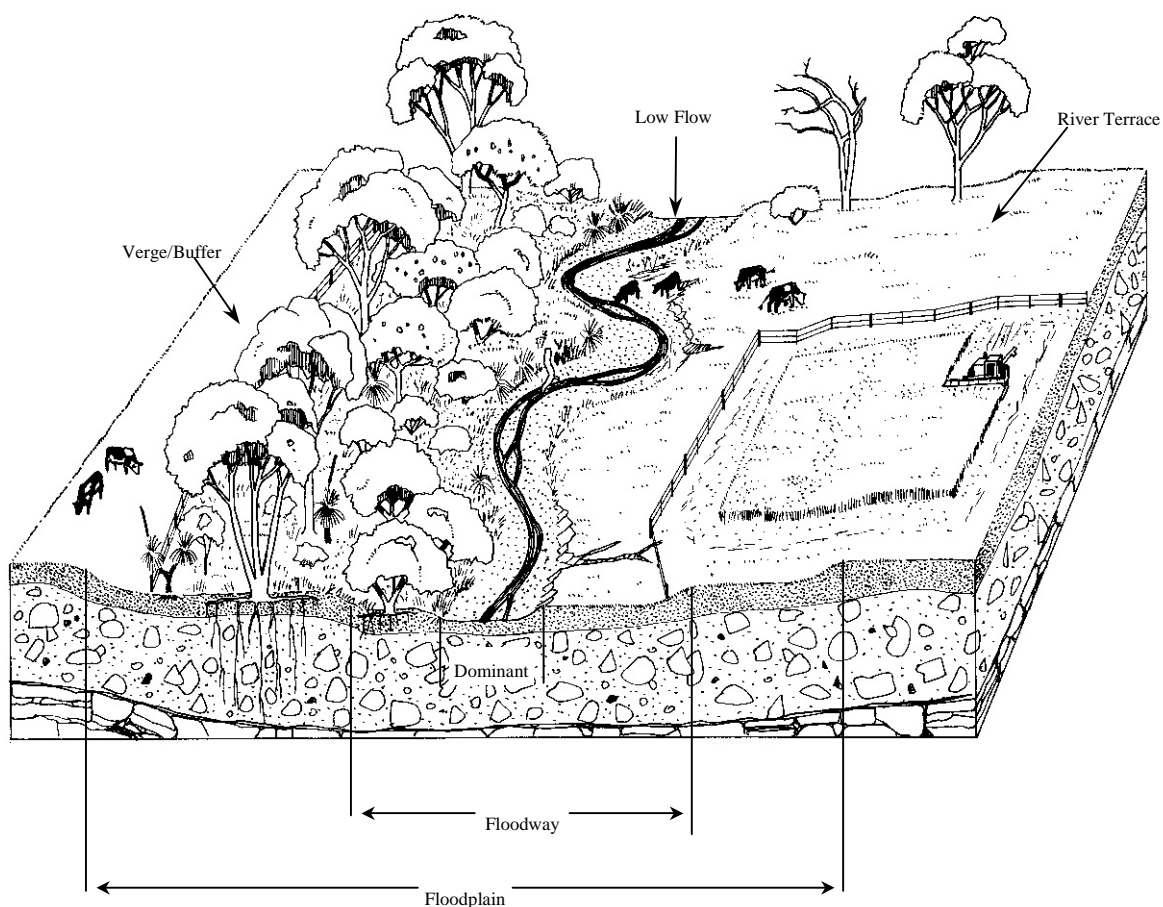


Figure 1. A diagram of the riparian zone and associated lands.

2 Values and Issues

2.1 The Value of Waterways

Waterways are used by people for a wide range of purposes and have intrinsic values and functions. Community expectations of the value and function of waterways differ and include:

- water conveyance;
- amenity – recreation, property values, tourism;
- water supply;
- ecosystem or habitat – biodiversity;

- wildlife sanctuary and drought refuge;
- ecological corridors (between remnant bushland habitats);
- landscape and aesthetics - WA's heritage;
- filtering and storing material;
- flood plain protection and floodwater containment and control;
- navigation;
- commercial and amateur fisheries (food source);
- social and cultural association; and
- Aboriginal heritage.

2.2 Issues and Symptoms of Waterway Decline

Table 1. An overview of the range of problems, symptoms and causes of waterway decline

Problem	Symptoms (State)	Cause (Pressure)
Instream and riparian vegetation degradation	<ul style="list-style-type: none"> • Declining riparian vegetation. • Exposed and eroded foreshores. • Erosion and sedimentation. • Ecosystem decline. • Fragmentation. • Loss of diversity. 	<ul style="list-style-type: none"> • Livestock grazing. • Salinisation and waterlogging due to clearing. • Inappropriate fire regimes.
Exotic plant and animal invasions	<ul style="list-style-type: none"> • Weed infested foreshores. • Clogged waterways. • Loss of native vegetation. • Altered stream ecology. • Ecosystem degradation. • Threat to native species by predation and disease. 	<ul style="list-style-type: none"> • Weed infestations. • Introductions and garden escapees. • Aquaculture escapees. • Existing pests.
Nutrient enrichment (diffuse sources)	<ul style="list-style-type: none"> • Declining water quality. • Algal blooms – macro and micro. • Fish kills. • Loss of seagrass. • River pool stagnation. • Anoxic events. 	<ul style="list-style-type: none"> • Nutrient and organic matter transport from catchments.
Point source pollution.	<ul style="list-style-type: none"> • Declining water quality. • Algal blooms – macro and micro. • Fish and invertebrate fauna kills. • Loss of seagrass. • Anoxic events. 	<ul style="list-style-type: none"> • Discharge of pollutants (including nutrients). • Biocide use.

Problem	Symptoms (State)	Cause (Pressure)
Stream salinisation	<ul style="list-style-type: none"> • Decreased useability of water. • Dying vegetation. • Changes from freshwater to saltwater conditions. • Salinised stream water quality. • Exposed foreshores. • Erosion and sedimentation. • Loss of diversity. 	<ul style="list-style-type: none"> • Altered catchment hydrology brought about by clearing.
Waterlogging and inundation	<ul style="list-style-type: none"> • Dying vegetation. • Increased extent of water logging along waterways. 	<ul style="list-style-type: none"> • Altered catchment hydrology brought about by clearing. • Inadequate drainage (especially culverts). • Sedimentation of waterways.
Streamflow changes.	<ul style="list-style-type: none"> • Declining basal flows. • Vacant niches for invasive species. • Blockage to fish passage. • Altered flow regimes. • Drowned river valleys. • Stagnation. • Altered timing, pattern and volume of flow. • Loss of wetlands. 	<ul style="list-style-type: none"> • Damming of streams. • Weirs, culverts, crossings. • Pumping from streams and wetlands. • Drainage. • Extraction. • Increased groundwater levels.
Flooding	<ul style="list-style-type: none"> • Increased flood frequency. • Increased flood damage. • Use of floodplain for development. • Erosion. 	<ul style="list-style-type: none"> • Inappropriate floodplain development.
Drainage	<ul style="list-style-type: none"> • Degraded drains. • Erosion and sedimentation. • Weed infestation. • Eutrophication of downstream waterways. 	<ul style="list-style-type: none"> • Rural and urban drainage. • Channel straightening and desnagging.
Channel changes	<ul style="list-style-type: none"> • Channel widening and deepening. • Changes to riffle patterns. • Instream erosion and sedimentation. • Floodplain erosion. • Loss of river pools. 	<ul style="list-style-type: none"> • Altered catchment discharge regime and loss of vegetation. • Direct excavation of channel bed.
Instream and riparian zone use	<ul style="list-style-type: none"> • Foreshore degradation. • Use options limited. • Degradation of high value sites. • Degraded river pools. 	<ul style="list-style-type: none"> • Conflicting and unsustainable use of the riparian zone.

3 Background to Policy Vision, Guiding Principles and Objectives

Figure 2 illustrates the sustainable development approach being promoted by the OECD and the direction being promoted by the Commonwealth Government. It illustrates that for an economic outcome to be achieved it must be in the context of social requirements, which ultimately rely on the foundation of a healthy and resilient ecosystem.

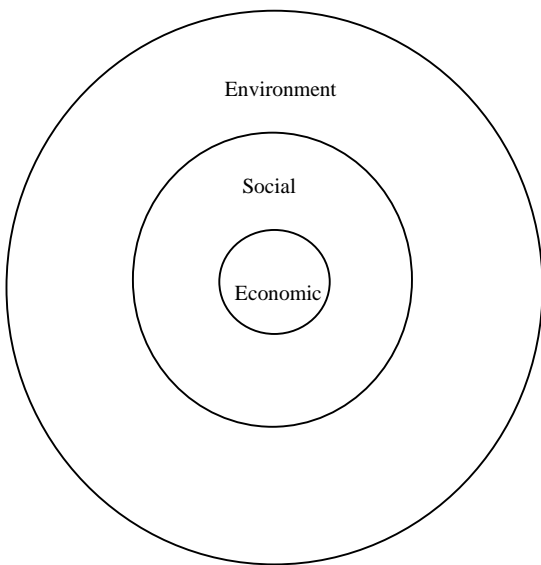
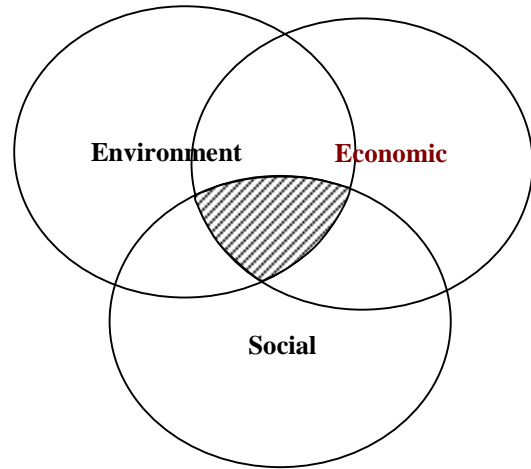


Figure 2. OECD model

Natural resource management is not just about managing the impacts of human activities, it is also about managing the impacts of natural processes on humans. This means balancing the demands between economic, social and environmental needs and integrating these through planning and implementation. The objectives of the Policy have been developed to achieve outcomes that meet environmental, social and economic values. This is not easy. As Figure 3 shows there are times when there is common ground between all three aspects and there will be times when one dominates over the others. However, regardless of which aspect may dominate, the aim is always to achieve sustainability. We are trying to achieve gains in the long-term, not just in the short-term.

Figure 3. Model balancing social, economic and environmental needs



It is important to recognise that there are competing demands for water resources and that some compromises will need to be made. For instance, water is often extracted for uses that conflict with environmental maintenance. The amount of water that is made available for diversion needs to account for the amount of water required to sustain the key ecological values of water dependent systems. The natural water regime such as timing, frequency, duration, extent, depth and variability of flow also needs to be considered. This is known as the Ecological Water Provision (WRC, 1999) and needs to be incorporated into any decisions on water allocation. The result may involve some compromise between ecological, social and economic goals.

Waterways management is one component of natural resource management. In Western Australia there are a number of waterway systems that have been managed for more than 20 years. In some instances policies have been developed to guide development on and in waterways. Many of the experiences and lessons learnt from these locally focussed policies have application across the State.

Management of any natural resource involves balancing the intended use of the resource and the consequences of that use. Clear outcomes are needed to identify the intention and expected results of management actions. In the Policy three levels have been developed and Table 2 provides a brief description of these.

Table 2. The three levels of the statewide waterways management policy

Level	Aim
Vision	Identify the broad outcomes intended by management actions.
Guiding Principles	Articulate the fundamental tenets against which statewide objectives and decisions are made.
Objectives	Define the specific focus for action.

Further definition of specific strategies required to implement the objectives has not been defined. This is because:

- Natural Resource Management is evolving quickly in the State;
- many regional strategy groups are developing specific actions for waterways management and this may be the most efficient mechanism for implementation of the Policy; and
- the intent of the Policy is to establish direction for waterways management and to use the comment period for discussion of the options for waterways management.

4 Vision

The Vision for the Policy articulates the long-term outcomes expected from waterways management. It tries to encompass the wide range of situations in Western Australia, to describe an ultimate goal to work towards.

The Policy is intended to provide for the widest possible range of economic, social and environmental options. The term healthy is used to describe the physical, chemical and biological condition of a waterway. This does not mean that the system is unchanged but is functioning in the optimum way for the range of beneficial uses identified for that waterway. In this context the Vision for Western Australia's waterways is:

Healthy waterways that provide for a range of environmental and human needs

5 Guiding Principles

Guiding principles have been developed to form a common understanding of good waterways management and highlight a range of considerations. The Guiding Principles have been developed under the headings - economic, social and environmental - to support the development of the Vision and Objectives for waterways management.

Although the Guiding Principles have been developed in this way, they **relate to each other and are never completely independent of each other**. This is important as it starts to demonstrate the complexity of relationships surrounding waterways management.

In the Draft Policy no hierarchy of Guiding Principles has been presented, all are equal. Pressures on waterways differ throughout the State in extent, intensity and ease of management. Therefore, the application of the Guiding Principles will vary from waterway to waterway, catchment to catchment and even region to region. It is at these levels that groups involved in managing waterways will determine the importance and priority of each Guiding Principle.

5.1 Economic Principles

<i>E1</i>	<i>Balance short and long term economic development with impacts on social and environment aspects.</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Sustainable use that does not compromise future options. • Minimising conflicts over different expectations between different users. • Appropriate application of the user pays principle. • Enabling multiple uses where compatible, recognising active and passive uses. • Fair and equitable public and commercial use.
<i>E2</i>	<i>Recognise the role of waterways, including their economic function</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Waterways as natural and artificial drainage infrastructure. • Uses of waterways linked to ecological integrity and public health. • Flooding and hydrological function.
<i>E3</i>	<i>Support economic development in accordance with sustainable development and precautionary principles (see Glossary)</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Fair and equitable decisions when there are competing economic demands. • Determine resources available to support current and future economic development. • Prevention of environmental degradation at the earliest opportunity. • Use 'best management practice' and 'best bet' in face of uncertainty or lack of information regarding impacts, management and restoration. • Establishment and maintenance of environmental flows.

5.2 Environmental Principles

<i>W1</i>	<i>Prevent degradation, address the causes of problems and implement appropriate management actions</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Managing deleterious impacts on waterways. • Waterway problems are symptoms of catchment problems. • Need to manage both the short-term symptoms and long term impact. If only treat symptom (ie short-term management options like oxygenation) and not the longer-term cause, the symptom will recur. • Stabilise and restore catchment and waterway processes to agreed standards. • Use best management practice and best bet in face of uncertainty or lack of information regarding impacts, management and restoration.
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W2	<i>Recognise that waterways provide essential habitats and have a high landscape value</i>	<p>Examples:</p> <ul style="list-style-type: none"> • The diverse habitats that waterways provide and the landscapes they are part of. • Appreciation of wide diversity of waterway dependent flora and fauna. • Importance of drought refuge and watering places for native and non-native species. • Importance of marine life regeneration areas. • Maintenance of physical, chemical and biological processes and values, including ecological flows and biodiversity. • Maintenance and improvement of water quality (National and State Water Quality Management Strategies).
W3	<i>Take action to manage high value waterways</i>	<p>Examples:</p> <ul style="list-style-type: none"> • High value may not necessarily mean good condition. • Protection is one form of restoration. • Focus where issues show the greatest potential for recovery.
W4	<i>Develop adaptable management that recognises the dynamic nature of the environment and that knowledge is constantly changing.</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Dynamics changed by human activities. • Seasonal extremes and protracted conditions such as drought and flood. • Shared understanding facilitates informed decision making and planning. • Incorporate local knowledge where possible and useful. • Identify and address the gaps in knowledge needed for effective management.

5.3 Social Principles

S1	<i>Recognise Aboriginal peoples' cultural values and knowledge of waterways</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Aboriginal peoples rights, traditional land-use practices and cultural significance. • Compliance with <i>Aboriginal Heritage Act 1972</i> (WA) and <i>Native Title Act 1993</i> (Cwlth) as appropriate.
S2	<i>Recognise cultural and social significance of waterways</i>	<p>Examples:</p> <ul style="list-style-type: none"> • Educational and scientific values. • Recognise peoples historical value, knowledge of and connection to the environment. • Comply with the Heritage Act as required.

S3	<i>Apply a whole of catchment, integrated management approach</i>	<p>Examples:</p> <ul style="list-style-type: none">• Management actions integrated with other catchment activities.• Consistency with National and State NRM Framework Policy; Salinity Strategy; regional strategies, integrated catchment management at the catchment level.• Maximising opportunities for stakeholder involvement in decision making.• Shared investment principles.• Maintain integrated approach to land and water planning and management.
S4	<i>Manage in partnership with the community now and in the future</i>	<p>Examples:</p> <ul style="list-style-type: none">• Considering and protecting the widest range of possible options for use.• Agreed transparent framework for managing waterways in partnership between community and government.• Minimising and managing impacts of land use activities which affect waterways.• Improve understanding, using local knowledge.• Creating opportunities for community involvement in waterways management.• Involvement in deciding on trade-offs between short and long-term benefits.
S5	<i>Public access to a wide range of uses</i>	<p>Examples:</p> <ul style="list-style-type: none">• Waterways available for a wide range of uses: recreation, tourism, agriculture, industry, etc.• Hard decisions when there are competing demands.• Created amenities to accommodate specific pressures.• Landscape values of natural, modified and artificial waterways.
S6	<i>Manage for future generations</i>	<p>Examples:</p> <ul style="list-style-type: none">• Maintaining the widest range of options possible.• Consider the impacts of decisions on future options.• Setting priorities for management focus.

6 Objectives

The objectives for the Policy stem from the need to sustainably manage Western Australia's waterways.

The Objectives are structured in the following way:

- Objective – outcome to be achieved.
- Supporting Statements – justification and background for the objective.
- Linkages – identifying linkages with some other State and Federal programs.

6.1 Objective 1: Improve Understanding of Waterways

6.1.1 Supporting Statement

Waterways in Western Australia are exhibiting signs of stress associated with salinisation, loss of fringing vegetation, eutrophication, erosion, sedimentation, contamination, water extraction and weed and feral animal invasions. To understand the extent of impacts associated with these environmental issues and to effectively manage them, a detailed understanding of the structure and function of our waterways is required. Current understanding is largely restricted to freshwater streams in coastal and forested areas and estuaries of the southwest. While it is not possible to understand every system in detail, there is a need to expand the knowledge of the dynamics of nutrient and energy source, biological interactions and food web structure, in a broader range of geological, climatic and hydrological conditions.

It is important that up to date information on our understanding of waterway structure and processes is available to the community to assist in raising the general awareness on how waterways function. Education and awareness programs can also contribute to a sense of social responsibility regarding water values and uses and to greater participation in management activities.

The community and government agencies are gradually increasing preventative and restorative actions to address waterway degradation, as well as undertaking baseline and investigative monitoring. An increased understanding of waterway functions will enable the

development of appropriate monitoring and assessment methods. These methods can then be used by the community to measure the effectiveness of their management activities.

Training in data collection and analysis, and tools to encourage information exchange need to be in place at local, regional and state levels to assist in improving management. In addition, the value of indigenous knowledge and historical information on waterway condition should be incorporated where possible.

In addition to raising community interest in rivers and their restoration, it is necessary to increase community knowledge of the technology available for protecting and restoring waterways. Currently, restoration techniques have been developed for the south-west of the state. Techniques still need to be developed for a wider range of conditions and waterways types.

Waterways are not isolated in the environment. They are intricately linked with catchment processes and groundwater flows. Understanding the linkages within the hydrologic cycle and understanding land processes is important to the development of appropriate and effective management of waterways.

The development of techniques that simulate waterways in a catchment setting and provide decision support for management approaches (eg modelling) can be useful in the development of adaptive management approaches.

6.1.2 Linkages

Ribbons of Blue / Waterwatch

Land and Water Resources Research and Development Corporation (LWRRDC):

- Rehabilitation and Management of Riparian Lands, National R&D Program.
- Natural Eutrophication Management Program.

National Pollution Inventory

6.2 Objective 2: Protect Waterways of High Environmental, Scenic and Heritage Significance

6.2.1 Supporting Statement

Western Australia has many diverse landforms and our waterways are no exception to this. Waterways that remain in a pristine or near-pristine condition are relatively rare and therefore are an important part of our heritage. It is important to conserve the reaches, sections and rivers that are healthy and in near pristine condition.

The Water and Rivers Commission participated in a national study funded by the Australian Heritage Commission, aimed at identifying all of Australia's 'wild' rivers. These are defined as those "rivers which are undisturbed by the impacts of modern technological society" (Williams; 1999). In Western Australia, 26 rivers were identified as 'wild' (see Appendix 2). More than half of these are located in remote and very sparsely populated areas in the northwest of the State and the majority have catchments located within Crown Land. The combined length of these waterways is estimated to represent only 1% of all the State's rivers.

In Western Australia, there are other rivers that do not fit the Australian Heritage Commission's 'wild' definition but can be considered least disturbed or of local, regional or statewide significance for their environmental, scenic or heritage attributes. These are highly valued and are in need of special management.

Many of Western Australia's National Parks and reserves incorporate waterway features within their boundaries and the waterways often form a significant attraction for the park. Some of these National Parks are Geikie Gorge (Fitzroy River), Windjana Gorge, Tunnel Creek, Millstream-Chichester, Karijini, Rudall River, Shannon, Stokes, Walpole-Nornalup, and Waychinicup.

There are a number of international agreements to which Australia is a signatory, which address management and protection of waterway systems, in particular migratory bird habitats. In signing these agreements, Australia is bound to protect these habitats as much as possible. In Western Australia there are

nine sites registered on the "Ramsar List" (see Appendix 2) and various types of reservation protect all sites. Six of these sites are classified as waterways in the Policy. These are Lake Toolibin, the Lake Warden system, Lakes Argyle and Kununurra, Peel-Yalgorup and Vasse-Wonnerup.

6.2.2 Linkages

Federal Wild Rivers Program
 Japan Australia Migratory Bird Agreement
 China Australia Migratory Bird Agreement
 Convention on Wetlands (RAMSAR)
 Biodiversity Convention
 Rio Agreement - Agenda 21 (Keating; 1993)
 World Heritage Convention
 National Parks and Reserves

6.3 Objective 3: Manage Waterways to Agreed Conditions for a Range of Uses

6.3.1 Supporting Statement

Healthy waterways are central to the existence of a large variety of flora and fauna and are vital to our society. Overuse, climate change and some land-use practices are, however, threatening the availability of water for consumptive and non-consumptive uses and the maintenance of natural systems. Waterway degradation, in particular declining water quality, has the potential to limit economic growth and recreational activity.

The environmental condition of a waterway is determined by the condition of the land immediately adjacent to it; by land use activities within the catchment; and by the quality of water draining from the catchment. Thus, sustainable management of a river section will involve in-stream riparian management, to stabilise the channel or improve conditions downstream, and catchment management, to improve water quality and preserve hydrological regimes. The particular management technique involved depends on the range of environmental values and beneficial uses desired by the community. Both components of management are part of integrated catchment management. They reflect the need to

consider the immediate environment of the waterway and the broader catchment.

The scope of waterways management is broad, complex and occurs at a variety of scales. These include statewide waterways, regional, catchment and local waterway action planning. The debate on how to manage waterways is often very diverse and inter-related. The variety of demands inevitably leads to tensions and a potential for the criticism of administrative arrangements and political processes (Waterways of WA, 1994).

The complex nature of waterways management means that any framework needs to be flexible, responsive, multi-levelled and inclusive. Waterways cannot be managed in isolation due to the direct links between catchment health and waterway condition. Therefore, waterways management is one component of integrated natural resource management.

Determining the desired uses for waterways assists in defining the conditions required to undertake those activities. Development of targets for waterways helps to establish the baseline condition, provide a set of conditions to aim for and enable measurement of progress for achieving those aims. Targets can cover scientifically derived water quality parameters (ie specific concentration targets), or biological aims (like returning marron to a river or measuring invertebrate communities to assess change). They can also include improvements to the condition of foreshore vegetation. Gaining agreement on uses and targets allows consistent and complementary decision making by the various individuals and groups with responsibilities for management.

6.3.2 Linkages

Swan-Canning Clean-up Program
National/State Water Quality Management Strategy
State Salinity Action Plan (1996)/Strategy (2000)

6.4 Objective 4: Achieve Economic Benefits Based on Sustainable Use of Waterways and Their Catchments.

6.4.1 Supporting Statement

Waterways are economically valuable assets for Western Australia as they supply water for urban, agricultural, industrial and pastoral uses. Waterways also provide a focus for the aquaculture, recreation and tourism industries, including commercial and recreational fishing, and have important aesthetic value. It is difficult to put an exact dollar value on waterways but it should be acknowledged that they contribute to an agricultural industry with an annual market value of \$5 billion in the south-west alone, commercial fisheries worth \$11.2M (based on the value of fisheries that take species with estuarine component to their life cycle) and a tourism industry worth \$2 billion. In addition, river and estuarine frontage or views often improve land values.

Activities associated with urban, industrial and agricultural development both directly and indirectly affect the condition of waterways. Direct impacts include the diffuse and point source input of nutrients and other pollutants to waterbodies, clearing of riparian vegetation, channelisation and the diversion of water. Waterways are also affected by land clearing for urban and agricultural development that result in increases in salinisation, water volume, erosion and sedimentation. These impacts affect their economic value. For example, a decline in water quality can have direct effects on fisheries and can also affect agriculture by reducing the quality and quantity of water that is available for use.

Many waterways are showing signs of declining health, which threatens both the State's capacity to generate revenue and its social well being. The declining health of waterways threatens important recreational and commercial fisheries, recreational and tourism activities, commercial and agricultural development and land values in both urban and agricultural areas. For example, in the State's south-west, more than one-third of the previously divertible surface water resource has become brackish or saline and is no longer available for domestic, agricultural or some industrial uses (SSC, 2000).

The challenge is to develop and retain innovative and competitive industries that minimise impacts on the sustainable use of the State's water resources. This requires cooperative approaches between government and the community to recognise the value of waterways across a range of conflicting and overlapping uses and develop management strategies that balance competing needs. It will not always be possible to balance the economic, social and environmental requirements. In these cases trade-offs will need to be made. Such decisions will need to consider both short and long-term benefits associated with development compared with the costs in terms of both environmental degradation and the loss of associated values. Where trade-offs occur, every effort should be made to minimise damage to the environment through the implementation of best management practice.

Remediation and resource replacement programs are expensive. Examples include the cost of the Dawesville Channel, associated catchment management and associated monitoring, estimated at \$64m; the Swan Canning Clean-up Program costing \$16.5M; and salinity management in water supply catchments estimated at \$100M. In the long term the cost of reversing the declining health of waterways may be far greater than the cost of prevention.

6.4.2 Linkages

Water Allocation planning
Draft Environmental Water Provision Policy for WA
State development
Water sensitive urban design

6.5 Objective 5: Protect and Enhance Water Quality and Amenity

6.5.1 Supporting Statement

Waterways are used in a wide variety of ways, including extraction for drinking, industrial and agricultural use, recreational activities and the environment. The level of degradation of a waterway directly affects the quality of recreational experience and the range of uses it can have. The most common forms of degradation in Western Australia are water

quality, nutrient enrichment, salinisation, turbidity, and sedimentation/erosion of river pools and reaches.

In many areas of the State, particularly the southwest, algal blooms are occurring as a result of large increases in nutrients. Excessive algal blooms are a clearly visible sign that the water has changed. In some southwest areas the type and intensity of blooms has led to the waterways being closed to direct contact. Blooms usually occur during summer or autumn, when recreation is at its peak.

Maintenance of certain water quality conditions is also important for ecosystem function and survival of aquatic animals (such as fish, crabs, prawns, and marron). Small increases in nutrients may be beneficial to fisheries increasing food availability and productivity of the system. However, algal blooms can threaten aquatic life. The blooms may smother aquatic plants and animals and as the bloom dies it can cause a significant shortage of oxygen in the water leading to their death.

It is important to assess the water regime needed to sustain water dependent ecosystems before water is allocated for other uses. The volume of water taken from a waterway can affect the downstream condition. The process of allocating water for environmental and other uses usually involves a balance between ecological, social and economic goals (WRC 1999).

The condition of a waterway is directly linked to the activities of land users in the catchment and within the waterway. Non-consumptive or in-stream activities such as boating, fishing and in-situ land-use practices can degrade the quality of the waterway by the addition of litter, chemicals, increased noise, and by trampling of foreshore vegetation. Changes in catchment condition (eg clearing), and use of chemical supplements and controls decrease the quality and increase the quantity of water reaching waterways.

For example, salinity has developed as a major water quality issue in Western Australia. It has had a wide ranging impact on agricultural production and implications for water resources, biodiversity, increased flood risk and risk to rural infrastructure (SSC, 2000). Clearing vegetation and the use of shallow-rooted crops has resulted in increased recharge without a subsequent increase in discharge. This has

resulted in rising groundwater levels, bringing saline waters closer to the soil surface.

6.5.2 Linkages

Swan Canning Clean-up Program
 Vasse-Wonnerup Restoration Program
 National Eutrophication Management Program –
 LWRRDC – Wilson Inlet
 Salinity Strategy – water management strategies
 State Water Quality Management Strategy – SWQMS
 (Government of WA, 2000)
 National Water Quality Management Strategy –
 NWQMS
 Draft Environmental Water Provision Policy for WA

6.6 Objective 6: Protect Social and Cultural Values When Managing Waterways

6.6.1 Supporting Statement

Western Australia's waterways are an integral part of our heritage, and a significant State asset with important social and cultural values. There is a mixture of social and cultural responses that people have to waterways. For example, Princess Royal Harbour, Albany, is a marine embayment managed to allow a range of uses including shipping, eco tourism, aquaculture, water sports, and domestic land values.

Many waterways provide water and food resources for Aboriginal peoples, as well as places of spiritual and cultural significance for which custodial responsibilities are still being recognised. Therefore, it is important that the wider Western Australian community appreciates the interests of Aboriginal people in respect to their connections to land and water.

Waterways are also important in a historical sense to the broader Western Australian population. Early European settlements were often associated with rivers because of the need for water. Significant historic sites on waterways include the remnants of agricultural buildings, jetties, water mills, whaling stations, homesteads and aquatic sports buildings.

The cultural significance of waterways is also relevant to present day activities. Western Australia's rivers

offer a diverse range of physical settings and scenic attractions. Many of our waterways are the focus of day trips and tours for people that live within the state, interstate or overseas. There is also an increasing trend towards eco-tourism and the State's remote waterways in the Pilbara and Kimberley regions are popular tourist destinations.

Waterways are a focus for recreation in our predominantly dry landscape offering relief and contrast. Popular recreational activities include swimming, boating, aquatic sports, picnicking, camping and bushwalking. Other social activities take place in riverine settings because of their aesthetic qualities, such as outdoor arts activities and community events like the Australia Day fireworks on the Swan River. The various landscapes of Western Australia's waterways are a source of inspiration for artistic expression.

Communities expect local waterways to remain in good condition, look attractive, retain good water quality and be available for a range of uses. This expectation is linked to the desire for a good quality of life. Issues which affect waterways and people's quality of life can also be health related such as the quality of water and water borne disease such as Ross River Virus. The issue of the protection of life and property from flooding is also a major social pressure.

Pressures associated with increasing urbanisation and its effects on waterways can also affect quality of life. In urban areas waterways and foreshores are often included as part of the limited open space and are often subject to intensive use. In some waterways, pressures created for particular uses generate the need to develop nodes for recreation and/or environmental management.

Waterways, like any form of natural or artificial amenity, need maintenance and can take only so much use before they degrade. Careful planning and management is required to ensure that the availability of waterway amenity is in proportion to the demand. Finally, people's regard for and expectations of waterways are largely governed by perceptions. For example, people living on floodplains enjoy the benefits associated with the waterway but seldom accept the associated flooding as a normal occurrence. Waterway management must address perceptions and

increase people's understanding of waterway conditions and functions.

6.6.2 Linkages

State Wetlands Policy
Draft Environmental Water Provision Policy for WA
State Planning Policy

6.7 Objective 7: Increase Community Awareness and Involvement in the Management and Protection of Waterways

6.7.1 Supporting Statement

To ensure successful management of the State's waterways, it is essential to have a well-informed community that understands and values the environmental services provided by them. Community interest and care for rivers is a first step to community action to protect, restore and manage waterways.

To facilitate involvement in waterways management it is important to develop programs that aim at increasing awareness and understanding and provide readily accessible information. Examples of these programs include Ribbons of Blue and River Restoration.

A community with a good knowledge base is more likely to appreciate, care for and respect waterways, particularly if there is a strong appreciation of the pressures that degrade waterways. Informed communities are more likely to advocate, support and lead initiatives for the protection, enhancement and sustainable use of waterways. A community like this will accept the constraints on use and will want to be involved in the management and decision making process.

Effective waterways management requires the cooperation of all sectors of the community and government. Involvement from community members is critical to the identification and prioritisation of management issues within an area. Cooperation can be fostered through partnerships between governments, industry, non-government organisations, individual land managers and community groups.

6.7.2 Linkages

Ribbons of Blue/ Waterwatch
Regional Natural Resource Management Strategies
Regional Natural Resource Management Groups
Integrated Catchment Management Group
Landcare Conservation District Committees
Landcare Groups
River Restoration Action Planning
River Restoration Action Team
Community networks and groups

7 Roles and Responsibilities

7.1 Water and Rivers Commission

There are many organisations throughout Western Australia that are currently involved in waterways management. The Water and Rivers Commission has the primary role of water management in the state. The role of the Commission is to ensure that Western Australia's water resources (including rivers, estuaries, wetlands and groundwater) are managed to support sustainable development and conservation of the environment, for the long-term benefit of the community. The Commission provides services to the community through three broad sub-program areas:

- Water resource investigations - the investigation of the quality (condition), quantity and location of ground and surface waters resources.
- Water resource allocation and management - the allocation and management of the efficient use of water resources.
- Water quality and conservation - the conservation, protection and enhancement of water quality for public, private and environmental uses or values.

It is the Commission's Vision "to excel in water resource management by ensuring that water and rivers are used wisely for the whole community" with the mission being "to manage the water resources of Western Australia for the benefit of present and future generations in partnership with the community".

In this regard it is the Commission's responsibility to:

- allocate water resources between competing interests to ensure sustainable use and conservation

through mechanisms including licensing and education;

- protect water quality;
- conserve and manage the State's rivers and waterways through maintaining or enhancing their public amenity;
- investigate the health and extent of groundwater resources;
- measure water flow and quality;
- investigate, measure and assess the State's water resources.

Therefore, the Commission has overarching responsibility for the management of all the State's waterways. This does not mean that the Commission will undertake all management activities throughout the State. Waterway systems are simply too large and extensive, and the land uses and tenure within a catchment, and from catchment to catchment, too variable to enable effective on-the-ground management by any one group. Because waterways are continuous systems they must be managed cooperatively between all individuals, businesses, agencies and groups that live and work in the catchment.

7.1.1 Waterways Management Bodies

The *Waterways Conservation Act (1976)* provides for the management of waterways in need of coordinated management by the declaration of Management Areas with defined boundaries and the establishment of *Management Authorities*. Management Authorities manage their section of river or waterway in accordance with the powers of the Act, the statewide policies developed by the Water and Rivers Commission and regional/local management guidelines and priorities, which they establish for themselves. The latter must be consistent with Commission policy.

Five waterways in the south west of the state, the Avon, Peel-Harvey, Leschenault, Wilson and the Albany waterways and all or part of their associated river systems, are managed through statutory based authorities, under the *Waterways Conservation Act (1976)*. The Swan River Trust (under separate legislation and supported by the Commission) manages the Swan River and associated land. Geographe Bay catchment is managed by the Geographe Catchment Council formed under the *Water and Rivers Act 1995*.

The Commission has established a subcommittee, the River and Estuaries Council, to oversee waterways management activities of the management groups described above. Currently this Council comprises the Chairs of all the management bodies described above and a representative of waterway issues in the north of the state. In order to fulfil the need for statewide community advice on waterways management the Rivers and Estuaries Council needs to evolve into a body with broader community and regional representation. It will then be able to oversee the development of the Waterways WA Program and provide advice to the Board of the Commission on waterways and catchment management.

7.1.2 Waterways WA Program

The Waterways WA Program is Western Australia's first statewide management program. The program aims to build on and coordinate existing knowledge and action in the management of waterways.

The National Heritage Trust (Rivercare) and the Water and Rivers Commission jointly fund the Program. Funding from the Rivercare Program is being used to support the development of the statewide management framework (of which the Policy forms part), to assist regional strategy groups address waterways management issues and to provide technical advice and support to community groups undertaking river restoration activities. The Commission is also undertaking:

- development of river restoration techniques and information;
- water quality and quantity monitoring and database;
- assessment of ecological water requirements;
- floodplain management;
- development of water sensitive design guidelines;
- algal bloom management programs;
- awareness and information programs; and
- planning and management.

7.1.3 Other Management Approaches

Under the *Rights in Water and Irrigation Act (1914)* permission is required in proclaimed areas to undertake works that alter the bed or banks of a waterway or to extract water (WRC, 2000). Proclaimed surface water areas include:



- Gingin Brook Catchment Area
- Stoney Brook and Tributaries
- Moore River and Certain Tributaries
- Swan River System
- Murray River System
- Serpentine and Dandalup River Systems
- Avon River System
- Canning River
- Southern River and Wungong Brook
- Brunswick River and Tributaries Catchment
- Donnelly River System
- Capel River System
- Preston River and Tributaries
- Margaret River and Tributaries
- Ferguson River and Tributaries Catchment
- Fitzroy River and Tributaries
- Pilbara Area – River Systems and Tributaries
- Greenough River and Tributaries Catchment
- Gascoyne River and Tributaries

- Hill River and Tributaries
- Eneabba Creek and Tributaries
- Ord River and Tributaries

Some waterways are currently managed through the national parks and reserves system.

The rest have no specific legislative management. They rely on community and agency partnerships to achieve management objectives.

7.2 Overview of Roles and Responsibilities

Table 3 provides an overview of the roles and responsibilities in relation to waterways management from the property to the Federal Government.

Table 3. Overview of roles and responsibilities

Type	Agency/Organisation	Role in waterway management
Community	<ul style="list-style-type: none"> • Individual. 	<ul style="list-style-type: none"> • Sustainable landuse. • Restoration activities. • Feral animal control. • Visual monitoring.
	<ul style="list-style-type: none"> • Environmental interest groups. • River action groups. 	<ul style="list-style-type: none"> • Restoration activities. • Environmental education.
	<ul style="list-style-type: none"> • Land Conservation District Committees. 	<ul style="list-style-type: none"> • Encourage cooperation among land users and agencies to implement sustainable land management and prevent land degradation.
	<ul style="list-style-type: none"> • Catchment groups. 	<ul style="list-style-type: none"> • Planning, decision making and action in a defined catchment.
	<ul style="list-style-type: none"> • Regional Natural Resource Management groups. 	<ul style="list-style-type: none"> • Developing natural resource management plans to tackle environmental degradation while balancing social and economic considerations. • Establish regional priorities. • Partnership between community and government. • Coordinate regional action.
Local Government	<ul style="list-style-type: none"> • 144 local government authorities throughout the state. 	<ul style="list-style-type: none"> • Local planning and development control, including the local stormwater drainage network. • Provision of recreation facilities. • Maintenance of vested foreshore reserves.

Type	Agency/Organisation	Role in waterway management
State Government	<ul style="list-style-type: none"> Water and Rivers Commission. 	<ul style="list-style-type: none"> Statewide waterways management. Key stakeholder in natural resource management. Coordination of restoration technique development and training. Management Authorities whose role is to coordinate management of particular waterway systems.
	<ul style="list-style-type: none"> Swan River Trust. 	<ul style="list-style-type: none"> Manages the Swan and Canning Rivers and associated land which includes SCCP, development control, water sampling and remediation works.
	<ul style="list-style-type: none"> Conservation and Land Management (or Department of Conservation). 	<ul style="list-style-type: none"> Management of National Parks, Marine and nature reserves which can include waterways on behalf of the National Parks and Nature Conservation Authority and the Marine Parks and Reserves Authority. Key stakeholder in natural resource management.
	<ul style="list-style-type: none"> Water Corporation. 	<ul style="list-style-type: none"> Public water supply (eg dams), sewerage and drainage. Restoration works associated with dams, drainage, etc.
	<ul style="list-style-type: none"> Office of Water Regulation. 	<ul style="list-style-type: none"> Regulates licensed providers, encourages competition and promote development of water services.
	<ul style="list-style-type: none"> Department of Land Administration. 	<ul style="list-style-type: none"> Management of unvested (or vacant) Crown land, gazettal of reserves, and production of remote sensing information. Pastoral Lands Boards. Oversee management of pastoral leases.
	<ul style="list-style-type: none"> Western Australian Planning Commission. Ministry for Planning. 	<ul style="list-style-type: none"> Development of regional strategies, approval of and advice to Town planning schemes and amendments, subdivision control, development policy and coastal planning and management.
	<ul style="list-style-type: none"> Environmental Protection Authority. Department of Environmental Protection. 	<ul style="list-style-type: none"> Protection, control and abatement of environmental pollution. Conservation, preservation and protection of the environment. Policy review/development. Development assessment. Key stakeholder in natural resource management.
	<ul style="list-style-type: none"> Agriculture WA. 	<ul style="list-style-type: none"> Sustainable rural development. Pest, plant, animal and disease control. Agriculture industry development. Key stakeholder in natural resource management.
	<ul style="list-style-type: none"> Soil and Land Conservation Council. 	<ul style="list-style-type: none"> Leadership for land conservation and Landcare. Drainage and clearing control.

Type	Agency/Organisation	Role in waterway management
	<ul style="list-style-type: none"> Department of Transport. 	<ul style="list-style-type: none"> Efficient and safe boating in waterways including vessel survey and registration, commercial operators, safety management, mooring licences, definition of navigable waters and boat speeds. Provision and maintenance of facilities.
	<ul style="list-style-type: none"> Health Department. 	<ul style="list-style-type: none"> Issuing health warning on algal blooms. Assessment of human health impacts.
	<ul style="list-style-type: none"> Department of Regional Development. Regional Development Commissions. 	<ul style="list-style-type: none"> Promote, facilitate and assist in economic or social development.
	<ul style="list-style-type: none"> Fisheries WA. 	<ul style="list-style-type: none"> Fisheries management and habitat protection. Management of professional and recreational fisheries. Approval of aquaculture activities.
	<ul style="list-style-type: none"> Aboriginal Affairs Department. 	<ul style="list-style-type: none"> Coordination of Aboriginal heritage and culture across government. Administration of the <i>Aboriginal Heritage Act 1972 (WA)</i> which identified significant sites for Aboriginal culture. Under the <i>Aboriginal Heritage Act 1972</i> waterways should be considered places of significance and subject to consultation.
	<ul style="list-style-type: none"> Department of Premier and Cabinet – Native Title Unit. 	<ul style="list-style-type: none"> Administration, agency coordination and policy advice on <i>Native Title Act 1993 (Cwlth)</i>.
	<ul style="list-style-type: none"> Port Authorities. 	<ul style="list-style-type: none"> Planning, construction and maintenance of port facilities and provision of port services.
Commonwealth	<ul style="list-style-type: none"> Environment Australia and Agriculture, Fisheries and Forestry Australia. 	<ul style="list-style-type: none"> NHT funding. Federal Policy on Natural Resource Management.
	<ul style="list-style-type: none"> Land and Water Resources Research and Development Commission. 	<ul style="list-style-type: none"> Research into rural land management issues, such as riparian, wetland, and eutrophication as well as options for action.

8 Natural Resource Management in Western Australia

The management of Western Australia's waterways is part of the overall natural resource management framework. The Western Australian Government has developed a State Natural Resource Management (NRM) Framework Policy (NRM Policy) (Government of WA, 1999) that will assist in achieving sustainable natural resource management.

The framework recognises that good natural resources management contributes to a strong economy, high standards of living and natural amenities which are highly valued by the community. It also states that the protection and management of natural resources that underpin this diversity and prosperity and these values is vital to the State's future. The NRM Policy recognises that there are a number of pressing land, water and biodiversity issues associated with the use of the State's natural resources that need to be addressed.

The importance of natural resource management in regional development is recognised in the State's Regional Development Policy. The policy includes strategies to strengthen the partnerships between government and community; increase knowledge and understanding of natural resource management options; and help ensure that community groups can build their capacity to manage the natural resource.

The State Salinity Strategy (SSC, 2000) provides a blueprint for action through a partnership approach between the State Government, its agencies, landholder groups and the community. This approach has formed the basis of the NRM Policy (Government of WA; 1999).

The NRM Policy also incorporates industry and other sectors. The rural industry, including agri-business, must play a larger role in addressing salinity and in developing new and innovative agricultural products. Sustainable management practices underpin the long-term productivity and profitability of these industries. Industry can play a valuable leadership role through developing codes of practice, developing environmentally sound production systems and enhancing the knowledge and skills of their members to better manage natural resources.

The NRM Policy has defined Natural Resource Management (NRM) “*as the ecologically sustainable management of the land, water and biodiversity resources of the State for the benefit of existing and future generations, and for the maintenance of the life support capability of the biosphere. It does not include mineral or marine resources.*”

The NRM Policy has developed a number of principles, which also underpin the principles of the State Waterways Management Policy. The NRM principles are:

- Economic and social growth and environmental protection are interdependent and essential to society's long-term well being.
- Individual and community well-being and welfare should be enhanced while having regard for inter-generational equity.
- Management means seeking a sustainable balance between the competing socio-economic and ecological objectives for the use of natural resources. Balancing these factors requires knowledge and judgement that may require trade-offs.
- The value that the community places on natural resources and the environment for current and future generations should be augmented.
- Biological diversity should be protected and ecological processes and systems restored and enhanced.
- Productive capacity of the land, through a variety and diversity of land uses, should be protected.
- Water quality and quantity should be maintained to support both aquatic ecosystems and consumptive uses.
- Partnerships and understandings between government, industry and the community should be improved to achieve sustainable NRM.
- The prime responsibility for the management of natural resources lies with the land owner/manager. However restoration of the environment is a problem that must be universally shared in partnership arrangements.

The Western Australian Government has six priority Programs for natural resource and environmental management in Western Australia. These are:

- Biodiversity Conservation.
- Coastal Management.
- Rangelands Management.
- Salinity Strategy.
- Waterways WA.
- World Heritage.

All these programs depend on partnerships between the community, landholders and local government to plan and implement on-the-ground action, coordinated where appropriate through cooperatively developed regional, coastal and catchment strategies.

Currently the federal government is in the process of developing a national policy on natural resource management in rural Australia. The proposed partnership model is similar to that of the Western Australia's in that it proposes strong links between commonwealth, state and local government and regional NRM bodies (Commonwealth of Australia, 1999b).

8.1 Regional Natural Resource Management Groups

Regional and sub-regional groups are well placed to manage waterway issues at the strategic level, and it is primarily at the catchment and farm scale where the impacts of management practices are felt and the responses best directed. Currently, regional groups are working towards developing or updating regional natural resource management strategies in the South Coast, South West, Metropolitan, Central Agricultural, Northern Agricultural and Pastoral Regions.

The groups are developing regional natural resource management strategies aimed at tackling environmental degradation while balancing social and economic considerations. This includes establishing regional priorities, working in partnership with community and government and coordinating regional action. The strategies are being developed to cover, in various detail, waterways management issues including:

- Changes in riparian vegetation (eg. weeds, loss of native vegetation, over-grazing).
- Salinisation.
- Waterlogging and inundation.
- Eutrophication.
- Water quality contamination.
- Ecosystem decline, altered ecology, habitat changes.
- Erosion, sedimentation, accretion.
- Ecological flows and damming.
- Channel instability.
- Flooding.
- Pool degradation.

Figure 2 shows the relationships between the developing NRM Regional Strategies and Statewide NRM strategies.

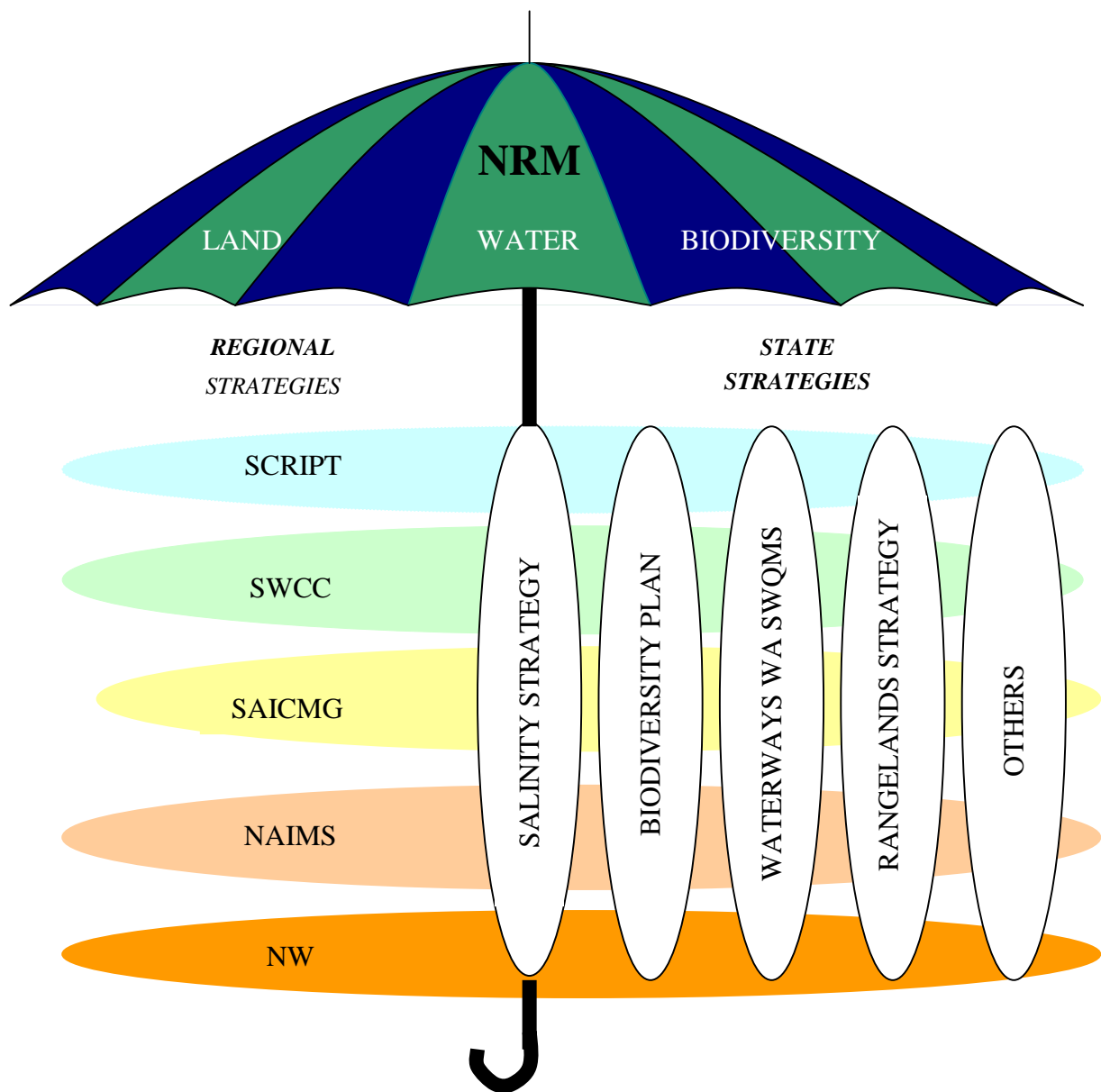


Figure 2. The NRM Framework: The relationship between regional and state NRM strategies.

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Glossary

WORD	DEFINITION
Aerobic	Organisms living or active only in the presence of free oxygen.
Algae	A diverse group of aquatic plants containing chlorophyll and other photosynthetic pigments. Many are microscopic (often being single cells) but some can be large, including the large seaweeds. They grow as single cells or an aggregation of cells (colonies). (see Phytoplankton and Macroalgae).
Algal Bloom	The rapid excessive growth of algae generally caused by high nutrient levels and favourable conditions. Can result in deoxygenation of the water mass when the algae die, leading to the death of aquatic flora and fauna.
Anaerobic	See Anoxic; lacking oxygen. Anaerobic organisms can or must live without oxygen.
Anoxia	Deficiency of oxygen in water.
Aquaculture	Farming of fresh or saltwater fish, molluscs, crustaceans or plants, usually for commercial purposes.
Aquatic	Living in, growing in, or frequenting water.
Beneficial use	The current or future uses for a water resource, which have priority over other potential uses because of their regional significance to the community. Beneficial use designations provide guidance in determining the management and protection of the quality and quantity of the resource.
Benthic organisms (benthos)	Relatively sedentary organisms (plants and animals) that dwell on the sediment at the bottom of a water body.
Billabong	An Australian term for pools associated with a river, which become isolated from the main channel when the river ceases to flow.
Biological diversity	“Variability of all living organisms and the aquatic ecosystems and other ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems” (Anon; 2000)
Biomass	The amount (weight) of living material (plants or animals) (see Biota).
Biota	Flora and fauna in a given region.
Brackish water	See Salinity.
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Community	All levels of individuals, groups, organisations, local, state and federal government departments throughout the state.
Competing demands/use	Where one use precludes or limits the pursuit of the same or another use of a resource.
Confluence	Running together, flowing together or intermingling eg where a tributary joins a river.
Conservation	The management of human use of the biosphere for present generations while maintaining its potential to meet the needs and aspirations of future generations.
Consumptive use	See Divertible.
Deoxygenation	Depletion of oxygen.
Dissolved oxygen (DO)	The concentration of oxygen dissolved in water or effluent, measured in milligrams per (mg/L).
Divertible (renewable) water	The average annual volume of water which, using current practice, could be removed from potential or developed surface or groundwater sources, on a renewable (sustainable) basis at rates capable of serving urban, irrigation, industrial or extensive stock uses.

Ecologically Sustainable Development	“Using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased” (Commonwealth of Australia; 1992).
Ecology	The study of the interrelationships between living organisms and their environment.
Ecosystem	A term used to describe a specific environment, eg. lake, to include all the biological, chemical and physical resources and the interrelationships and dependencies that occur between those resources.
Estuary	An enclosed or semi-enclosed coastal body of water having an open connection to marine waters and fresh input from land runoff which measurably reduces salinity. Water levels vary in response to ocean tides and river flows.
Eutrophication	A natural process of accumulation of nutrients leading to increased aquatic plant growth in lakes, rivers, harbours and estuaries. Human activities contributing fertilisers and other high nutrient wastes can speed up the process, leading to algal blooms and deterioration in water quality. (See Nutrient enrichment, Algal bloom and Trophic status).
Fauna	Animal life of a particular area or period of time.
Flood	A great flowing or overflowing of water, especially when it leaves the channel and spreads over the floodplain
Flood – 100 year	Refers to a severe flood that has a statistical probability of occurring once in 100 years. The 100 year flood level is generally defined as a contour through the floodplain to which this flood will rise. The flood has a 1% chance of occurring in any given year; on average it will occur once in every 100 years.
Flood fringe	The area of the floodplain, outside the floodway, which is affected by flooding. This area is generally covered by still or very slow moving waters during the 100 year flood
Floodplain	The portion of a river valley next to the river channel that is or has been periodically covered with water during flooding.
Floodprone land	All land subject to flooding including the floodway, flood fringe and flood plain.
Floodway	The river channel and portion of the floodplain which forms the main flow of flood waters once the main channel has overflowed.
Flora	Plant life.
Foreshore	Area of land next to a waterway.
Groundwater	Water which occupies the pores and crevices of rock or soil (see also Surface water).
Habitat	The environment or place where a plant or animal grows or lives (includes soil, climate other organisms and communities).
Headwaters	The upper tributaries of a river.
Hydrologic cycle (water cycle)	The continual cycle of water between the land, the ocean and the atmosphere.
Hydrology	The study of water, its properties, distribution and utilisation above, on and below the earth’s surface.
Hypersaline	Having a salinity greater than seawater (ie. above 35 parts per thousand). (see Salinity)
In-situ use	Used in the environment where it occurs eg boating is in-situ as it does not result in the water being moved.
In-stream	In the water between the banks.
Integrated Catchment Management (ICM)	The coordinated planning, use and management of water, land, vegetation and other natural resources on a river or groundwater catchment basis. ICM is based on cooperation between community groups and government agencies at all levels to consider all aspects of catchment management.
Intertidal	Areas of land covered by water at high tide and exposed at low tide.
Inundation	Water ponded on the surface of the land, usually after flooding in a storm

Landscape	The visual appearance of natural and man-made environments.
Macroalgae	Algae that can be seen by the unaided human eye in contrast to microscopic algae that must be studied under the microscope. Includes large green, red and brown algae often up to many metres long and referred to as seaweed.
Macroinvertebrates	Invertebrates are animals without a backbone. Macroinvertebrates are big enough to be seen with the unaided human eye though they can be very small. Aquatic invertebrates are termed macroinvertebrates if they are retained on a 0.25mm mesh net. Major groups include worms, snails, crustaceans (eg. Prawns) and insects.
Micro organism	An organism so small as to be invisible to the naked eye.
Multiple uses	Where more than one use of a resource can be undertaken.
Natural Resource Management	Ecologically sustainable management of land, water and biodiversity resources for the benefit of existing and future generations, and for the maintenance of the life support capacity of the biosphere (Government of WA; 1999).
Non-consumptive use	Does not lead to the extraction of water from a waterway. (see also In-situ use)
Nutrient enrichment	Over-enrichment of water by dissolved nutrients particularly nitrates and phosphates which leads to excessive growth of aquatic plants. (see Algal bloom and Eutrophication)
Nutrient load	The amount of nutrient reaching the waterway over a given time (usually per year) from its catchment area.
Nutrients	Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorus (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
Partnership	Individuals, groups and organisations working together with agreed goals, clear roles identified and expectations specified.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
pH	A symbol denoting the concentration of hydrogen (H) ions in solution. A measure of acidity or alkalinity in water in which pH 7 is neutral, values above 7 are alkaline and values below 7 are acid.
Phytoplankton	Microscopic (up to 1-2 mm in diameter) free-floating or weakly mobile aquatic plants eg. diatoms, dinoflagellates, chlorophytes, blue greens.
Policy	Statement of direction.
Pollution	Water pollution occurs when waste products or other substances, eg effluent, litter, refuse, sewage or contaminated runoff, change the physical, chemical, biological or thermal properties of the water, adversely affecting water quality, living species and beneficial uses. (National Water Quality Management Strategy).
Precautionary principle	See Ecologically Sustainable Development.
Protection	Keeping the existing condition unchanged, usually applied to near pristine environments.
Receiving Water	Waters into which effluent or waste streams are discharged.
Regional NRM groups	Community working together at a regional scale to tackle environmental degradation whilst balancing social and economic considerations. This includes establishing regional priorities, working in partnership with community and government and coordinating regional action.
Remnant vegetation	The parts of the natural vegetation still existing after major change to the environment.
Riparian vegetation	Vegetation growing along banks of rivers, including the brackish upstream reaches of an estuary.
Riparian zone	The zone along or surrounding a water body where the vegetation and natural ecosystems benefit from and are influenced by the passage and storage of water.

River basin	The area drained by a river and tributaries (river catchment). (see Catchment).
Runoff	Water that flows over the surface from a catchment area, including streams.
Salinisation	An increase in salinity levels in soil or waters, which impairs quality.
Salinity	The measure of total soluble (or dissolved) salt ie. Mineral constituents in water. Water resources are classified on the basis of salinity in terms of Total Soluble Salts (TSS) or Total Dissolved Salts (TDS). Different processes measure TSS and TDS, but for most purposes they can be read as the same thing. Measurements are usually in milligrams per litre (mg/L) or parts per thousand (ppt). Measurements in ppt can be converted to mg/L by multiplying by 1000, eg. seawater is approximately 35ppt or 35 000 mg/L TSS. Salinity is also often expressed as electrical conductivity, measured by an electronic probe (conductivity meter). Conversion factors to mg/L or ppt are given in reference 3.

Water resources are classified as fresh, marginal, brackish or saline on the basis of salinity.

	Water supply(1) Mg/L TDS	Environmental (3) Mg/L TDS	Plant zones in a wetland (4) Mg/L TDS
Fresh	< 500 good quality (2)	<500	<3000 all year
Marginal	500 –1500 500 –1000 acceptable drinking based on taste (2) >1000 may have excessive scaling, corrosion, unsatisfactory taste (2)	500 –1500	
Brackish	1500 - 5000	1500 - 5000	<10,000 all year < 3000 after inflow
Saline	>5000	>5000	<50,000 all year <10,000 after inflow

1. Based on WA Water Resources Council classification.
2. Based on national Health and Medical Research Council and Agricultural and Resource management Council of Australia and New Zealand (1996) National Water Quality Management Strategy. Australian Drinking Water Guidelines.
3. George, R, Weaver, D, & Terry, J (1996) Environmental water quality – a guide to sampling and measurement, Agriculture Western Australia.
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Seagrasses	Marine flowering plants (angiosperms) found in coastal rivers, estuaries and protected coastal embayments which are important to ecological functioning as they provide habitat for many organisms, stability to the bed of the water body and, in a decomposed form, a major food source for a variety of organisms.
Sediment	Sand, clay, silt, pebbles and organic material carried and deposited by water or wind. Sedimentation is the process by which sediment is deposited eg in waterways.
Sediment load	The quantity of sediment moved past a particular cross-section in a specified time. Usually refers to the amount of sediment being transported by a stream or river.
Siltation	Process whereby fine particles of sand, mud and other material picked up by moving water are deposited to form sediment.
Stormwater	Rainwater which has run off the ground surface, roads, roofs, paved areas etc. and is usually carried away by drains.
Surface water	Water flowing or held in streams, rivers and other wetlands in the landscape.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED; 1987)
Targets	Goals to be reached
Tributary	A stream, creek or small river which flows into a larger stream, river or lake.

Trophic status	<p>Trophic comes from the Greek word for feeding. There are generally three classes distinguished for estuaries and wetlands:</p> <ol style="list-style-type: none">1. eutrophic (well fed) means nutrient-rich and is usually associated with low oxygen levels;2. mesotrophic (medium); oligotrophic (little fed), nutrient-poor with high oxygen levels.
Water allocation	<p>A process to equitably share the rights to take or use water between competing “users”. Users include consumptive and <i>in-situ</i> users (which includes the environment).</p>
Watercourse	<p>A river, stream or creek in which water flows in a natural channel, whether permanently or intermittently.</p>
Waterlogging	<p>Soil with high levels of water, such that it inhibits the exchange of gases (primarily oxygen and carbon dioxide)</p>
Water quality	<p>The physical, chemical and biological measures of water.</p>
Water regime	<p>Timing of flow, flow rate.</p>
Water resources	<p>Water in the landscape (above and below ground) with current or potential value to the community and the environment.</p>
Waterways	<p>All streams, creeks, rivers, estuaries, coastal lagoons, inlets and harbours.</p>
Waterway Channel	<p>See watercourse</p>
Waterways Management Authority	<p>Established under the <i>Waterways Conservation Act</i> (1976) coordinated management of a specified waterway in accordance with the powers of the Act, the statewide policies developed by the WRC and regional/local management guidelines and priorities, which they establish for themselves.</p>

Appendices

Appendix 1: The Significance and Status of Riparian Land

Extract from: Tubman W & Price P 1999, The significance and status of riparian land, In: Lovett S and Price P (Eds), *Riparian Land Management Technical Guidelines Volume 1: Principles of sound management*, Land water Water Resources Research Development Corporation, Canberra.

Summary

- For the purposes of these guidelines, riparian land is defined as ‘any land, which adjoins, directly influences, or is influenced by a body of water’. However, there is no rule of nature which defines the ‘width’ of riparian land: the width of interest or concern is largely determined by the management objectives.
- Riparian land is important because it is ecologically and economically productive.
- Riparian land is vulnerable and is the ‘last line of defence’ for aquatic ecosystems.
- Since European settlement, riparian land in Australia has been subjected to considerable degradation, much of which is associated with clearing of vegetation in the catchment.
- Fortunately, the importance of managing riparian land well is increasingly being recognised, and remedial work is being undertaken at the local, regional, state and territory and national levels.

A1.1 What is Riparian Land?

Riparian land can be defined in a number of ways – *how* it is defined in particular situations largely depends on *why* it is being defined.

For example, for administrative or legal purposes riparian land is sometimes defined as a fixed width alongside designated rivers and streams. For management purposes this definition is not very useful: in places, the band identified may be too narrow to include all the land influencing the stream; in other places, it may be wider than is necessary. It would clearly not be helpful to have the same

riparian width designated for a small upland tributary as for the large, main stem of a river in its floodplain.

Definitions based on land use are similarly of limited use for management purposes. This is because what the land is used for often takes little heed of the natural processes fundamental to riparian land.

This publication aims to help people improve and protect the health of riparian land (including associated waterbodies). As a result, the definition used here is in terms of the roles – or functions – of such land.

Using the functional approach, riparian land is defined as ‘*any land which adjoins, directly influences, or is influenced by a body of water*’.

With this definition, riparian land includes:

- the land immediately alongside small creeks and rivers, including the river bank itself;
- gullies and dips which sometimes run with surface water;
- areas surrounding lakes; and
- wetlands on river floodplains which interact with the river in times of flood.

It is important to remember that there is no single law of nature that defines the width of riparian land, or of buffer strips within riparian land, as these are largely management decisions. For example, the width required to trap sediment may be a fraction of that required to provide wildlife habitat, yet both are legitimate objectives for riparian management. One of the aims of this manual is to help people make informed choices about the riparian and buffer widths appropriate to their particular management objective.

Because of the complex interactions between land and water in riparian areas, these guidelines deal with both the land around water bodies (riparian land) and the water itself.

A1.2 The Importance of Riparian Land

Productivity and vulnerability

Riparian land is important because it is usually the most fertile and productive part of production and ecosystems.

It often has better quality soils than the surrounding hill slopes and, because of its position lower in the landscape, often retains moisture over a longer period.

Riparian land often supports a higher diversity of plants and animals than does non-riparian land. This is a result of its wide range of habitats and food types, its proximity to water, its microclimate and its ability to provide refuge. Many native plants are found only, or primarily, in riparian areas, and these areas are also essential to many animals for all or part of their lifecycle. Riparian land provides a refuge for native and animals in times of stress, such as drought or fire.

From an aquatic perspective, vegetation on riparian land regulates in-stream primary production through shading; supplies energy and nutrients (in the form of litter, fruits, terrestrial arthropods and other organic matter) essential to aquatic organisms; and provides essential aquatic habitat by way of large woody debris.

In addition to being productive, riparian land is often a vulnerable part of the landscape – being at risk of damage from cultivation and from natural events such as floods.

The combination of productivity and vulnerability means that careful management of riparian lands is a vital for conservation of both Australia's unique biodiversity and economic productivity.

The interaction between land and water

There are many types of interaction between riparian land and adjacent waterways. For instance, a tree on riparian land may fall into a stream, creating a new aquatic habitat. Riparian land can 'buffer' streams against sediment and nutrients washing off agricultural land. It can also be a source of litter and insects, which fall into a stream and become food for aquatic organisms. Operating in the other direction, insects that spend much of their life in the stream may become food for land-based animals when they emerge.

For some time, the important linkages between land and water in riparian areas were not well recognised by Australian land users. There was a widespread belief that streams and rivers could be used as drains – removing problems from the adjacent land. However, it is now understood that, rather than being seen as drains, waterways should be likened to arteries supporting the land around them. Similarly, because of its position, riparian land can be seen as a 'last line of defence' for aquatic ecosystems.

In recent years, in recognition of the many potential benefits that can be achieved, many landholders, community groups and government agencies have become actively involved in improving riparian management. They have recognised the capacity of riparian land to:

- trap sediment, nutrients and other contaminants before they reach the waterways;
- reduce rates of bank erosion and loss of valuable land;
- control nuisance aquatic plants;
- help ensure healthy stream ecosystems;
- provide a source of food and habitat for stream animals;
- provide an important location for conservation and movement of wildlife;
- help to maintain agricultural productivity; and
- provide recreation and deliver aesthetically pleasing landscapes.

Many of these benefits can be achieved through careful riparian management.

A1.3 Degradation of Riparian Land

Because riparian land is a particularly dynamic part of the landscape, it can change markedly – even under natural conditions. Fires, unusually severe frosts, cyclones, and major floods, can all have a huge impact on riparian land and result in major changes to channel position, shape and surrounding vegetation.

However, human impact since European settlement has resulted in widespread and large-scale degradation of these vulnerable areas. In southern Australian this degradation has resulted largely from the wide-scale removal of riparian vegetation, whereas in northern Australia the cane and beef industries and feral animals and plants have had a major impact on riparian areas.

The nature of the problem

The degradation of riparian land, especially in southern Australia, is often associated with the removal of vegetation. The major impacts of this are summarised below.

- Removal of riparian trees increases the amount of light and heat reaching waterways. This favours the growth of nuisance algae and weeds.

- Under natural conditions trees would occasionally fall into the river, creating woody debris-an important habitat for aquatic organisms. Removal of this debris and of the source of large branches and trunks disrupts aquatic ecosystems.
- Continuation of agriculture to the top of stream banks increases the delivery of sediments and nutrients to streams. Large volumes of fine-grained sediment smother aquatic habitat, while increased nutrients stimulate weed and algal growth. Increased nutrient load also affects estuarine and marine life beyond the river mouth.
- Removal of riparian vegetation destabilises stream banks, often resulting in massive increases in channel width, channel incision and gully erosion. This erosion of the channels often delivers more sediment to streams than does human activity on the surrounding land.
- Removal of vegetation along channels, and of woody debris in channels, can allow water to travel downstream at a faster rate, sometimes contributing to increased flooding and erosion of lowlands.
- Removal of vegetation throughout the catchment can lead (and has led) to raised water tables and salinisation of land which, as salt-saturated water drains into rivers and streams, ultimately results in saline waterways.

However, removal of vegetation is not the only human land use that adversely affects riparian land.

- Alteration of water regimes (through the imposition of dams, weirs and pumps) can severely affect aquatic populations and the capacity of the waterways to carry flow.
- Sand and gravel removal and channel straightening can result in channel incision and head cutting, which in turn can influence bank height and shape and lead to increased erosion rates.
- Uncontrolled access of stock can lead to grazing and trampling of vegetation, breakdown of soil structure and contamination of the water with nutrient-rich urine and faeces.
- Altered fire regimes and invasion by exotic weeds can further degrade riparian land.

It is important to recognise that the impacts of these disturbances are not just cumulative; they actually exacerbate each other. For example, clearing riparian

vegetation from upland streams multiplies, many times, the impact of increased nutrients. This is because clearing also provides the light and higher temperature conditions needed to enable nuisance weeds and algae to flourish and dominate the aquatic ecosystem.

Appendix 2: State, National and International Policies Relevant to Waterways Management

A2.0 Introduction

This Appendix provides an overview of state, national and international policies and strategies that relate to, direct management or protection of waterways. The information is provided to encourage greater understanding of the linkages from local through to international management approaches.

A2.1 Western Australia

A2.1.1 State Salinity Strategy

The State Salinity Strategy was released in April 2000. The Strategy explains what leads to salinity problems, and their impacts in Western Australia, particularly the south-west agricultural region. It also sets out a strategy to manage salinity and outlines the tools to be used (SSC, 2000).

Two of the five key goals of the Strategy provide a strong link between management of the salinity issue and waterways management. These are:

- To protect and restore key water resources to ensure salinity levels are kept to a level that permits safe, potable water supplies in perpetuity.
- To protect and restore high value wetlands and natural vegetation, and maintain natural (biological and physical) diversity within the southwest region of Western Australia” (SSC; 2000).

The proposed actions to achieve these goals are based on three fundamental principles:

- salinity needs to be addressed by treating the causes of the problem, focussing on managing recharge and rising watertable;
- developing practical and environmentally-sound methods that mitigate the impact of salinity by managing the discharge; and
- the strategy needs to be implemented in a partnership approach between all stakeholders at the regional and catchment scale” (SSC; 2000).

Some of the major tools for restoring salinisation within the south-west are: planting deep-rooted perennial shrubs and trees; phase farming (rotations which include a perennial phase); alternative, high-water use enterprises alongside catchment-scaled surface water management; and a broad spectrum of complementary engineering options. Many of these either relate to, or impact on, waterways management and therefore a strong link is required between action to address salinity and action to restore waterways.

One approach used by government agencies to deliver on-ground planning and technical expertise, is that of focus/recovery catchments. Providing waterways support through such groups, or through a similar process, may have merit and warrants further investigation.

A2.1.2 State Wetlands Conservation Policy

The State Wetlands Conservation Policy (Government of WA,1997) is focused primarily on the conservation/protection of the diversity of wetlands systems in the State (see Statement of Policy below). The definition of wetlands in this Policy includes those waterways described by definition in Section 1.2 (ie wetlands that overflow into a stream). The intent of the Waterways WA Policy is management of all systems (degraded and healthy) for a wide range of uses (including conservation/protection). The conservation and protection objectives of the State Wetlands Conservation Policy have been incorporated into the intent of the Waterways WA Policy objectives without specifically restating them.

The implementation strategy component of the SWCP relates only to groundwater fed wetlands on the Swan Coastal Plain.

Statement of Policy (Wetlands Conservation Policy 1997)

“The Government of Western Australia, recognising that wetlands:

- are essential habitats for a multitude of plant and animal species, many of which have high public appeal;
- play a key role in supporting the diversity and abundance of species within surrounding terrestrial ecosystems;

- add considerable landscape diversity and aesthetic appeal to mainly arid land;
- provide many opportunities for enjoyment for the people of Western Australia;
- are, in some cases, of international significance, particularly as habitats for migratory bird species;
- have other significant values, including flood mitigation, water resource, soil conservation, biological filtration, fish nurseries, Aboriginal and historical significance, recreation and tourism;
- form one of the habitats that will be most affected by possible climate change;
- have, in many instances, been unnecessarily lost or diminished in value through inappropriate use or management of the wetlands themselves and their catchments; and
- may be observed and enhanced through proper planning and management;

is committed to identifying, maintaining and managing the State's wetland resource, including the full range of wetland values, for the long-term benefit of the people of Western Australia.

In making this commitment the Government establishes the following principle objectives with respect to conservation of the resource:

- To prevent further loss or degradation of valuable wetlands and wetland types, and promote wetland conservation, creation and restoration.
- To include viable representative of all major wetland types and key wildlife habitats and associated flora and fauna within a Statewide network of appropriately located and managed conservation reserves which ensure the continued survival of species, ecosystems and ecological functions.
- To maintain, in viable wild populations, the species and genetic diversity of wetland dependent flora and fauna.
- To maintain the abundance of waterbird populations, particularly migratory species.
- To greatly increase community awareness and appreciation of the many values of wetlands, and the importance of sound management of the wetlands and their catchment in the maintenance of those values."

A2.1.3 National and State Water Quality Management Strategies

The National Water Quality Strategy (NWQMS) was developed jointly by two Commonwealth and State Ministerial councils, [Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and the Australian and New Zealand Environment and Conservation Council (ANZECC)] and had input from the National Health and Medical Research Council (NHMRC). This strategy provides information and tools to assist communities to manage water resources for current and future needs. It provides policies, a process and a series of national guidelines for water quality management. A State Water Quality Strategy (Government of Western Australia; 2000) has been developed to implement the NWQMS in Western Australia.

The SWQMS (Government of WA, 2000) will establish a coordinated and consultative structure to ensure effective outcomes for water quality management in Western Australia, consistent with the National Strategy.

A2.2 National and International Policies

A2.2.1 Natural Heritage Trust Partnership Agreement

The Natural Heritage Trust (NHT) was established to provide for natural resource management activities with funding provided through the part sale of Telstra. There are a number of programs under the trust, of which the: National Vegetation Initiative (Bushcare), National Landcare Program, National Rivercare Initiative, Waterwatch, National Wetlands Program, Fisheries Action Plan and the Coast and Clean Seas Program (Coastcare) pertain to the management of waterways and their catchments.

Objective of the NHT:

"A partnership of the Federal Government with State Governments, Local Governments and the Community to improve natural resource management and environmental protection. The aim is to catalyse the establishment and development of self-sufficient, on-going management and environmental protection systems."

NHT provides funds for the implementation of the national environmental protection and natural resource management strategies, which include:

- National Strategy for Environmentally Sustainable Development.
- Decade of Landcare Plan (1990s).
- COAG's Water Reform Framework.
- National Strategy for the Conservation of Australia's Biological Diversity.
- National Water Quality Management Strategy.
- National Reserves System.
- Coastcare (funded by NHT but delivered separately).
- National Weeds Strategy.
- National Feral Animals Strategy.
- Endangered Species Program.
- Farm Forestry Program.

National Rivercare Initiative

The aim of this initiative is: "To ensure progress towards the sustainable management, rehabilitation and conservation of rivers outside the Murray-Darling Basin" (DPIE and EA, 1997). The program seeks to encourage the development of strategic and integrated responses to river issues. These include projects that: maintain or improve water quality; manage erosion and sedimentation; and contribute to healthy stream and riparian ecosystems.

This Initiative focuses on the following objectives:

- Increased community awareness and involvement in river management.
- Integration of river action plans with other management issues.
- Issues that address national, State and regional strategies and priorities.
- Assist in providing high quality data and information in relation to environmental water provisions.

This year (2000) there are 71 projects from Esperance to Kununurra funded under this program. The objectives of these projects range from monitoring to restoration.

A2.2.2 National Strategy for Ecologically Sustainable Development (1992)

This strategy defines ecologically sustainable development as: "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased". Put more simply, its about using resources now while maintaining the widest possible range of options for the future. The Strategy recognises that to do this: "we need to develop ways of using those environmental resources that form the basis of our economy in a way that maintains and, where possible, improves their range, variety and quality. At the same time we need to utilise those resources to develop industry and generate employment" (Commonwealth of Australia, 1992).

This strategy forms the basis of natural resource planning and management approaches throughout Australia. The core objectives and guiding principles underpin those identified in the Policy.

Objectives and Principles of the ESD Strategy

Core Objectives;

- To enhance individual and community well being and welfare by following a path of economic development that safeguards the welfare of future generations.
- To provide for equity within and between generations.
- To protect biological diversity and maintain essential ecological processes and life-support systems.

Guiding principles;

- Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations.
- Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- The global dimension of environmental impacts of actions and policies should be recognised and considered.
- The need to develop a strong, growing and diversified economy, which can enhance the

capacity for environmental protection, should be recognised.

- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised.
- Cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.
- Decisions and actions should provide for broad community involvement on issues which affect them.

A2.2.3 Wild Rivers

The Water and Rivers Commission participated in a national study managed by the Australian Heritage Commission aimed at identifying all of Australia's 'wild' rivers. 'Wild rivers' were defined as *“those rivers which are undisturbed by the impacts of modern technological society. They remain undammed, and exist in catchments where biological and hydrological processes continue without significant disturbance. They occur in a variety of landscapes, and may be permanent, seasonal or dry watercourses which flow only occasionally”* (Williams et al, 1999).

The project identified 26 rivers in Western Australia that met the classification of pristine or near-pristine (Table A2.1). These rivers have undergone no significant changes to their watercourse, despite some past or present human activity within their catchments and are mostly located in remote and very sparsely populated areas of the State. The majority of their catchments are located within Crown Land.

The significance of these rivers is reinforced when the combined catchment areas is estimated as 17,500 square kilometres, or 0.7% of the State's area and a similar proportion, less than 1%, of the total length of watercourses in the State. Thus considerably less than 1% of the State's rivers can be said to be pristine or near-pristine (Williams; 1998).

The 'wild' rivers identified are distributed widely throughout the State, and include a variety of rivers in terms of size, type and hydrologic (flow) regime. However, in Western Australia twenty-five (25) river types have been identified, based on their length, flow regime and the type of vegetation. Only six (6) of these twenty-five (25) river types have representative examples remaining in a pristine or near-pristine condition (Williams et al; 1999).

These are waterways that deserve a high level of protection due to their natural condition.

Table A2.1. Waterways identified in the classification 'wild' (pristine or near-pristine) (Williams et al, 1999)

Timor Sea	Western Plateau	Indian Ocean	South West
Cape Whiskey Creeks	Herbert Wash	Tanberry Creek	St Mary River
Doubtful River	Ponton Creek	Upper Robe River	Dempster River
Gibson Creek	Rudall River		Forth River
Glenelg River	Savory Creek		
Helby River			
Hunter River			
Jinunga River			
Londonderry Creek			
Mount Grey Creek			
Prince Regent River			
Scott Creek			
Stewart River			
Thompson River			
Thurnburn Creek			
Wade Creek			
Walmar/Canal Creek			

A2.2.4 Other National Programs

The Commonwealth Government supports waterways management in Western Australia. Table A2.2 outlines some major Federal initiatives that complement the Waterways WA Program.

Table A2.2. Federal initiatives supporting Waterways WA

Program	Federal Government Lead Agency	Scope	Further information
National Rivercare Program (NRP)	Agriculture, Fisheries and Forestry Australia as part of the Natural Heritage Trust	Investment towards sustainable management, rehabilitation and conservation of rivers	www.dpie.gov.au/dpie/nht/nrp-summary.html
National Land and Water Resource Audit (NLWRA)	Agriculture, Fisheries and Forestry Australia and the Land and Water Resources Research and Development Corporation as part of the Natural Heritage Trust	Provides a comprehensive national appraisal of Australia's natural resource base	www.nlwra.gov.au
Rehabilitation and Management of Riparian Lands National Research and Development Program	Land and Water Resources Research and Development Corporation	Investing in research to provide knowledge and processes to support those undertaking river and riparian lands restoration activities	www.rivers.gov.au
National Eutrophication Management Program (NEMP)	Land and Water Resources Research and Development Corporation and Murray-Darling Basin Commission	The Program provides the scientific research necessary for effectively managing algal blooms	www.nemp.aus.net
National River Health Program (NRHP)	Initiated by Land and Water Resources Research and Development Corporation and lead by Environment Australia	The program has developed Australia's first nationally consistent and standardised method of assessing river health	www.lwrrdc.gov.au/commissi.htm

A2.2.5 The International Perspective

Ramsar Convention on Wetlands

The Convention on Wetlands of International Importance especially as Waterfowl Habitat (or Ramsar Convention on Wetlands), was the first (1971) global inter-governmental treaty on conservation and use of natural resources. Its focus was specific to the habitats of waterbirds but has over time broadened its scope to include all aspects of wetland conservation.

Obligations of the treaty include listing of sites of significance, including principles in land-use planning, creation of nature reserves and cooperation where wetlands cross more than one boundary (Ramsar, 2000).

In Western Australia there are nine sites registered on the “Ramsar List” and various types of reservation protect all sites. Of these, six can be considered to be waterways under the definition of the Policy. They are: Lake Toolibin, Lake Warden system, Lakes Argyle and Kununurra, Peel-Yalgorup and Vasse-Wonnerup.

International Migratory Bird Agreements

Australia is signatory to two agreements regarding the conservation and protection of migratory birds and their associated habitats. These agreements are the Japan-Australia Migratory Bird Agreement (1974) and China-Australia Migratory Bird Agreement (1986). The China-Australia agreement identifies 80 species of seabirds and shorebirds. Fifty nine (59) species are common to both agreements (Environment Australia, nd).

The agreements obligate the signatories to manage, preserve and enhance the habitats of migratory birds; joint research; prevention of sale of birds or their eggs; and reporting on progress (Environment Australia, nd)

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Publications in the policy series are:

Statewide Policy No. 1 Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Areas

Statewide Policy No. 2 Pesticide use in Public Drinking Water Source Areas

Statewide Policy No. 3 Policy Statement on Water Sharing

Statewide Policy No. 4 Draft Waterways WA Policy

