

Draft for Public Comment

**Swan
Avon**
INTEGRATED
CATCHMENT
MANAGEMENT

2001

The Swan Region

A Natural Resource Management Strategy

NRM Regional Strategies

An aerial photograph of the Swan River in Perth, Australia. The river flows from the background towards the foreground, where it meets the city. A large bridge with multiple lanes of traffic spans the river. In the background, the city skyline is visible with various buildings. The foreground is dominated by lush greenery, including large palm trees and other tropical plants. A white banner with the text 'NRM Regional Strategies' is overlaid diagonally across the middle of the image.

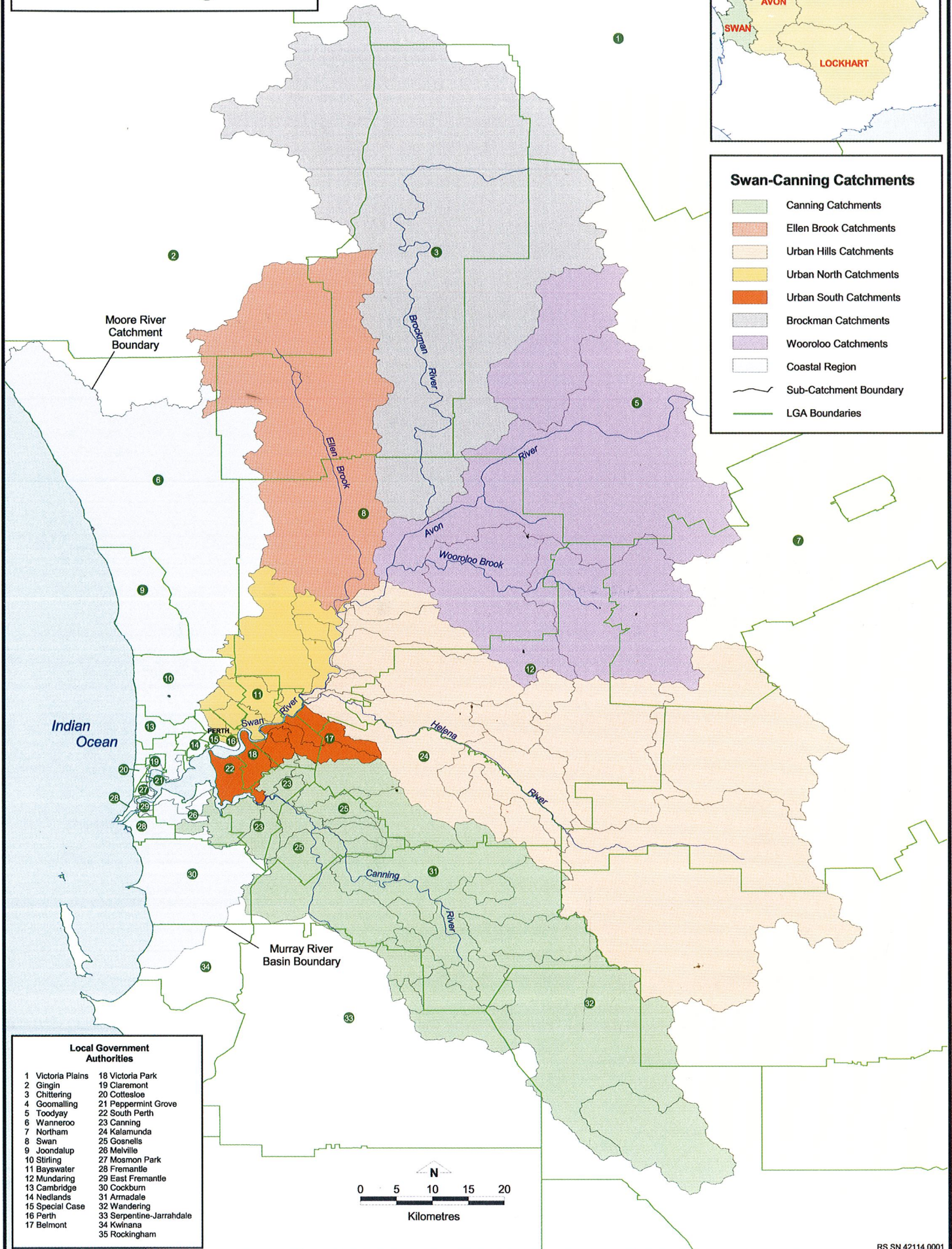
Catchments of the Swan Region

Locality Map



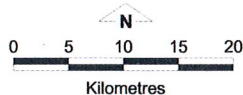
Swan-Canning Catchments

- Canning Catchments
- Ellen Brook Catchments
- Urban Hills Catchments
- Urban North Catchments
- Urban South Catchments
- Brockman Catchments
- Wooroloo Catchments
- Coastal Region
- Sub-Catchment Boundary
- LGA Boundaries



Local Government Authorities

- | | |
|-------------------|--------------------------|
| 1 Victoria Plains | 18 Victoria Park |
| 2 Gingin | 19 Claremont |
| 3 Chittering | 20 Cottesloe |
| 4 Goomalling | 21 Peppermint Grove |
| 5 Toodyay | 22 South Perth |
| 6 Wanneroo | 23 Canning |
| 7 Northam | 24 Kalamunda |
| 8 Swan | 25 Gosnells |
| 9 Joondalup | 26 Melville |
| 10 Stirling | 27 Mosman Park |
| 11 Bayswater | 28 Fremantle |
| 12 Mundaring | 29 East Fremantle |
| 13 Cambridge | 30 Cockburn |
| 14 Nedlands | 31 Armadale |
| 15 Special Case | 32 Wandering |
| 16 Perth | 33 Serpentine-Jarrahdale |
| 17 Belmont | 34 Kwinana |
| | 35 Rockingham |



The Swan Region

- a Natural Resource Management Strategy

Draft - June 2001

Prepared by

*the Swan Catchment Council, Western
Australia*

PREFACE

The Swan Region is unique - it has marvellous natural diversity, bushland, wetlands and river landscapes. It combines these natural values with a rich social and cultural heritage. It comprises the State's capital city and houses over 1.2million people.

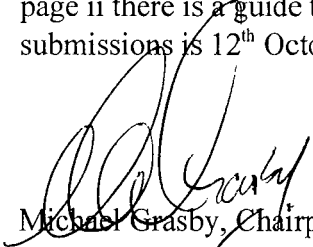
The issues facing environment and natural resource managers in the Swan are complex and diverse. An increasing population, competing land uses and development pressure are the key drivers in this region and they need to be balanced by a need to protect our wonderful environment.

The preparation of this Strategy commenced in March 2000 with a series of public workshops in Bayswater, Midland and Gosnells attended by community and local government representatives. A sub-committee of the Swan Catchment Council (comprising community and State agency staff) has carefully guided the process - their commitment over a long period is acknowledged and applauded. This document strongly represents a community/agency partnership perspective in relation to the future management of natural resources in the Swan Region.

The Strategy will guide natural resource management in the region by identifying the priority issues, suggesting mechanisms to address them, and identifying the group or agency best placed to lead the change.

During the past five years we have witnessed a maturing of the community-government partnership in NRM in the Swan Region. This Strategy provides the blueprint for an even stronger partnership.

I encourage anyone with an interest or a role in managing our environment to read and provide comment and suggestions on this draft Strategy. To assist us to refine this Strategy and to ensure it will deliver valuable outcomes it is critical that we receive feedback from local government, State government agencies and community groups. On page ii there is a guide to help you with your submission. The deadline for receipt of your submissions is 12th October 2001.



Michael Grasby, Chairperson

SWAN CATCHMENT COUNCIL

Note: The public sector is currently undergoing a structural review. Some of the government agencies mentioned in this document will cease to exist from 1 July 2001, and others will have been created. By the end of the public comment period the structural reforms will be in place. The final document will incorporate the new agencies and their responsibilities.

TABLE OF CONTENTS

1	Introduction	1
1.1	The vision and goals for the Region	1
1.2	Defining Natural Resource Management.....	2
1.3	Rationale, purpose and use of the <i>Swan Strategy</i>	3
2	The Swan Region in 2000 – a situation statement	10
2.1	The environment in the Swan Region	10
2.2	Natural resource management in the Swan Region	17
	Goal 1 – Conserve natural diversity	25
	Conservation of physical and biological diversity	25
	Bushland and wetland protection and management	28
	Goal 2 – Ensure acceptable water quantity and quality	40
	Goal 3 – Improve land condition	50
	Goal 4 – Improve management processes	58
	Goal 5 – Achieve culture change	71
3	Implementation and evaluation	84
3.1	Implementation	84
3.2	Evaluation	85
4	Sources and Acknowledgments	89
4.1	Sources.....	89
4.2	Additional reading	90
4.3	Acknowledgments.....	91

Providing comment on the *Draft Natural Resource Management Strategy*

The Draft *Strategy* has been produced for use by all those with an interest in the way in which natural resources are managed in the Swan Region - individuals, community groups, industry and government - the people known as its 'stakeholders'. The Swan Catchment Council is seeking your comments on the Draft *Strategy*. This can be read in two forms – a Summary which lists the background, goals, objectives and strategies; and the full Draft document, which describes these aspects in full.

Where can copies of the Summary and Full Draft Strategy be obtained?

The Swan Catchment Centre

108 Adelaide Terrace

East Perth 6004 Ph: 9220 5300, Fax: 9221 4960, Email: saicc@wrc.wa.gov.au

Copies of both documents can also be viewed on the following website.

www.wrc.wa.gov.au/swanavon

Copies of both documents are also available on CD-ROM upon request to the Swan Catchment Centre.

In providing comments on the *Strategy*, it would be helpful to consider the following points:

- Where your comments reflect your *beliefs or values*, or you are unhappy with something, would you please state the reasons for your views, and offer some alternatives rather than just making a statement of belief.
- A useful approach in making your comments is to follow the sequence of *opinion, evidence example*.
- Where comments relate to *factual* information - for example an error in fact, or something crucial that has been omitted - please supply the facts and, if possible, a supporting statement and/or the source of your material.
- Please try and make your comments as *specific* as possible and note the page number (and, if possible, paragraph and line) of the document you are referring to. Again, give your reasons for the change, if they are relevant.

Some questions to assist you in your reply

1. How important is this *Strategy* to you - as an individual, group, industry or agency?
2. How do you see yourself using the Strategy (for example: as a general guide to projects you are involved in; for plans or policies you are preparing; to help track

- performance; to help secure funds; to assist in better engagement with government, industry or community)?
3. Have the broad issues for the Swan Region been satisfactorily identified? If not, what has been overlooked?
 4. Have the five main goals adequately addressed the main issues for the Region?
 5. Is there anything else you would like to add?

Thank you for your comments. These will assist greatly in preparation of the final Strategy.

When should feedback be provided and to whom?

Closing date: 12 October 2001
Post to: The Swan Catchment Centre
108 Adelaide Terrace
Perth 6004
Fax to: 9221 4960
Email to: saicc@wrc.wa.gov.au
Enquiries to: 9220 5300

1 Introduction

This document presents a **Natural Resource Management Strategy** for the Swan Region, Western Australia. The **Swan Region** (Figure 1) includes the Swan and Canning River catchments and estuaries, including the Ellen Brook and Brockman River to the north, Wooroloo Brook and the Helena River to the east and the Southern River and Wungong Brook to the south. The coastal plain and wetlands north and south of the Swan River estuary and associated urban catchments make up the remainder of the Region. The Region extends west to the coast, although coastal issues are dealt with in other strategic plans.

The Swan Region is shown in Figure 1.

The Strategy is referred to as the '*Swan Strategy*' and has been prepared by the **Swan Catchment Council**.

1.1 The vision and goals for the Region

The Vision is that

the natural resources of the Swan Region will be protected and managed sustainably in their own right and for the enhancement of the quality of life for present and future generations.

1.1.1 Goals

There are *five goals* for the management of the natural resources of the Swan Region that support the vision. The goals are in two categories –

- 'content driven goals' describe the desired state of the natural resources in the Region, and
- 'process driven goals' describe the necessary human behaviour to achieve that state.

Content driven goals

Goal 1: Conserve natural diversity – native plants and animals, natural habitats and physical diversity conserved at regional and local scale.

Goal 2: Ensure acceptable water quantity and quality – acceptable water quantity and quality standards achieved in surface and ground waters.

Goal 3: Improve land condition – all peri-urban and rural land to be used within its capability and suitability.

Process driven goals

Goal 4: Improve management processes – legislation, statutory processes, programs and strategies to be integrated to improve natural resource management.

Goal 5: Achieve culture change – government, community and individual behaviours enhance the understanding and management of the Region's natural resources.

1.2 Defining Natural Resource Management

Natural Resource Management (NRM) is defined in Western Australia as:

the 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 capability of the biosphere. It does not include mineral or marine resources¹

NRM acknowledges the principles of Ecologically Sustainable Development (ESD), a nationally adopted goal^{2,3} and the State-endorsed process of Integrated Catchment Management.

Sound Natural Resource Management can occur through the implementation of **Integrated Catchment Management (ICM)** principles. In general terms, ICM is the coordinated planning, use and management of water, land, vegetation and other natural resources on a river or catchment basis. It involves the whole community of the catchment including landholders, businesses, industries, residents, local government and State agencies. The building blocks of ICM are based on: a systems approach; integration; partnerships between stakeholders, equity and flexibility.

The Swan Region is home to an expanding economy and population that presents a very challenging environment for the achievement of the NRM outcomes as defined above. Because of this regional dynamism and the consequent high demand for land use change and access to natural resources, NRM in the Swan Region is closely linked to **statutory planning processes**, which play a central role in achieving the defined outcomes. The reliance on the use of planning processes is much greater in this metropolitan-based Region than in other rural environments where the demand for land use change is generally lower.

The natural resources in the Region contribute to **environmental values** that have both an **intrinsic value** and **beneficial uses**, that derive from their ecological health condition. All the natural resources and ecological processes in the Region are assets in their own right, or put another way, they have value because they exist. The 'ecological health conditions' of the natural resources generate 'beneficial uses' in providing services through ecosystem functioning – soil and water resources produce food and fibre; forests produce timber and clean water; and soil and water micro-biota breakdown waste.

Issues or problems arising from the management of natural resources relate to the natural or human pressures exerted on those environmental values. For instance, the stock of native vegetation may amount to a number of hectares in fair condition. The pressures on the vegetation consist of those activities that reduce the amount of the asset (e.g. land clearing) and its condition (e.g. weed introduction through recreational activity in the area).

Within the context of the *Swan Strategy*, the natural resources being addressed will be confined to land, water, living organisms and natural processes. A key focus is on the interface between

urban/peri-urban and rural development and its impact on natural resources in the Region, especially biodiversity and water quality.

The *Swan Strategy* has been developed within the following **Key Guiding Principles for NRM in the Swan Region** that provide the context for the goals and actions. These principles (Box 1), established during the process of Strategy development, collectively recognise the need to pursue ecologically sustainable development in the Region, and highlight the importance of a partnership approach.

Box 1: Key guiding principles for NRM in the Swan Region

Adopt Ecologically Sustainable Development (ESD) principles in implementing regional natural resource management, with a focus on:

- recognising environmental values in sustaining ecological health conditions and beneficial uses;
- managing the pressures on environmental values across the whole Region, in particular recognising the essential need to conserve the Region's biodiversity through the development and implementation of local, regional and State strategies.
- efficiently and fairly allocating rights to use and enjoy natural resources across the Region to the benefit of the natural environment and those who live in it – now and in the future;
- enhancing and supporting the role of local government in planning for environmental management that is consistent with regional and State strategies;
- integrating the work done by government and community in developing partnerships in managing natural resources with shared responsibilities and resourcing,
- acknowledging future uncertainties and the need for a capacity to change, and
- incorporating regular audit and review of plans and strategies.

1.3 Rationale, purpose and use of the *Swan Strategy*

1.3.1 Strategic planning in the Swan-Avon Catchment

The *Swan-Avon Integrated Catchment Management Program* was established in 1995 with Commonwealth and State government assistance as a community-driven partnership with the Commonwealth and State governments to protect land and water resources within the Swan-Avon catchment. The vision of the program is to enhance well-being within the urban and rural community in the Swan-Avon catchment through a sense of community interdependence. The key linking document for the Swan-Avon Catchment is *Working Together (1997)* which was developed by the Swan-Avon Integrated Catchment Management Coordinating Group.

The *Swan-Avon Integrated Catchment Management Program* is supported by the two community led groups, the Swan Catchment Council and the Avon Working Group who have re-affirmed their desire to work closely together and ensure that their NRM strategies are complementary. The relationship between these groups is shown in Figure 5. The Avon

Working Group released a draft NRM Strategy for the Avon Region in July 2000 entitled *Avon River Basin. Draft Natural Resource Management Plan 2000*.

1.3.2 The need for the *Swan Strategy*

The Swan Region is home to over one million people who enjoy a standard of living based on a very high level of consumption of natural resources from all over the world⁴. While recognising the global implications of their natural resource use, this Strategy focuses on the relationship between the Swan Region's natural resources and its people. The Strategy outlines how the natural resources of the Region can support this generation's needs and those of future generations, as well as protecting the Region's environmental values. This needs to be achieved in the face of a projected increase in Perth's population from 1.2 million in 1996 to 2.0 million in 2031.

The *Swan Strategy* meets Commonwealth and State expectations for **regional natural resource management strategies** that set out the partnership between community and government in managing natural resources at a regional scale. The Strategy is needed to:

- ensure that key national and State environmental policies and programs are addressed in the Swan Region;
- set recognised goals, outcomes and indicators that are agreed to by all partners;
- manage pressures placed on natural resources by the large and growing population in the Region, and
- coordinate and link the wide array of existing and planned activities being undertaken by individuals, communities, and governments across the Region.

The **purpose of the *Swan Strategy*** is to:

- formalise the partnership between government and community in natural resource management;
- define over-arching goals for NRM in the Region;
- establish priorities for action to meet defined goals;
- identify responsibilities and resources for management within existing instruments and structures;
- provide a key linking mechanism between existing government and community management instruments and activities (see Figure 2);
- ensure regional objectives have a local relevance and dimension;
- guide investment decisions in priority Strategies by individuals, community groups, industry and local and state government agencies, and
- identify gaps in the coverage of natural resource management instruments and activities and define how they will be addressed.

Individual **Strategies** in the document have five main functions, as follows:

- an endorsement function, in recognising and where possible building on and improving existing government instruments (e.g. *Bush Forever*);

- a function in identifying and addressing gaps in existing government arrangements and endorse existing actions to address these (e.g. planned Urban Bushland Statement of Planning Policy, new biodiversity conservation legislation);
- a support function for partnerships between governments and community and shared activities undertaken through these partnerships (e.g. land management planning);
- a support function for community activities (e.g. resourcing groups involved in managing natural resources), and
- an advocacy function in providing for the promotion of NRM profile and needs (e.g. promoting improved rural land management).

These functions and the relationship between them are identified in Figure 2.

Figure 2: Examples of inter-relationships in NRM in the Swan Region

Policies (examples)	<i>National Action Plan for salinity</i>	<i>COAG Water policies</i>	<i>National strategies for biodiversity, ESD</i>	<i>State NRM Policy</i>	<i>Environmental Protection (Swan and Canning Rivers) Policy</i>
Organisations	Government agencies Industry groups Local governments Regional community groups Peak community groups				
Programs (examples)	<i>Bush Forever</i>	<i>Swan-Canning Cleanup Program</i>	<i>Waterways WA</i>	<i>Ecoplan</i>	<i>Riverplan</i>
Strategies (examples)	<i>State Weed Strategy</i>	<i>State Salinity Strategy</i>	Swan Strategy	<i>State Planning Strategy</i>	<i>Metropolitan Region Scheme</i>
Functions in the Swan Strategy	Endorse/improve existing government instruments	Address gaps in existing government coverage	Support partnerships between government and community	Support community activities	Promote and advocate NRM profile and needs

The *Swan Strategy* will be used by:

- **individuals** – in supporting the important contribution they are making to NRM in the Region; in building further understanding about NRM and the opportunities for individual action;
- **regional community groups** – in supporting their vital and pivotal role in local and regional natural resource management; in developing and resourcing projects that are locally important within a regional context, and in increasing their capacity to contribute to local and regional planning;
- **statewide community groups** – in supporting the adoption of initiatives and policies that have state and regional relevance;

- **industry groups** – in encouraging and developing opportunities for strategic investment into NRM in the Region;
- the **Swan Catchment Council** – in providing leadership and training to community groups; in setting priorities for action, funding; and in partnership building with government;
- **local governments** – in providing guidance for local area planning and action, and in leveraging support from community groups, and state agencies;
- **State government agencies** – in securing funds for commitments to existing policies, programs and plans made through the Strategy; in meeting statutory obligations; and in developing capacity for NRM within the Region, and
- **Commonwealth government** – in developing investment plans; in ensuring that State-Commonwealth partnership arrangements are being addressed, and that international and national commitments are being met.

The **development of partnerships** between government, community, industry and individuals is critical for good management of the Region's natural resources. No one sector can achieve the goals unaided. The Strategy defines the parameters for partnerships between these sectors that will increase the integration of effort and the effectiveness of outputs in managing natural resources. In particular, these partnerships will empower and strengthen the contribution made by the community to the management of natural resources in the Region. By endorsing the Strategy, governments, industry and community have committed to shared roles and obligations that will contribute to the achievement of the NRM goals.

1.3.3 Developing the Swan Strategy

The Strategy was prepared over a 12 month period by a Sub-Committee of the **Swan Catchment Council**, including the Chairperson; two community members; representatives of the Department of Environmental Protection, the Ministry for Planning, the Department of Conservation and Land Management, Water and Rivers Commission and Agriculture Western Australia; and the Program Manager of the Swan Catchment Centre and the *Swan-Canning Urban Landcare Program*.

This sub-committee pulled together and analysed a large amount of information in preparing the strategy. The information came from many sources.

- Documentary information was available from previous community workshops and planning events held over the last four years. This information has already been used in developing the *Working Together* document, and in designing and implementing the *Swan-Canning Urban Landcare Program*.
- Community people involved in NRM in the region were invited to attend three workshops held in March-April 2000. These workshops, held in Bayswater, Midland and Gosnells were attended by over 50 people from a number of community groups. People at the workshops confirmed the issues of importance to be addressed in the Strategy, the desired outcomes, and provided input to the means of achieving the outcomes.
- The sub-committee also obtained direct input from representatives of major community environmental organisations active in the region, such as the Wildflower Society and the Urban Bushland Council.

- State and National environmental and natural resource management policies were used as important reference points in Strategy development. Key policies included the *National Strategy for the conservation of Australia's biological diversity*; the *National Strategy for Ecologically Sustainable Development*; the Council of Australian Governments' program for water reforms, and the Western Australian framework for natural resource management.
- Existing State NRM policies and programs in the Region were incorporated into the Strategy. The most important of these are: the *Environmental Protection (Swan and Canning Rivers) Policy*; the *Swan-Canning Cleanup Program and Action Plan*, and *Bush Forever*.
- The strategy benefited greatly from the input from government agencies with major natural resource management responsibilities. Representatives from these agencies (see Figure 5) provided information on their own programs and activities, both current and planned.
- The Swan Catchment Council provided critical comment and input to the work of the Sub-Committee, particularly in setting direction at the outset of the process.

1.3.4 Endorsement and duration of the Strategy

The Strategy will be endorsed and supported through to implementation in the following essential stages.

- Review by the Swan Catchment Council and government agencies prior to release as a formal draft (completed at June 2001).
- Sign off by key agencies and community groups, prior to formal cabinet endorsement.
- Commitment to goals and objectives by the Ministers for the Environment, Primary Industries, Water Resources and Planning.
- Commitment to goals and objectives by State and regional community groups.

Goals and outcomes have been set for 10 years, with a mid-term review after five years. Priority strategies are either already being implemented or they will be initiated over the first five years.

1.3.5 Organisation of the document

Section 1 sets the vision for the Swan Region and the five peak goals for Natural Resource Management. **Section 2** provides a situation statement briefly describing the Swan Region and the environmental values, issues and mechanisms in the Region. The **five NRM goals** are presented separately, with a description of:

- the status, issues and adequacy of current management arrangements;
- the 10 year outcomes and indicators, and
- objectives and strategies to achieve the outcomes.

Section 3 summarises priorities for implementation and presents an evaluation framework for the Strategy. The structure of the Strategy is shown in Figure 3. **Section 4** lists the principal sources of information and the acknowledgments.

Figure 3: Structure of the *Swan Strategy*

Section 1 – Vision and goals				
Section 2 – Situation statement				
Goal 1 Conserve natural diversity	Goal 2 Ensure adequate water quantity and quality	Goal 3 Improve land condition	Goal 4 Improve management processes	Goal 5 Achieve culture Change
Status, issues, adequacy of management arrangements				
Outcomes and Indicators				
Objectives and Strategies				
Objective 1.1	Objective 2.1	Objective 3.1	Objective 4.1	Objective 5.1
Objective 1.2	Objective 2.2	Objective 3.2	Objective 4.2	Objective 5.2
Objective 1.3	Objective 2.3	Objective 3.3	Objective 4.3	Objective 5.3
			Objective 4.4	
Section 3 Priorities and evaluation				
Section 4 Sources and acknowledgments				

1.3.6 Resourcing the strategies

Some of the strategies are already fully resourced, some will require additional resourcing to achieve the targets, and others are new. Resourcing the strategies needs to consider the role of the lead organisation(s) and the key partners as presented under the following headings.

Lead organisation(s) and their role

A lead organisation(s) is defined for each strategy. The nominated organisation(s), normally being a government agency has the responsibility of ensuring the strategies occur through a mixture of leading, facilitating, auditing and service delivery. In many situations, the role will be confined to a leadership/facilitation role, with auditing and service delivery resourced and delivered by other organisations. This applies to several of the strategies where either the Department of Environmental Protection or the Western Australian Planning Commission / Ministry for Planning is the nominated leader, thereby recognising their 'end of line' legislative responsibilities for services delivered by other agencies. For these strategies, additional resourcing for the lead organisation will be limited to that required to discharge the leadership/facilitation role.

In other cases, the lead organisation is also the principal service deliverer, or will be required to audit performance of themselves and others. Where the strategy is already fully implemented, resourcing will not be an issue. However, where the strategy is either an expansion of existing

activities or is completely new, there will be resourcing issues to be addressed for that organisation.

Key Partners

The key partners are those organisations and groups that have an important stake in the outcome resulting from implementation of the strategy, and/or those that have a key role to play in service delivery. In most cases, the key partners will be involved in service delivery, either through collaborative projects or in stand-alone activities.

The key government agencies for implementing the strategies are the five State agencies with specific core responsibilities for natural resource management and the Swan River Trust. These are named in Section 2.2.5. Other important partners include local governments, community groups, industry groups and corporate entities, the Swan Catchment Council, and educational and research bodies.

As with the lead organisation, implementing the strategies may have resourcing implications for the partners. Addressing the resourcing implications will be a key consideration in obtaining commitment to implementing the strategy.

2 The Swan Region in 2000 – a situation statement

This section presents the current physical and socio-economic state of the Region (as defined in Section 1.1). It also documents the array of key legislation, policies, instruments, strategies and activities that currently apply to the management of the Region's natural resources.

2.1 The environment in the Swan Region

The Region's residents have developed an outdoor lifestyle that is heavily reliant on the high quality environmental values and assets in the Region. Examples include Kings Park, Bold Park, Lakes Monger and Joondalup, the beaches and the Darling Plateau. Equally important are the significant areas of neighbourhood remnant bushland and wetlands that are valued and nurtured by local residents. These areas provide easily accessible rural and natural landscapes which provide a contrast to urban and coastal areas. Central to the Region is the Swan-Canning estuary, described as 'the jewel in Perth's crown'. The magnificent expanse of water in the estuary provides aesthetic and recreational pleasures for many and is a welcome area of open space in a crowded city.

The Swan Region has a number of distinctive features that set it apart from the other NRM regions across the state.

- Its social and economic life is dominated by the Perth metropolitan area, with its associated secondary and tertiary industries. A much smaller component of the economy is contributed from primary industries. Many of the natural resource management issues relate to the large and increasing demand for land, water and power to support the urban population.
- At the same time, a significant proportion of the Region retains its 'naturalness', mainly because the lands on the sandy coastal plains were found to be so unsuitable for agriculture, and development was restricted in the Hills water catchment areas. This history has been fortuitous in providing this generation with a legacy of bushland and wetland to protect and conserve.
- The large population, the steady demand for more natural resources to sustain social and economic life and the importance of protecting the natural heritage have resulted in a very large number of policies, strategies, plans and instruments being managed by the State Government and local governments.
- The level of community activity to protect the environment in the Swan Region is high. Some 250 groups and perhaps as many as 10,000 people are active in one way or another in land use planning, catchment management, weed and pest eradication, wetland rehabilitation, publicity and so on. This voluntary effort is motivated by the value of the resources in their own right, and complements the efforts of governments in environmental protection.

The following sections describe more fully this complex operating environment for natural resource management.

2.1.1 The natural environment

The Swan Region covers approximately 7,000 square kilometres, of which 55 square kilometres comprise the Swan-Canning estuary.

Landforms and soils

The Region lies across three significant landscape units. The **Darling Plateau** to the east consists of granitic rocks some 2,500 million years old, which outcrop most commonly close to the **Darling Scarp** which occurs along the western margin of the Plateau. Granite occurs in the deeply incised valleys of the Swan-Avon, Helena and Canning Rivers. Elsewhere on the plateau, extensive laterisation has occurred with the granitic rock basement covered by a deep layer of weathered regolith beneath a lateritic cap.

To the west of the Darling Scarp is the **Swan Coastal Plain**, which has developed over the much younger and deep sedimentary deposits of the Perth Basin. There are six landform elements on the Swan coastal plain.

- The **Dandaragan Plateau** is a major feature north of Perth and protrudes only slightly into the Swan Region near Bullsbrook. It is composed of Jurassic and Cretaceous sandstones that have been laterised to produce lateritic and colluvial sandy soils. This is a minor landform in the northern part of the Swan Region.
- A narrow band (1 to 3 km) of **Foothills** lies immediately below the granitic rises of the Darling Scarp and comprise alluvial and colluvial material from the scarp and ancient beach sands. Soils are light grey and white quartz sands.
- The **Pinjarra Plain** consists of relatively recent alluvium transported from the scarp by rivers flowing to the west. It occurs extensively in the Swan River valley and on the north eastern side of the Canning River in the Kelmscott-Gosnells area. Soils include clays, with silts, sands and peats and are generally well-structured and relatively fertile.
- West of the Pinjarra Plain is a broad band (about 10 km wide) known as the **Bassendean Dunes**. These are deep, heavily leached aeolian sands from Pleistocene times. The dunes are 40 to 80 m high in parts comprising light grey quartz sands. The landform is internally drained, with wetlands occurring in lower areas – e.g. Bibra, Yangebup and Thomsons Lakes. These landforms are naturally nutrient-poor, with virtually no capacity to adsorb introduced nutrients.
- Further to the west are the **Spearwood Dunes** which are also aeolian sands, but which overlie occasionally outcropping Tamala limestone. Soils are white to pale yellow sands. The area is also internally drained, with extensive lakes and wetlands lying in a north-south orientation – including Lakes Monger, Herdsman and Joondalup. These sands are less leached and hence more fertile than the Bassendean Dunes.
- Between the Spearwood Dunes and the ocean lie the **Quindalup Dunes** which are calcareous recent aeolian deposits, also overlying Tamala Limestone. Soils are white infertile calcareous sands.

Climate

The area has a Mediterranean climate with warm dry summers and mild wet winters. Mean temperatures vary from 24°C in summer to 13°C in winter. Frosts are uncommon. Rainfall is generally reliable, with a growing season commencing on average in mid-April, and finishing in

October. Average rainfall varies from 800 mm on the coast to 1000 mm along the face of the Darling Scarp. June and July are typically the wettest months, with seasonal inundation common in low-lying areas across the Swan Coastal Plain. Summer rainfall is very low and erratic in incidence, with occasional downpours from cyclonic systems.

The poor moisture holding capacity of the sandy soils on the plain, the lack of summer rain and high evaporation rates has led to the indigenous flora developing a range of drought resisting mechanisms. The typically dry summers increase susceptibility to fire in the native vegetation, although it has evolved a number of adaptive mechanisms to cope with fire.

Flora and Fauna

The Swan Region is within the south west of WA which is one of the 25 most important regions for biological diversity in the world⁵. The Region includes parts of two Interim Biogeographic Regions of Australia (IBRA) – the Swan Coastal Plain and the Jarrah Forest. Both IBRAs have a rich flora including a large proportion of endemic species – up to 80 per cent. For instance, WA has 50 per cent of Australia's known flowering plants, ferns and cycads and the south west, including the Swan Region has the greatest variety of these plants. More than 1,200 native plant taxa have been identified in the Perth Metropolitan Area alone, including 32 Declared Rare Flora and over 100 Priority Flora species. Vegetation diversity at both specific and community scales is highest in the woodlands and wetlands on the Pinjarra Plain and Foothills landforms, and in the Bassendean Dune woodlands. Wetland diversity is particularly high, although an estimated 80 percent of the original wetlands on the Swan Coastal Plain have been artificially drained or filled in for agricultural or urban land uses⁶.

As shown in Table 2.1⁷, the Swan Coastal Plain IBRA has 11 percent of the original area held in the Nature Conservation Estate. *Bush Forever*⁸ identifies 51,200 hectares of regionally significant bushland in 26 vegetation complexes on the Swan coastal plain west of the Darling Scarp that is recommended for protection. This amounts to about 18 per cent of the original vegetation on the Swan Coastal Plain portion of the Perth Metropolitan Area.

Although only 3.5 per cent of the Jarrah Forest IBRA is in the Nature Conservation Estate, a total of 34 percent of the area is managed by the Department of Conservation and Land management for nature conservation.

Table 2.1: Land managed for nature conservation in the Region⁷

IBRA Region	Nature conservation estate (% of IBRA)				Total land managed for nature conservation	
	National Park	Nature Reserve	Cons. Park	Total		
Swan Coastal Plain	6.06	5.12	0.05	11.22	214,077 ha.	14.23%
Jarrah Forest	0.90	1.40	1.23	3.53	1,581,805 ha	34.33%

The Swan Region is also home to a diverse fauna. Bird species are particularly well represented with over 300 species occurring in the area, 34 migrating to the area annually. The reptile, mammalian, invertebrate and micro-fauna is also abundant and diverse, but has been depleted particularly as a result of habitat loss and feral animal predation¹⁵.

Water abundance and quality

The dominant surface feature in the Region is the tidal Swan-Canning estuary, which is connected to the Swan-Avon River system to the north-east and the Canning River system to the south-east (see Figure 1). The estuarine system has a range of important environmental values in its riparian vegetation and is a very significant economic and recreational asset⁹.

The Swan-Canning estuary is fed mainly by the Avon River Basin which drains a very large catchment east of the Darling Range (121,000 square kilometres). The catchment is occupied by only 54,000 people living in 34 Shires. Catchment and landcare activities centre mainly on private farms: in the Avon River basin alone, these number about 4000 and cover more than 700 sub catchments.

Clearing of most of this Basin has increased the salinity, sediment loads and nutrient levels in the streamflow which enters the Swan River below the Darling Scarp. About 75 per cent of the salt load and 25 per cent of the nutrients enter the estuary via the Avon. Other significant sources of nutrients include Ellen Brook and a range of coastal streams. Between 1987 and 1992 the annual nutrient flow into the estuary was 75 tonnes of Phosphorus and 750 tonnes of Nitrogen. As a consequence of increased nutrient inputs from the Avon and Swan-Canning systems, algal blooms are now common in some stretches of the Swan and Canning Rivers¹⁰. Occasionally these become widespread and toxic, as in January 2000, when un-seasonal heavy rains in the Avon River catchment generated a large nutrient flow into the Swan-Canning estuary. Algal blooms result in significant environmental, social and economic costs to the community.

The Swan Region is well supplied with natural fresh water resources. The quick flowing streams in the Darling Ranges rise in largely protected forested catchments and run at less than 500 mg/L salt. Most of these have been dammed to meet Perth's and the Goldfields' large demand for industrial and domestic water. As a consequence of diversions, flow regimes in many streams are insufficient to support environmental values.

The sandy, porous coastal plain holds a large amount of fresh ground water, some of which nourishes strings of lakes and wetlands that occur north and south of the Swan-Canning estuary. This water supply is also critical for metropolitan Perth's domestic and commercial needs, and accounts for approximately half the total supply. The quality and abundance of these water bodies is threatened in places by pollutant-rich plumes, excessive use of nutrients and inadequate urban stormwater drainage design, all of which have the potential to contaminate and deplete the groundwater resource.

2.1.2 The socio-economic environment

The Swan Region has been home to Aboriginal peoples for more than 40,000 years. Despite major dispossession and dislocation at the time of European settlement, Aboriginal communities have maintained a cultural and economic attachment with the Region, parts of which are the subject of Native Title claims. Aboriginal heritage in sites and story is an important component of the socio-cultural landscape in the Swan Region. This Aboriginal heritage is recognised by many local governments and catchment groups which have established close ties with local indigenous communities.

The Region now supports 1.25 million people, or about 70 per cent of the State's population. This concentration of people places high demands on land and water resources for industry, residential, transport and lifestyle needs and sets this Region apart from the others across the state. Government of the Region is complex – there are 30 local authorities, with 36 small townships in the peri-urban fringe outside the metropolitan area. Table 2.2¹¹ presents a range of socio-economic measures for the area bounded by the Wanneroo, Swan, Mundaring, Kalamunda, Armadale, Serpentine-Jarrahdale and Rockingham local governments, which are indicative of the level of pressure on the Region's resources.

Table 2.2: Trends in resource use and pressures in the Swan Region

Indicator	1986	1991	1996	Projected
Population (millions)	0.994	1.133	1.234	2.0 (2031)
Total dwellings ('000s)	371	434	497	NA
Single detached dwellings (%)	76.7	75.9	NA	NA
Multi-unit dwellings (%)	21.3	21.8	NA	NA
Urban zoned land (hectares)*	NA	66,907	78,812	NA
Industrial land (hectares)**	11,085	9,757	10,963	NA
Vehicle travel (million km)	58	68	83	128 (2011)
Tonnes of waste per capita	NA	1.4	1.1 (1997)	0.7 (2000)

* Years shown are 1992 and 1998.

** Years shown are 1985, 1990 and 1997

NA not available

Table 2.2 shows that the Region's population is growing at about 1.2 percent per annum. Net migration to WA is a source of population growth, with 70,000 additional people coming to the state between 1986 and 1991. Population growth is causing an increased demand for residential land - between 1993 and 1996, 12,500 hectares were converted from Other Zones to Urban Use. Conversely, the area of industrial land has not changed over the last decade¹¹.

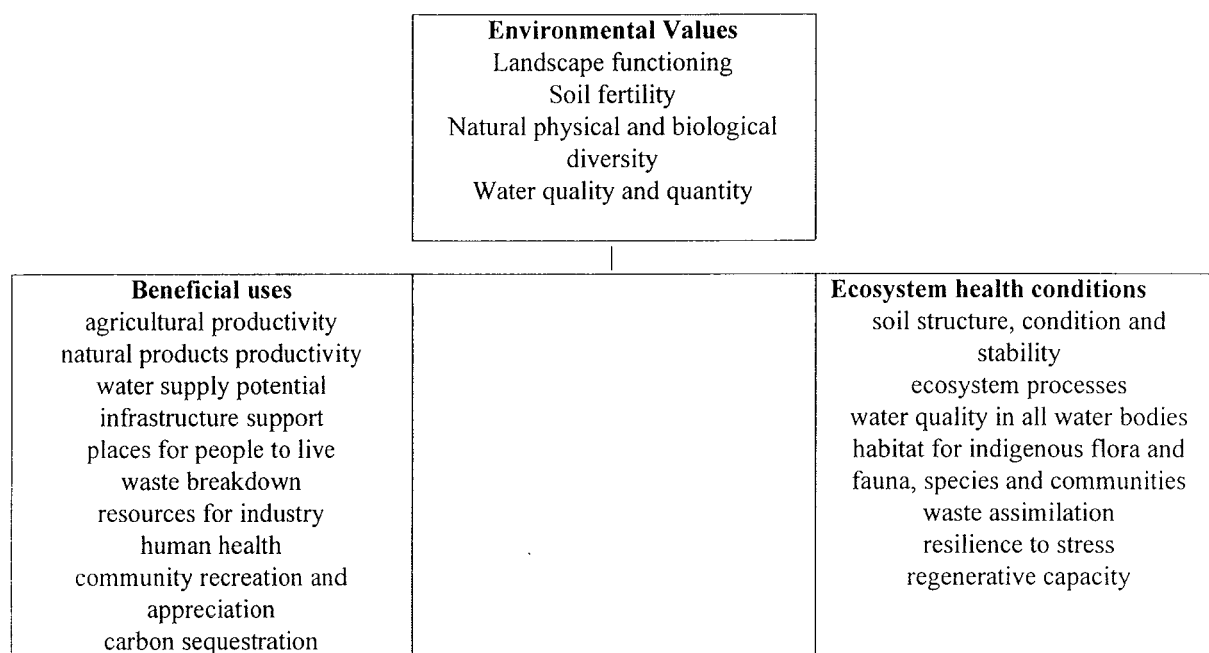
Seventy five per cent of Perth's urban residents live in detached houses with generous space for garden and outdoor activities. There has been a small decrease in this percentage as the number of multi-unit dwellings have increased slightly, and government is promoting more environmentally sensitive housing design¹². Perth residents are high users of water and energy compared to residents in other capital cities, although average levels are lower than in some other parts of the State. Annual residential water use in Perth is about 300 kL/customer and electricity consumption is almost 5,000 kWh per household (1999 data). Total fuel consumption was 1,523 million litres in 1995, or about 1,200 litres per person. Solid waste generation per capita is being reduced through a range of targeted recycling campaigns conducted mainly by local governments^{4,11}, and through the Draft State *Waste 2020 Strategy*¹³.

Current economic drivers for an increased standard of living which includes better access to services and facilities is increasing the pressures on the natural resources and also is a basis for conflicts over land use in the increasingly crowded Swan Region.

2.1.3 The environmental values in the Swan Region

The environmental values for the natural resources of the Region have been determined and confirmed through community input to the *Swan Strategy*. The relationship between environmental values, and their beneficial uses and ecosystem health conditions is shown in Figure 4. This list excludes air quality values, which are outside the scope of the State's NRM policy¹.

Figure 4: Environmental values, beneficial uses and ecosystem health conditions in the Swan Region



The values above include those defined for the protected waterways in the *Environmental Protection (Swan and Canning Rivers) Policy*⁹.

Conservation and protection of these values requires actions that ensure:

- protected habitat areas are located to ensure adequate conservation of biodiversity and ecological processes at the regional scale;
- habitat areas are sufficient in size to support resident flora and fauna or migratory species;
- direct management of habitat areas contributes to their value as refugia for biodiversity and ecological processes;
- direct management of water resources in rivers, streams and wetlands contributes to water quality objectives, and
- management of all other lands contributes to the protection of these values.

2.1.4 Priority natural resource management issues in Perth and on the Swan Coastal Plain

The community concerns focus on the pressures on land and water-based natural resource values – particularly biodiversity, water quality and land condition. Air quality and noise issues are considered to the extent that they have an effect on the land and water-based values. Community concerns reflect priority environmental issues for the Swan Region summarised in the first comprehensive report of the condition of the environment for WA shown in Table 2.3⁴.

Table 2.3: Priority environmental issues in the Swan Region

Perth Metropolitan Area		
Carbon monoxide	<i>Contamination of inland waters</i>	Haze from particulates
Enhanced greenhouse effect	<i>Eutrophication</i>	<i>Loss of fringing vegetation</i>
<i>Land contamination *</i>	Lead	Stratospheric ozone depletion
<i>Maintenance of biodiversity</i>	Photochemical smog	
Sulphur dioxide emissions	Dust	
Swan Coastal Plain		
<i>Acidification</i>	<i>Contamination of inland waters</i>	Enhanced greenhouse effect
<i>Erosion</i>	<i>Eutrophication</i>	<i>Land contamination</i>
<i>Land salinisation</i>	<i>Loss of fringing vegetation</i>	<i>Maintaining biodiversity</i>
<i>Salinisation of inland waters</i>	<i>Sedimentation</i>	Stratospheric ozone depletion
Sulphur dioxide	<i>Waterlogging</i>	
South West Forests		
<i>Acidification</i>	<i>Contamination of inland waters</i>	Enhanced greenhouse effect
<i>Erosion</i>	<i>Eutrophication</i>	<i>Land contamination</i>
<i>Land salinisation</i>	<i>Loss of fringing vegetation</i>	<i>Maintaining biodiversity</i>
<i>Salinisation</i>	<i>Sedimentation</i>	Stratospheric ozone depletion
<i>Waterlogging</i>		

* The issues shown in *italics* were selected by participants in the public workshops held in March and April 2000 to be the focus of the *Swan Strategy*.

In summary, the major issues for natural resource management in the Swan Region are as follows.

- *Land and soil use values and management* – loss of high value agricultural land; increasing secondary salinity; erosion; poor land management.
- *Native vegetation and biodiversity values* – loss of values occurring as a result of clearing for infrastructure, weed ingress, disease and feral pest infestation, poor fire management, recreational pressures, other forms of inappropriate management.
- *Water use values and management* – loss of water values, eutrophication, decline in flows, loss of habitat, pollution, over-use of resources, recreational pressures.

The Strategy recognises that addressing these issues will require:

- work in changing cultures and behaviours in managing natural resources,
- greater coordination and support for community and government programs in NRM, and
- a planning process that addresses NRM needs.

2.2 Natural resource management in the Swan Region

2.2.1 National and State trends

National and State approaches to NRM are changing rapidly in the face of an awareness that the problems faced are far more complex and widespread than previously recognised. Key features of these approaches are:

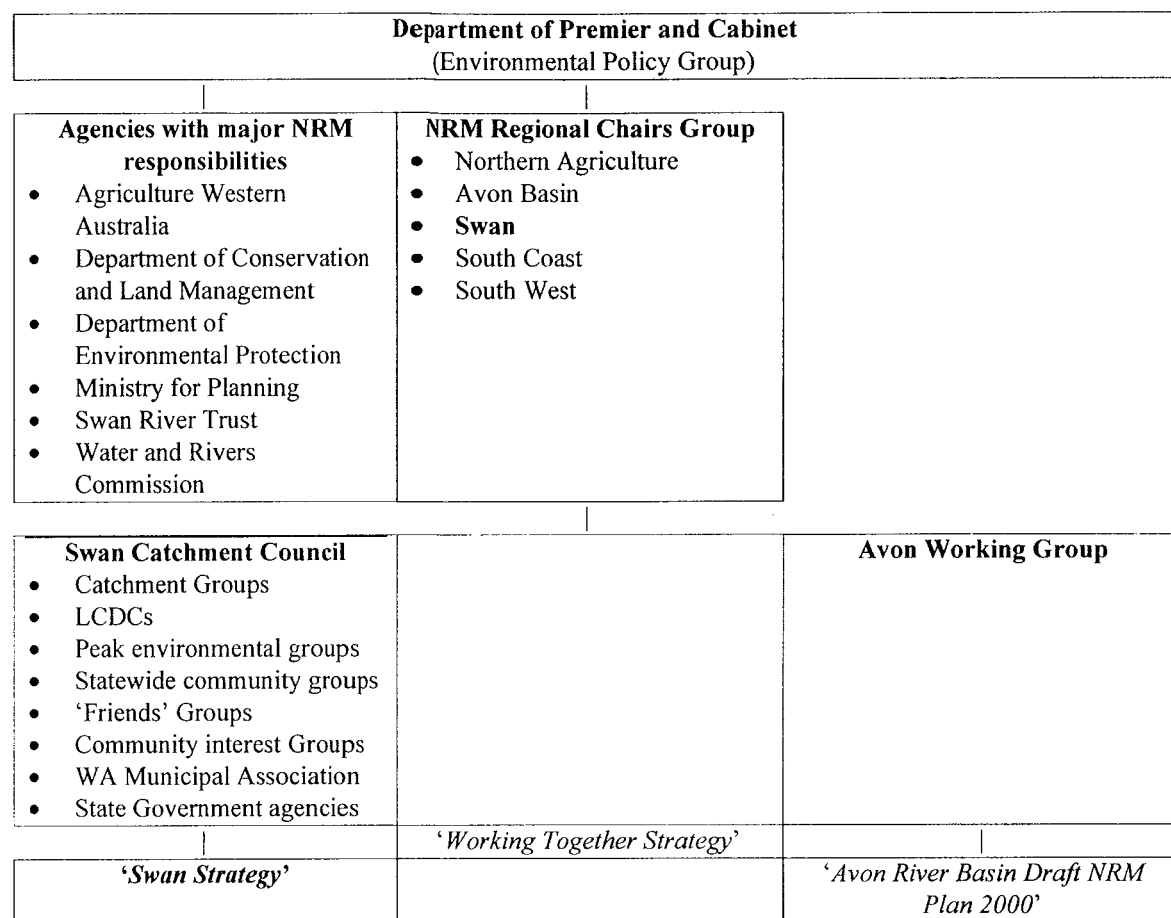
- the endorsement of important national and international requirements for ecologically sustainable development and conservation of biological diversity;
- the recognition that investment in NRM must occur in a coordinated way through strategies and action plans;
- the development and 'signing off' of regional natural resource management strategies;
- the development and political empowerment of partnerships between government (local, State and Commonwealth) and local and regional communities in managing natural resources;
- a tighter integration and rationalisation between environmental, social, cultural, economic and political components of natural resource management as a feature of NRM strategies;
- a greater community involvement in planning and land use decisions, and
- an increased direct provision of public resources to community managed NRM activities.

2.2.2 The State NRM framework

In line with national initiatives for Natural Resource Management², the State Government is moving to organise NRM within an evolving framework led by the Environmental Policy Unit in the Department of Premier and Cabinet. The framework includes the Premier and Ministers and Chief Executive Officers for four of the agencies with specific NRM responsibilities – the Departments of Environmental Protection and Conservation and Land Management, the Water and Rivers Commission and Agriculture Western Australia. In the Swan Region, the Ministry for Planning and the Swan River Trust also have key roles in natural resource management.

Advising the Department of Premier and Cabinet are the four NRM agencies plus the Ministry for Planning, and a Regional Chairs Group, made up of the chairpersons of five regional NRM groups - the South West Catchments Council, the South Coast Regional Initiative Planning Team, the Avon Working Group, the **Swan Catchment Council**, and the Northern Agricultural Integrated Management Strategy Team.

The relationship between these groups is shown in Figure 5 below.

Figure 5: State structures in Natural Resource Management

The **Avon Working Group** and the **Swan Catchment Council** are linked through the *Swan-Avon Integrated Catchment Management Program*. The Avon Working Group works in the areas of the Swan-Avon catchment east of the Wooroloo Brook and Brockman River Catchment¹⁴ while the Swan Catchment Council contributes to NRM in the Swan Region.

2.2.3 Roles in managing natural resources

Natural resources are managed across many dimensions – for instance, by area, by type of human activity and across time. There is a continuum evident between actions taken by individuals and those taken by the legislature. The roles are as follows:

- *individual* – applying knowledge, skills and networks in day-to-day activities, providing technical assistance, helping with group coordination and local action planning;
- *local area community groups* – coordinating and supporting group activities, providing leadership, supporting local and regional activities, education and awareness raising;
- *issue-based and statewide community groups* – providing input in policy development and review, supporting local area community groups, partnering in projects with government;
- *industry* – fostering Best Management Practices, cleaner production, supporting R&D, providing leadership and sponsorship to community;
- *local governments* – provision of information, coordination support, development of local environmental and catchment strategies and plans;

- *regional NRM groups* – development of strategies and support for priority needs, monitoring and evaluation, negotiations with government;
- *State agencies* – addressing regional and state issues, implementing programs and plans, monitoring and evaluation, policy and strategy development, regional planning;
- *Commonwealth agencies* – establishing national policies and strategies for NRM, negotiating agreements for implementation with States, providing resources through mechanisms such as the Natural Heritage Trust, and
- *legislature* – developing and implementing statutes, resourcing agencies, local governments and community, monitoring and evaluation, reporting, providing links to national policies and programs.

2.2.4 Instruments, strategies and activities relevant in the Swan Region

Management of natural resources through the *Swan Strategy* must recognise and integrate instruments, strategies and actions occurring across community, industry and government. There is a large number – perhaps 250 – of existing strategies and plans relevant to natural resource management in the Swan Region. These occur in nine categories.

- 1 **Commonwealth Acts** – e.g. the *Natural Heritage Trust Act 1997* and the *Environmental and Biodiversity Conservation Act 1999*.
- 2 **Western Australian Acts** - e.g. the *Environmental Protection Act 1986* (currently being amended); the *Wildlife Conservation Act 1950* (to be replaced by a Biodiversity Conservation Act); the *Conservation and Land Management Act 1984*; the *Soil and Land Conservation Act 1945* (to be replaced by an Agriculture Management Act); the *Swan River Trust Act 1988*; the *Town Planning and Development Act 1928*; *Metropolitan Region Scheme Act 1963* and the *Western Australian Planning Commission Act 1994* (with these last three to be consolidated into one Urban and Regional Planning Act).
- 3 **Statutory and policy instruments** - e.g. the *Environmental Protection (Swan and Canning Rivers) Policy*; the Draft Comprehensive Management Plan for the *Environmental Protection (Swan and Canning Rivers) Policy*, *Environmental Protection (Swan Coastal Plain Lakes) Policy* (being replaced by the Draft *Environmental Protection (Swan Coastal Plain Wetlands) Policy 2000*), Statements of Planning Policy, *Metropolitan Region Scheme*, *Town Planning Schemes* and Section 5AA policies and the *State Planning Strategy*.
- 4 **National agreements and strategies** – e.g. *National Strategy for the Conservation of Australia's Biological Diversity*, *National Framework for the Management and Monitoring of Australia's Native Vegetation*, Council of Australian Government's *Water Reform Program*, Japan-Australia and China-Australia Migratory Bird Agreements (JAMBA, CAMBA).
- 5 **'Whole of Government' initiated policies and plans** - e.g. Natural Heritage Trust Programs (Commonwealth and State Governments), *Bush Forever*, *Swan-Canning Clean-up Program and Action Plan*, state of the environment reporting (Commonwealth and State Governments), *State Weed Plan* (Draft), *State Salinity Strategy* and the State Government's commitment to ICM processes.
- 6 **Agency programs and plan** – both published and internal. Published plans include the *Swan River Management Strategy 1986* (Swan River Trust), *Ecoplan* (Department of Environmental Protection), Western Australian Planning Commission Regional Strategies, Area Management Plans (e.g. *Darling Range Regional Park Management*

- Plan* - Department of Conservation and Land Management), *In-fill Sewerage Program* (Water Corporation), *Waterways WA Program* (Water and Rivers Commission).
- 7 **Local governments' strategies and plans** – e.g. *State of the Environment Report* (City of Armadale), *Eastern Metropolitan Regional Councils' Regional Environmental Strategy*; local planning policies and strategies;
 - 8 **Sub-regional plans developed by ICM Groups**, local governments and State agencies both separately and in partnership - e.g. *Ellen Brook Catchment Management Plan*, and foreshore management plans.
 - 9 **Catchment Plans** developed by community groups, local governments and State agencies both separately and in partnership – e.g. *Upper Canning / Southern Wungong Catchment Plan*, and *Helena River Catchment Plan*.
 - 10 **Local management plans** for specific sites developed by local community groups e.g. Waterford, the Glen Forest Superblock, and Mary Carroll Management Plans.

2.2.5 Community-government partnerships for NRM in the Swan Region

There are over **250 Community Groups** contributing time and resources in addressing environmental issues within the Swan Region. The groups include:

- peak environment groups;
- local, regional and statewide interest groups;
- Integrated Catchment Management groups ;
- Land Conservation District Committees and other catchment groups;
- special interest community groups working with local governments and the Natural Resource Management agencies, and
- 'Friends' groups managing parts of the Region's natural resources.

The direct involvement of the community is vital for achieving the Strategy's goals. Community groups are supported by individual contributions, local government assistance, State and Commonwealth government funds and expertise and industry sponsorship. Community groups are involved in a very wide range of activities which include:

- educating and motivating the wider community about natural resource management issues and how individuals can contribute;
- preparation of strategic and action plans for specific areas in association with state and local government;
- monitoring of trends in the condition of vegetation, water bodies and fauna;
- direct on-ground management of bushland, wetlands, streams and riparian areas through 'Friends' groups;
- volunteer support to government research programs;
- attracting investment into natural resource management at local levels, and
- making direct representations to local and State governments and agencies.

The **State Government** is mainly represented in the partnership through the five State agencies with specific NRM responsibilities (shown in Figure 5), plus the Swan River Trust which has an important role in the management of the Swan and Canning Rivers. **Local government** is

represented by 40 separate authorities in the Region. The legislative, policy and program activities of these agencies and local governments are shown in Table 2.3.

State and Commonwealth Government support for these partnerships is strong. Direct support from the Commonwealth for community-driven NRM in WA over the three years from 1997/8 to 2000/1 amounted to some \$30 million, with the bulk provided through the State-Commonwealth Partnership Agreement under the Natural Heritage Trust (NHT). About \$2 million of these funds with an equivalent amount in matching funds have been invested in the Swan Region to support a range of activities including:

- local government – community partnerships for catchment planning, land and revegetation management and rehabilitation and community education;
- Community Landcare Coordinators – who are located within local government or State agencies and who provide on-ground support for community groups;
- technical support for community group activities;
- information collection – such as the *Swan and Canning Industry Survey*;
- administration of the Swan Catchment Centre, and
- community awareness and education programs.

The **Swan Catchment Council** plays a key role in coordinating and supporting the NRM partnership across the Swan Region. It is a community-chaired and led committee with management responsibility for implementing the *Swan-Avon ICM Program* in the Swan Region. Council membership includes representatives of catchment groups, peak community bodies, local government and State government agencies.

The Council plays a leading role in:

- supporting and coordinating the activities of community NRM groups in the Swan Region;
- understanding NRM issues and developing regional and local processes to address these needs;
- developing and supporting strategic projects to address NRM priorities and attracting funding for these investments, and
- encouraging institutional change in government agencies so that community needs and activities are better addressed and supported.

Table 2.3: Organisational arrangements for NRM in the Swan Region

Organisation	Key Legislation and Government Policies	Key current activities in the Swan Region	Monitoring and reporting
Department of Environmental Protection / Environmental Protection Authority	<i>Environmental Protection Act 1986</i> <i>Environmental Protection (Swan and Canning Rivers) Policy</i> <i>Environmental Protection (Swan Coastal Plain Lakes) Policy</i>	<ul style="list-style-type: none"> • Set environmental objectives and standards • Pollution control and regulation of industry through licensing • Comprehensive management Plans for Environmental Protection Policies (EPPs) • National Pollutant Inventory • National Environment Pollutant Monitoring • Project assessment (EIA process) • <i>State Salinity Strategy</i> 	<ul style="list-style-type: none"> • Annual reporting • State of the Environment Reporting • Reviews of EPPs • Industry audits
Western Australian Planning Commission / Ministry for Planning	<i>Town Planning and Development Act 1928</i> <i>Metropolitan Region Scheme Act 1963</i> <i>Western Australian Planning Commission Act 1994</i> Statements of Planning Policy	<ul style="list-style-type: none"> • <i>State Planning Strategy</i> • <i>Metropolitan Region Scheme</i> • Regional Strategies • Subdivision and Development Control Policies • Implementing <i>Bush Forever</i> (with other agencies) • <i>Jandakot Land Use and Water Management Strategy</i> • <i>Gnangara Land Use and Water Management Strategy</i> • Promotion of water sensitive urban design • Development of Urban Bushland Statement of Planning Policy • Finalisation of <i>Agricultural and Rural land use Statement of Planning Policy</i> • Development of the Environment and Natural Resources Management Statement of Planning Policy • Acquiring land for Comprehensive, Adequate and Representative (CAR) Reserve system (reserved for Parks and Recreation) 	<ul style="list-style-type: none"> • Annual reporting • Review of <i>Bush Forever</i> • Appeals process

Organisation	Key Legislation and Government Policies	Key current activities in the Swan Region	Monitoring and reporting
Department of Conservation and Land management	<i>Conservation and Land Management Act 1984</i> <i>Wildlife Conservation Act 1950</i>	<ul style="list-style-type: none"> • Finalisation of Biodiversity Conservation Act • Recommending conservation requirements • Management of the conservation estate including CAR Reserve System • Off-reserve conservation • Research • Conservation activities with community groups • Endangered species protection • <i>State Salinity Strategy</i> 	<ul style="list-style-type: none"> • Area conserved / reserved • Annual reporting
Water and Rivers Commission (including Swan River Trust)	<i>Swan River Trust Act 1988</i> <i>Waterways Conservation Act 1976</i> <i>Rights in Water and Irrigation Act 1914</i>	<ul style="list-style-type: none"> • <i>Swan-Canning Clean-up Program and Action Plan</i> • Licensing of water use • Development of Environmental Water Provisions (EWPs) • <i>Waterways WA Program</i> • <i>State Salinity Strategy</i> • Information and advice to guide waterways management planning • Advice on wetland evaluation and management • Flood forecasting and advice • Awareness raising and technical support 	<ul style="list-style-type: none"> • Annual reporting • Ribbons of Blue • Frogwatch • Review of <i>Swan-Canning Cleanup Program and Action Plan</i>
Agriculture WA	<i>Soil and Land Conservation Act 1945</i> <i>Agriculture and Related resources Protection Act 1986</i>	<ul style="list-style-type: none"> • Completion of Agriculture Management Act • <i>State Salinity Strategy</i> • Land capability and suitability • Remnant vegetation protection on rural land • Supporting LCDs and Catchment Groups • Regulating rural land degradation issues • Developing and extending Best Management Practices for rural land use • Property Planning for landholders in the Swan-Canning catchment • Management of weeds • Management of the Natural Heritage Trust in WA • Sustainable rural development • Building community NRM capacity 	<ul style="list-style-type: none"> • Annual reporting • Best Management Practices in place

Organisation	Key Legislation and Government Policies	Key current activities in the Swan Region	Monitoring and reporting
Swan Catchment Council	NHT legislation	<ul style="list-style-type: none"> • Education and awareness building • <i>Working together</i> • Community development and training • Foster community-government partnerships • Representation to government • Group support and funding 	<ul style="list-style-type: none"> • Annual reporting
Community groups	NHT legislation	<ul style="list-style-type: none"> • Local environmental planning and community education • Influencing environmental change • Policy development • Conservation activities on-ground • Monitoring 	<ul style="list-style-type: none"> • Annual reporting to Swan Catchment Council and local government
Other agencies (e.g Water Corp, Department of Commerce and Trade)	Various	<ul style="list-style-type: none"> • Environmental programs • Drainage and sewerage • Management of vested land • In-fill sewerage progress • Regional development/planning • Climate change management • Recycling / waste minimisation 	<ul style="list-style-type: none"> • Annual reporting to Minister • Condition on vested lands
Commonwealth Government	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> NHT legislation	<ul style="list-style-type: none"> • Natural Heritage Trust investment to agencies, local governments and community • Commonwealth EIA processes • National Pollutant Inventory 	<ul style="list-style-type: none"> • Annual reports • NHT reviews
Other NGOs (incl National Trust and Greening Australia)	Various	<ul style="list-style-type: none"> • Environmental programs • Coordinating community, government and industry support • Support for community groups • Influencing environmental change and community education • Conservation activities on-ground 	<ul style="list-style-type: none"> • Annual reporting to stakeholders
Local governments Western Australian Municipal Association	<i>Local Government Act</i> and specialist statutes	<ul style="list-style-type: none"> • Town Planning Schemes • Rural land use strategies • Local planning policies • development policies • Strategic environmental planning • Local Bushland Management Plans • Agenda 21 activities • Support for local groups 	<ul style="list-style-type: none"> • State of the Environment Reporting • Local Agenda 21 reporting • Annual Reports
Industry and private sector	Various legislation and licensing requirements	<ul style="list-style-type: none"> • Codes of practice • Monitoring impacts • Implementing environmental management systems (ISO) • Sponsorship to community groups and Landcare Trust 	<ul style="list-style-type: none"> • Reporting to regulating bodies • Published environmental reports

Goal 1 – Conserve natural diversity

Native plants and animals, natural habitats and physical diversity conserved at regional and local scale.

In conserving natural diversity, the Swan Strategy considers the need to ensure that the Region's physical diversity (landforms and soils) and the range of organisms and ecological processes (the biological diversity or 'biodiversity') are conserved according to national and state requirements. The Strategy must also support the need to protect and manage as much as possible of the natural environment in the Region, particularly bushland and wetland remnants and their linkages and corridors in the urban and peri-urban areas. These two needs are not mutually exclusive – protection of local bushland habitats will contribute to regional and local conservation of biodiversity and vice versa.

Conservation of physical and biological diversity

The Region's landforms and soils have been described in Section 2. Conservation of representative areas of these physical features in their natural state is required.

The Region has a unique suite of biodiversity which must be conserved at regional and local scale in line with national and state commitments. Biodiversity is conserved to meet intrinsic and utilitarian objectives. Intrinsic values recognise that biodiversity should be conserved in its own right regardless of any human needs. Utilitarian objectives recognise that the stock of biodiversity contain organisms or biological processes that have known as well as undiscovered value for human welfare. Therefore, conserving biodiversity preserves options for the future. Most importantly, human life and health depends on ecosystem health which in turn depends on the biodiversity in the system.

Current status

The regional and local status of natural diversity is reasonably well known for landforms, soils and flora, and for some fauna. However, many species have not been described and the conservation status of others is unknown. The biodiversity of the whole of the south west of the State is considerably more extensive, spatially diverse and complex than previously thought^{5,15}. This has significant implications for the ability to capture this diversity within a conservation reserve system.

Within the Swan Region there are 32 flora species that are Declared Rare Flora, including 8 that are Critically Endangered according to international criteria. They face an extremely high risk of extinction in the wild in the immediate future. There are about 80 species of plant that are potentially threatened, but there are insufficient survey data to accurately determine their status (and so they cannot be formally declared as rare under the *Wildlife Conservation Act 1950*). There are a further 30 species known to be rare, but not currently threatened. There are also a number of threatened communities in the Region, especially those that exist now in small remnants which collectively make up only a few per cent of the original area of the community¹⁵.

At the community scale, *Bush Forever* defines 26 vegetation complexes across nine major landforms, but for 7 of these, less than 10 per cent of the original area remains intact.

The *State of the Environment Report* (1998) notes that at least 8 terrestrial mammals and 4 birds are threatened within the Swan Coastal Plain IBRA. Mammalian and aquatic fauna are facing serious pressures to continued persistence, although reptilian fauna are more secure, with the notable exception of the Western Swamp Tortoise¹⁵.

Across the Region, the regional and local status of biodiversity is continuing to decline in the face of threats from loss of habitat, weeds, fire and reduced water quality and quantity in some streams and wetlands. This situation applies both for terrestrial and aquatic biodiversity.

Biodiversity status is better in areas where there is a larger proportion of less disturbed bushland and wetlands, as in the Hills and in the northern and eastern catchments (Ellen Brook, Brockman, Wooroloo). The emphasis in these areas will be building on this better status in ensuring completeness in the protection of biodiversity. Action will need to consider the impact of secondary salinisation, which is increasing in these areas.

Issues

- Inadequate knowledge of the biodiversity and its conservation status.
- Clearing of natural vegetation.
- Inability to capture all the biodiversity within a Comprehensive, Adequate and Representative Conservation Reserve System.
- Pressures on all biodiversity stocks and refugia across the Region.
- Loss of terrestrial and aquatic habitat, especially wetlands.
- Impact of diseases, weeds and feral animals.
- Increased use of exotic species instead of local species in urban landscaping.
- Lack of appreciation of the value of and commitment to protect biodiversity in the community.
- Need for instruments to encourage conservation of biodiversity on private land.

These issues closely reflect the threats to biodiversity listed in the national biodiversity strategy¹⁶.

Existing arrangements

Current legislative arrangements for biodiversity conservation are being over-hauled, which has emerged as an imperative in its own right only in the last decade. Existing state legislation does not clearly define objectives and mechanisms to achieve adequate protection and fails to account for biodiversity at ecosystem and community scales. However, commitment to the conservation of biodiversity is now a national and state requirement and will be enshrined in a new Biodiversity Conservation Act that will replace the *Wildlife Conservation Act 1950*. This intended Act will need to drive the implementation of State and then regional strategies for the conservation of the State's biodiversity that are consistent with the *National Strategy for the Conservation of Australia's Biological Diversity*.

Instruments that address biodiversity directly or indirectly in the Swan Region include the *Wildlife Conservation Act 1950*, the *Environmental Protection (Swan and Canning Rivers) Policy*, *Bush Forever*, the *Conservation and Land Management Act 1984*, the *Environmental Protection (Swan Coastal Plain Lakes) Policy*, the *Wetlands Conservation Policy for Western Australia* and the *Waterways WA Program*. The Forrestdale and Thomson Lakes form one of the nine Ramsar sites in WA.

The establishment of a Comprehensive, Adequate and Representative (CAR) reserve system is an essential component for the protection of the habitats, landscapes and biota of the Swan Coastal Plain Interim Biogeographic Region (IBRA). In the Perth Metropolitan Area the Ministry for Planning has been given the lead agency role in implementing *Bush Forever*, which is the State Government's program for identifying and protecting a CAR reserve system in the Region. Acquisition of additions to the conservation reserve system is implemented by the Western Australian Planning Commission through the Metropolitan Region Improvement Fund. Management of the conservation reserve system is undertaken by the Conservation Commission and the Department of Conservation and Land Management.

Currently, 33,400 hectares of land in the area covered by *Bush Forever* have some form of protection through existing reservation and/or tenure arrangements. If fully implemented, *Bush Forever* will complete the State Government's commitment to Objective 1.4 of the *National Strategy for the Conservation of Australia's Biological Diversity* for the area west of the scarp in the Swan Region by adding 17,800 hectares to the area managed for conservation. Through the Western Australian Planning Commission, the State government has acquired land worth \$100 million over the last 7 years primarily for conservation. Government will invest a further \$100 million over the next 10 years in the acquisition of *Bush Forever* sites for conservation. Additional mechanisms to ensure protection of *Bush Forever* sites include: negotiated planning solutions; negotiated conservation management arrangements with private landholders; the use of conservation covenants, and financial assistance with management.

Even with full implementation of *Bush Forever*, 7 of the 26 vegetation complexes on the coastal plain will still have less than 10 per cent of the original area conserved. Further, even if all vegetation complexes could be conserved to this level, up to 50 per cent of the Region's biodiversity may still be outside areas managed primarily for conservation. Therefore, the value and function of the formal conservation reserve system must be supplemented by programs and partnerships for additional off-reserve conservation of biodiversity, as described in *Bush Forever* and in the State's Work Plan for the *National Framework for the Management and Monitoring of Native Vegetation*. Of particular importance is building the focus on conservation of locally significant bushland.

Bush Forever focuses on the Swan Coastal Plain part of the Region. Identification and conservation of biodiversity in the Hills area will occur through the System 1 update and through implementation of the Regional Forest Agreement which covers the Jarrah IBRA. Similar processes to that used in identifying *Bush Forever* sites will be used. Ultimately, an equivalent comprehensive plan to *Bush Forever* is required for bushland east of the scarp which covers a significant part of the Swan Region, thereby completing the area covered under System 6 (Department of Environmental Protection). This proposed comprehensive plan is referred to as 'Bushplan Phase II' in this document.

Bushland and wetland protection and management

The Region's stock of bushland on both drylands and wetlands contribute environmental values of major importance to the Swan Region. It provides habitat for much of the Region's biodiversity, acts as a carbon sink, has desirable micro-climate effects, breaks down waste and provides aesthetic and recreation resources. Areas of bushland, however small, occur throughout the metropolitan area and provide a focus for the development of values, attitudes and behaviours within the community that contribute to improved natural resource management practices.

Currently, bushland is held under a range of tenures, from inclusion in the State's conservation reserve system, as Un-allocated Crown Land (UCL), other forms of public ownership and private ownership. This complicates the management of these lands to meet regional needs.

Current status

The Perth metropolitan area has more bushland within its boundaries than comparable cities in Australia (28 per cent on the Coastal Plain – 50 per cent including Hills areas). This provides the Region with a priceless legacy that must be nurtured by current and future generations. Perth residents have the opportunity to see and enjoy remnants of the natural environment, usually within close reach of home. This is rarely possible in cities of comparable size.

However, the future of much of this bushland is uncertain, with continued demands for bushland to be converted to other uses. Further, the status and area of bushland varies between localities. Much of the bushland is securely held in State Forests, conservation reserves and water catchment areas, but elsewhere in the Region, unsecured areas of bush are subject to continued pressures for conversion to other uses such as housing, orchards and hobby farmers; and through disturbance by un-managed recreation. It is crucial that such a priceless legacy secures high levels of protection into the future.

Across the Region, loss and fragmentation of vegetation is increasing through clearing (for urban development); while diseases, weed infestation, inappropriate firing, grazing and other pressures (on private rural land and public land) is leading to a continuing loss of vegetation values in many areas. Wetlands, which are a special category of bushland are also threatened by eutrophication, pollution, excessive drainage, in-fill and water abstraction. Less obvious pressures include insufficient buffers between development and bushland and pollution, both of which reduce bushland resilience to normal and abnormal stresses. Aquatic habitats of the Swan-Canning estuary are similarly under pressure from nutrient enrichment, urban pollution and sedimentation.

Current percentages of retained bushland are lowest in the urban areas, which increases the urgency and importance of protecting those few remaining areas of bushland as local 'icons' that are valued by nearby residents in their own right and as a focus for increasing community awareness and action in natural resource management. In the Hills area, and on parts of the Swan Coastal Plain remote from urban areas, the reasonable coverage of bushland provides the opportunity for additions to the conservation estate.

Although action has been taken to conserve wetlands under System 6 provisions, overall conservation of wetland habitats does not satisfy CAR criteria in either the urban areas or elsewhere on Swan Coastal Plain. About 80 per cent of the original wetland area has been replaced by other land uses⁶. Conservation of the remainder should have high priority. Although wetland conservation status is better in Ellen Brook, Brockman and Wooroloo catchments than in the urban areas, rising saline groundwater is a significant threatening process¹⁷.

Issues

- Continued clearing of bushland without assessment or adequate legislative controls.
- Fragmentation of existing bushland areas and removal of bushland corridors.
- Inadequate management of private bushland.
- Lack of a State Government policy framework for protection and management of bushland by local governments and government landholders.
- Threats from weeds, feral animals, disease, fertiliser and chemical incursions.
- Inappropriate fire regimes – either intentional or unintentional.
- Management responsibility for some bushland areas is not clear.
- Recreational pressures on bushland.

Existing arrangements

The *Environmental Protection (Swan and Canning Rivers) Policy* recognises protection of native vegetation as part of the requirement to ensure the environmental values of protected waterways and watercourses. Clearing controls apply to rural zoned land under the *Soil and Land Conservation Act 1945* according to an inter-agency Memorandum of Understanding (MOU), but unless a project proceeds through the Environmental Impact Assessment process, these controls do not apply in the Perth metropolitan area. Allocation of land for urban and industrial development within the Perth metropolitan area is covered under planning legislation.

There is a suite of existing programs and mechanisms that deal with bushland and biodiversity protection in WA, and as such can play a role in the Swan Region. These include the *Wetlands Conservation Policy for Western Australia*, the *Draft State Weed Strategy*, the *Environmental Weed Strategy*, *Land for Wildlife*, *Ecoplan*, *Western Shield* and a number of threatened species and ecological community recovery plans. Government is implementing *Bush Forever* specifically for the management of regionally significant bushland on the Swan Coastal Plain, with encouragement given to conservation and management of locally significant bushland through the plan. The Urban Bushland Statement of Planning Policy which is under preparation will add significantly to the instruments available for bushland conservation and management.

Because of the importance of wetland habitats on the Swan coastal plain, sound wetland management is critical. In summary, the principal objectives of the *Wetlands Conservation Policy for Western Australia* are:

- to prevent further loss or degradation of valuable wetlands and wetland types, and promote wetland conservation, creation and restoration;

- to include viable representatives of all wetland types and key wildlife habitats and associated flora and fauna with a statewide network of appropriately located and managed conservation reserves;
- to maintain genetic diversity of wetland flora and fauna in wild habitats;
- to maintain waterbird abundance, particularly migratory species, and
- to increase community support for sound wetland conservation and management.

The Wetlands Coordinating Committee oversees the implementation of the policy.

While the mechanisms are generally in place, the overall resourcing for and commitment to bushland management will need to increase to achieve desired levels of protection of bushland.

Ten year outcomes and indicators

Key outcomes	Suggested indicator items
Biodiversity known and understood at both the local and regional scale.	Surveys of fauna completed for the Swan Coastal Plain. Surveys of flora and vegetation completed for the Darling Range and Dandaragan Plateau Evaluation of conservation values in all of the above in regional context Publications of scientific reports for all of the above.
Comprehensive, adequate and representative (CAR) reserve system established and managed.	Number and area of <i>Bush Forever</i> sites protected. Bushplan Phase II including Darling Range developed and implemented Quality of reserve system relative to established CAR criteria
Recognition and protection of locally and regionally significant urban bushland	Urban Bushland Statement of Planning Policy in place ensuring protection of regional and local bushland by local governments and State agencies. Effectiveness of urban clearing controls
Management of all conserved land adequately resourced	Number of areas where conservation is the primary objectives with management plans which are being implemented.
Off-reserve conservation of biodiversity integrated across land tenure and administrative boundaries	Use of instruments for bushland retention and management on private land. Area of land in off-reserve conservation (both public and private land)
Threatening processes eliminated or minimised	Management plans that address local and regional biodiversity conservation State Weed Strategies implemented Fire management plans in place for all bushland.
Local governments' bushland management strategies to reflect bio-physical and community needs.	Scientific adequacy of bushland strategies Level of community support for bushland strategies
Increased participation by public and private landholders in bushland protection	Area of bushland covered by appropriate tenures and covenants, with management plans that are being implemented.

Objectives and Strategies

Objective 1.1: Improve the knowledge of biodiversity and its management needs for conservation at regional and local scales

Strategy 1.1.1: Expand existing research programs to prioritise habitat and biodiversity needs

Activities to include:

- completion of the research and regional survey work required for Bushplan Phase II for the Hills and the portion of the Coastal Plain that is not covered by *Bush Forever*, and publish the information in an accessible form;
- direct research investment into the areas with the most need for management prescriptions and advice;
- support and enhance existing funding and research alliances, and
- seek new partners and funding sources.

Item	Response
Lead Organisation	Department of Environmental Protection/Department of Conservation and Land Management
Role	Facilitate increased investment in research programs, through partnerships with key partners Complete research and regional vegetation surveys for Bushplan Phase II
Key Partners	universities, CSIRO, industry groups, NGOs, community groups, WA Landcare Trust, Greening WA, Botanic Gardens and Parks Authority, Swan Catchment Council
Target	Commitment to increased investment for research included in strategic and operational plans of all organisations
Indicator of success	Flora and vegetation surveys finished for Bushplan Phase II
Priority	Immediate and essential need - Continue and expand current activities
Resources	Additional resources required

Strategy 1.1.2: Increase the focus on fauna management across the Region

The status of the Region's fauna is poor, with reducing habitat and pressure from predators, fire and disease. Mammalian fauna are particularly under-represented. However, management to protect existing fauna stocks does not have a high priority in the Region. Fauna awareness and protection needs to occur through a partnership between local community groups and the Western Australian Museum, which is doing most of the faunal research. The Strategy includes:

- promotion of fauna management and conservation needs through mass media;
- support for feral pest eradication activities;
- support for specific faunal protection projects undertaken by community groups, and
- fauna monitoring projects.

Item	Response
Lead Organisation	Department of Conservation and Land Management
Role	Promote management needs of fauna with partners. Seek external funding support
Key Partners	WA Museum, Department of Environmental Protection, local governments, industry groups, WA Naturalists Club, community groups, Landcare Trust, Greening WA.
Target	Opportunities identified and partners engaged
Indicator of success	Strategy for enhanced management in place
Priority	Highly desirable and later need – build up current activity
Resources	New resources will be required

Objective 1.2: Conserve natural and physical diversity at regional scale

Strategy 1.2.1: Develop a Comprehensive, Adequate and Representative (CAR) Reserve system within the Region.

Bush Forever is the State Government's plan for acquiring regionally significant bushland for addition to the conservation estate. Through *Bush Forever*, \$100 million will be invested over 10 years in securing identified sites for the CAR Reserve system through either purchase or a range of complementary measures recommended in the Plan. In addition to implementation mechanisms described in the plan, Government should give consideration to providing immediate interim protection of all sites referred to in *Bush Forever* that can be protected under existing planning laws (see *Bush Forever* 2.5.3).

Areas selected for reservation can be held in State ownership and reserved for conservation purposes under the *Conservation and Land Management Act 1984* and the *Land Administration Act 1997*. The former Act also requires the preparation, with public participation, of management plans for these reserves.

Item	Response
Lead Organisation	Western Australian Planning Commission
Role	Fully implement <i>Bush Forever</i> Acquire funds for reserve acquisition and management.
Key Partners	Department of Conservation and Land Management, Department of Environmental Protection, other government agencies, Commonwealth funding bodies, local governments, community groups, Swan Catchment Council, Greening WA, National Trust, NGOs, private landholders
Target	Implementation of <i>Bush Forever</i> to establish a Comprehensive, Adequate and Representative Reserve
Indicator of success	Area of land acquired and added to the Reserve system Management Plans in place and resourced for reserved areas
Priority	Essential and immediate need – action underway to implement <i>Bush Forever</i>
Resources	Additional resources will be required to achieve full CAR criteria

Strategy 1.2.2. Conserve the physical diversity of the Region

In most cases, meeting the goal of conserving biodiversity will ensure protection of the array of physical diversity in the Region. This will not always be the case, for example, where physically distinct sites may not be of prime importance for the conservation of biological diversity. As described in Section 2.1, the Swan Region has a large number of discrete physical environments, that collectively contribute to the visual character of the Region. This diversity includes the Hills sub-region, the Darling scarp, the high dunes on the coastal plain and limestone cliffs either side of the river. Due consideration needs to be given to the separate importance of protecting examples of this diversity in the natural state.

Item	Response
Lead Organisation	Western Australian Planning Commission
Role	Ensure planning instruments protect physical diversity that is significant at regional scale
Key Partners	Department of Conservation and Land Management, Department of Environmental Protection, Water and Rivers Commission, Swan Catchment Council
Target	Plans in place to protect regional examples of physical diversity
Indicator of success	Area added to conservation estate because of its physical diversity values
Priority	Essential and immediate – action underway
Resources	Additional resources may be required to acquire all regionally significant physical diversity

Objective 1.3: Promote effective local protection of biodiversity, bushland and wetland values through government-community partnerships.

Strategy 1.3.1: Formally recognise and support the community's actions in biodiversity, bushland and wetland protection and management

A large percentage of the community's contribution to natural resource management occurs through groups involved in protecting and managing areas of bushland and wetland. These groups which include catchment groups, 'Friends' groups and school groups make a vital contribution to the protection of locally significant biodiversity. At the regional level, groups such as the Environmental Weeds Action Network (EWAN), the Urban Bushland Council, the Wildflower Society, the Threatened Species Network and the Perth Naturalists Club are active in identifying issues and resourcing solutions for specific parcels of land.

These community organisations are assisted in their work with grants from the *Swan Catchment Urban Landcare Program* which is funded by the Swan River Trust and Alcoa World Alumina; in-kind support from local governments, and advisory services from government agencies and the Swan Catchment Centre. Their contributions need to be formally recognised, particularly in the management of publicly held bushland. The community's leadership needs to be supported through a strengthening of partnerships between community groups and State and local governments. Actions to achieve this will include:

- establishment of a template protocol for a Memorandum of Understanding for partnerships between a community group, the State Government and a local government

that allows formal recognition of the community group's leading role in managing specified areas of publicly held bushland;

- allocation of recurrent resourcing to support management costs once formal partnerships are established;
- increased government support for programs such as *Ecoplan* and *the Swan Catchment Urban Landcare Program* which are able to provide information and resources for community groups, and
- maintenance of government support for regional and locally-based resource centres for community groups.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Facilitate formal partnership arrangements between community groups managing bushland and State and local governments
Key Partners	NRM agencies, local governments, community groups
Target	Formal partnership protocols in place
Indicator of success	Community groups recognised as having a formal role in bushland management for half of the publicly held remnant bushland in the Perth Metropolitan Area
Priority	Essential and immediate need – continue and enhance current support
Resources	New arrangements required for security of resources into the long-term

Strategy 1.3.2: Implement effective weed strategies within the Region

Weed incursion into bushland and wetland poses a very significant threat to biodiversity conservation across the Region. Activities needed in weed control include:

- addressing threatening processes with the first priority being the implementation of the *State Weed Strategy* and the subsequent development of a region-specific Environmental Weed Strategy;
- providing regional, local and site-specific biodiversity management advice to land users and managers through programs like *Ecoplan*, especially when a change in land use is proposed, and
- direct support to local governments, 'Friends' and other groups for management including weed control work, through the appointment of specialist staff employed through Memoranda of Understanding established with government agencies responsible for weed control.

Item	Response
Lead Organisation	Department of Conservation and Land Management/Agriculture Western Australia
Role	Continue development of land use and management advice. Ensure these are extended to government, community and individuals
Key Partners	NRM agencies, Botanic Gardens and Parks Authority, CSIRO, Universities, Environment Australia, Swan Catchment Council, Community Groups (Australian Association of Bush Regenerators, Environmental Weeds Action Network, Urban Bushland Council, Wildflower Society, Conservation Council)
Target	Management advice readily available Enhanced support provided to 'Friends' groups
Indicator of success	Weed control strategies being implemented
Priority	Essential and immediate need – continue current activity
Resources	Additional resources would increase the effectiveness of the current effort

Strategy 1.3.3: Apply effective clearing controls in the Swan Region.

Current regulation of clearing in the Perth metropolitan area occurs through the development approvals process, which is managed by the Ministry for Planning and local governments. However, as noted in the *Bush Forever* recommendations, the regulation of clearing in the metropolitan area requires strengthening.

The development of improved clearing controls in the Swan Region will need to be coordinated with the revisions of the Memorandum of Understanding for clearing under the *Soil and Land Conservation Act 1945* and the development of the Urban Bushland Statement of Planning Policy (*Bush Forever* Section 2.5.4). The stock of bushland and wetland in the Swan Region is a priceless legacy and clearing controls need to apply regardless of previous zoning or planning approvals. A revised regional system of clearing controls established in the metropolitan area will need to apply to government, which is a very significant land user, developer and manager as well as to private landholders. Developing clear criteria for assessment and equity in the process will be critical.

Where the bushland is regionally significant, State agency involvement in managing clearing controls will be required. Clearing controls for locally significant bushland will be managed by local governments. Performance bonds should be considered where appropriate.

Item	Response
Lead Organisation	Department of Environmental Protection/ Ministry for Planning
Role	Develop a system of clearing control management for the metropolitan area
Key Partners	Agriculture Western Australia, LandCorp, other government agencies and local governments, Environmental Protection Authority
Target	Clearing control process in place by December 2002
Indicator of success	Process accepted by all land users and managers Reduced clearing of bushland in the Region, leading to no net loss
Priority	Highly desirable over medium timeline
Resources	Some additional resources required

Strategy 1.3.4: Support local government remnant native vegetation protection strategies

This Strategy will take the regional objectives established under *Bush Forever* and encourage the development of local inventories and management plans to protect bushland at local government scale. This will contribute to off-reserve conservation of bushland values and biodiversity. The Strategy will include:

- audits and inventories of current bushland resources in both public and private landholdings;
- development of strategies for protection including targets and priorities;
- provision of dedicated support within the Ministry for Planning through the *Bush Forever* Office;
- successful completion of the *Perth Biodiversity Project* (developed by the Western Australian Municipal Association and funded by the Natural Heritage Trust), and
- securing of long-term funding support for implementation.

Item	Response
Lead Organisation	Western Australian Municipal Association
Role	Facilitate LG involvement through <i>Bush Forever</i> Office, the planned Urban Bushland Statement of Planning Policy, <i>Environmental Protection (Swan and Canning Rivers) Policy</i> , <i>Swan-Canning Cleanup Program and Action Plan</i> .
Key Partners	Ministry for Planning, Department of Conservation and Land Management, local governments, Greening WA, Department of Environmental Protection, community groups, Swan Catchment Council.
Target	Commitment to complete audits, inventories and strategies
Indicator of success	Urban bushland resources adequately protected at local level
Priority	Essential and immediate need – continue and expand current effort
Resources	State resources adequate - local governments will need to commit new resources

Strategy 1.3.5: Government agencies to protect environmental values in all publicly owned bushland

Government is the major owner and manager of bushland within the Region, including 13,200 hectares of regionally significant bushland earmarked for conservation through *Bush Forever*. Agencies with direct management responsibilities include Department of Land Administration, Ministry for Planning, LandCorp, Ministry for Housing, Main Roads, Water Corporation, Western Power, Westrail and the Department of Conservation and Land Management. Agencies need to acknowledge their responsibilities for achievement of conservation objectives on this land.

While much of this land is held for specific land use objectives and may be cleared in the future, it will be important to protect the environmental values in these areas, particularly on the *Bush Forever* sites. Implementing this strategy requires plans established by the owner-agencies for all bushland areas that address the management of:

- weed, disease and feral pest infestation;
- fire;

- recreational access;
- rehabilitation of contaminated and disturbed sites, and
- areas identified for addition to the CAR Reserve system.

Item	Response
Lead Organisation	Department of Premier and Cabinet
Role	Negotiate MOUs for bushland management for areas held by government agencies through <i>Bush Forever</i> , <i>Environmental Protection (Swan and Canning Rivers) Policy</i> and the proposed Urban Bushland Statement of Planning Policy
Key Partners	Government agencies, community groups involved in bushland management, Greening WA, National Trust, Swan Catchment Council
Target	Management plans for all government-owned bushland
Indicator of success	Improvement in the condition of government managed bushland
Priority	Essential. Action occurring now, requires full attention over medium term
Resources	Additional resources needed

Strategy 1.3.6: Foster waterways, floodways, lakes and wetlands protection and restoration

Wetland and riparian protection has special requirements, especially on the coastal plain part of the Region. Wetland and riparian conservation issues are addressed in the *Environmental Protection (Swan Coastal Plain Lakes) Policy*, *Environmental Protection (Swan and Canning Rivers) Policy*, the *Swan-Canning Cleanup Program and Action Plan* and more generally in the *Wetlands Conservation Policy for Western Australia*.

Specific needs include provision for buffers around these areas and the development of management guidelines. More consideration should be given through these instruments to:

- the needs of riparian vegetation, and
- improving security of tenure under which wetlands and riparian vegetation is held.

Item	Response
Lead Organisation	Water and Rivers Commission
Role	Build on existing activities (eg Rivercare, Ribbons of Blue) through commitments to the Comprehensive Management Plan for the <i>Environmental Protection (Swan and Canning Rivers) Policy</i> to secure increased investment in riparian management
Key Partners	local governments, Swan River Trust, Department of Environmental Protection, Ministry for Planning, Department of Conservation and Land Management, Water Corporation, Greening WA, Swan Catchment Council, Community groups involved in riparian management
Target	MOUs established with managers of riparian environments through the Comprehensive Management Plan for the <i>Environmental Protection (Swan and Canning Rivers) Policy</i>
Indicator of success	Improved condition of riparian habitats. Biodiversity status in these areas enhanced
Priority	Essential - action occurring now needs to be extended over medium timeline
Resources	Additional resources will be required

Strategy 1.3.7: Support bushland and wetland retention schemes on private land

Bush Forever notes the desirability of conserving bushland located on private landholdings through a range of complementary mechanisms – including agreements and covenants, incentives and funding and voluntary arrangements.

Existing covenanting schemes are maintained by the Department of Conservation and Land Management, Agriculture WA and the National Trust. The Commonwealth Government has committed \$1 million to '*Bushbank*'. These schemes supply different demands and government could consider establishing a 'one-stop shop' to assist interested parties choose the most appropriate scheme. This coordination and promotion activity for the Region could be handled through the Swan Catchment Centre.

Additional needs include incentive schemes to encourage bushland and wetland retention by landowners that includes:

- land tax exemptions;
- development of a revolving fund for bushland and wetland retention and protection;
- special shire rates for bushland;
- a 'wetland banking' scheme;
- provision of advice through *Land for Wildlife* and *Ecoplan*;
- special grants for landholders to assist with specified management actions, and
- formal recognition and awards for individual landholders.

The State has committed to the establishment of a revolving fund through the WA Workplan for the *National Framework for the Management and Monitoring of Australia's Native Vegetation*. The Department of Conservation and Land Management is the lead agency for implementation of the Workplan.

Item	Response
Lead Organisation	Department of Conservation and Land Management/ National Trust/ Agriculture Western Australia
Role	Coordinate and promote existing schemes within the Region Establish a revolving fund to be used as a source of funding to enhance bushland management with funds contributed by government and private land users
Key Partners	Department of Environmental Protection, Water and Rivers Commission, Swan Catchment Council, Western Australian Municipal Association, local governments
Target	Promotional activities coordinated and extended in the Region Incentive schemes in place Revolving Fund established
Indicator of success	Area of land covenanted under above schemes
Priority	Highly desirable - current activities to be continued and extended into long-term
Resources	Additional resources required

Strategy 1.3.8: Implement corridor restoration plantings of local native species on road reserves, Public Open Space, Unallocated Crown Land and freehold land.

Large corridors of bushland and waterways exist throughout the urban landscape of the Swan Region. Much of this area which currently supports a 'European parkland' could be redeveloped to increase the area of land planted to local native plants in the urban areas and to build corridors between existing native bushland. Activities include promotion of the concept with owners and managers of open space in the urban areas.

The *Perth Biodiversity Project*, supported by the Western Australian Municipal Association, the Natural Heritage Trust and individual local governments will operate over the next three years in implementing action under this Strategy.

Item	Response
Lead Organisation	Swan Catchment Council/ Western Australian Municipal Association
Role	Promote opportunities for increased native vegetation use on available corridors through Greenways Support community groups seeking funding for the development of corridors on public land
Key Partners	Department of Conservation and Land Management, local governments, Main Roads, Western Power, Water Corporation, Swan River Trust, community groups, Greening Australia
Target	Promotion activities in place
Indicator of success	Increased corridor planting with native vegetation that enlarges the area allocated for off-reserve conservation
Priority	Desirable - implement over medium timeline
Resources	Adequate resources available under Perth Biodiversity Project for medium term

Goal 2 – Ensure acceptable water quantity and quality

Acceptable water quantity and quality standards
achieved in surface and ground waters.

The protection of surface and groundwater quantity and quality is vital for the maintenance of the environmental values and the quality of life in the Swan Region. Approximately half of Perth's domestic water supplies come from underground sources within the Region, with the rest sourced from surface reservoirs located in the Darling Range east and south of Perth. Perth residents use 330 kilolitres per household per annum, which is higher than household water use in Sydney, Melbourne and Adelaide²³.

The Region also contains two significant river and estuarine systems, the Swan and Canning which make a large aesthetic and recreational contribution to the quality of life in the Region. Important lakes and wetlands north and south of the rivers contain biological resources of national and international importance. Artificial drainage systems have been installed across areas of the coastal plain to convert land to rural and urban uses which have greatly modified natural drainage systems.

Current status

Some good quality surface water supplies remain in the Region, although many of the natural and artificial drains are polluted, and face increased pressures from urban and farming uses. There is evidence that some types of nutrient and pollutant run-off from urban areas into waterways is decreasing but this trend is not evident for rural land¹⁰. Unidentified or under-managed contaminated sites throughout the Region can pollute surface and groundwater. Surface flows in many streams are inadequate to sustain environmental values, although this is being addressed through the development of Environmental Water Provisions (EWPs).

Across the Region, the range of problems include generally inadequate flows out of the modified Hills catchments, nutrient enrichment, sedimentation and siltation, and the release of toxic chemicals into water bodies. Water quality in the Canning River is poor and several urban constructed drains are significant sources of pollution. The Belmont Main Drain and the Southern River-Wungong Brook have been identified as problem waterways for nutrient levels and the Ellen Brook is the largest source of phosphorus entering the Swan estuarine system, followed by the Avon River system. Localised flooding is emerging as a problem in the areas close to the foothills, a consequence of increased clearing and hard surfacing on the Scarp through urbanisation. This is likely to be an increasingly significant problem.

Salinisation of local aquifers and streamflow is extensive and increasing in the Brockman and Wooroloo catchments as a consequence of clearing and establishment of low water using annual farming systems on rural land. There is also anecdotal evidence that groundwater salinities are increasing in some bores and wells in the Hills' catchments. The Helena River Catchment above Mundaring Weir is one of five Water Resource Recovery Catchments supported through the *State Salinity Strategy 2000*, with the objective being to maintain the quality of the water entering the weir.

While groundwater supplies are in generally good condition and regulated through the *State Groundwater Environmental Protection Policy* and specific instruments such as the *Jandakot* and *Gnangara Land Use and Water Management Strategies*, there are some localised problems with near-surface pollution plumes. Urban development is also influencing watertable heights (both lowering and raising) in some areas (e.g. Gosnells). This impacts adversely on wetland habitats.

Issues

- The artificial drainage network infrastructure detail is not easily accessible and the system is not designed or managed sufficiently to achieve appropriate environmental outcomes.
- Modified and often inadequate environmental water flows in some waterways and watercourses downstream of large reservoirs and rural dams.
- Erosion and sedimentation in some waterways, with large silt volumes entering the systems from the Avon River.
- Contaminated sites resulting in pollution of waterways;
- Diffuse sources of pollution with no 'owners'.
- Poor fertiliser practise increasing eutrophication and the potential for algal blooms and nitrate pollution.
- Risk of flooding in some areas where land use is inappropriate.
- Altered wetland hydrology and loss of wetland values.
- Insufficient understanding of groundwater resources and management needs in the community.
- Inadequate scientific knowledge of sub-surface aquifers.

Existing arrangements

The *Swan River Management Strategy* was released in 1988 with a comprehensive set of recommendations for the Swan and Canning Rivers. The aim was 'to balance competing demands for use and development with the need to conserve and enhance the functional healthy river environment for the enjoyment of present and future generations'. Implementation of the recommendations has either been completed or is on-going, with the audit completed in 1999 (Swan River Trust Report 31) reporting a continued commitment towards achieving the strategy outcomes.

The *Environmental Protection (Swan and Canning Rivers) Policy 1997* will be implemented through a Comprehensive Management Plan to address the needs of protected waterways and watercourses in the Region. The Environmental Protection Policy binds government to deliver against its objectives. The *Swan-Canning Cleanup Program and Action Plan* documents strategies and actions required to ensure improved water quality in the Region. This important Action Plan will drive much of the environmental management required to secure the quality of the waters and riparian areas in the two rivers and has clear targets for achievement. The *Gnangara Land Use and Water Management Strategy* has been established to protect and manage Perth's most important groundwater resource. The strategy specifies land use controls for the area.

The Council of Australian Governments (COAG) water reforms being implemented by the Water and Rivers Commission will ensure that adequate Environmental Water Provisions and licensing and allocation requirements are in place to manage surface and groundwater abstraction. A *National Water Quality Management Strategy* developed through this process will be implemented in WA through the *State Water Quality Management Strategy* and Waters and Rivers Commission by-laws. The approach recognises that responsibility for water quality management is shared between State and local governments, industry and the community.

The *Waterways WA Program* is a new statewide program for the management of waterways for the next 20 years. Essentially the program builds on activities already being undertaken by landholders, community groups, local government and State agencies, such as *Ribbons of Blue*. The *Waterways WA Program*¹⁸ will operate through the provision of advice and support for on-ground actions that will promote waterway restoration. Progress is being made in developing a policy and strategy for the program. The program defines principles for waterway management, sets objectives, outlines approaches for a statewide strategy, and explains the roles and responsibilities of the Water and Rivers Commission. Importantly, the planned statewide strategy will link to NRM frameworks, priorities and programs.

As in bushland protection and management, direct community action makes a significant contribution to maintaining the health and attractiveness of water bodies in the Region. Community groups are supported in their work in water body management through grants from the *Swan-Canning Urban Landcare Program*, assistance from local governments and technical advice through activities such as River Restoration workshops run by Water and Rivers Commission. Continued resourcing of community groups through programs such as *Waterways WA* is essential. Programs are also in place to change behaviour in fertiliser practice, but their effectiveness is not sufficiently understood. Finally, commitment to Water Sensitive Urban Design in new developments is not universal, although the approach is being encouraged.

Investment in management of the artificial drainage network to achieve water quality outcomes is not adequate and point source and diffuse source water pollution from industrial and domestic sources needs to be better managed. This reflects the lack of clear water quality objectives in artificial drainage management, an issue being addressed by the Water Corporation. The Water and Rivers Commission have released a *Manual for Managing Urban Stormwater Quality* to improve information availability in this area.

Ten year outcomes and indicators

Key outcomes	Suggested indicators items
Adequate Environmental Water Provisions (EWPs) secured in priority waterways (as defined in the <i>Environmental Protection (Swan and Canning Rivers) Policy</i>)	Environmental water requirements determined and provisions implemented in priority waterways by managers of these resources
Management of surface water bodies consistent with environmental objectives.	Water use is managed to ensure adequate water for protection of environmental values
Groundwater use consistent with conservation of wetlands and native vegetation	Allocation procedures and groundwater extraction rates recognise the water needs of wetlands and native vegetation
Flood risks defined and managed.	New developments take flood risk into consideration
Water sensitive urban design approaches implemented by the community	All new developments implemented using water sensitive urban design (WSUD)
Point source and diffuse source pollutants into groundwater, drains and waterways identified and managed in accordance with regulations	Land and industry managers have best management plans in place for discharge management, that are revised using monitoring data
Trends in environmental values for all water bodies adequately monitored	Monitoring information available to all users and managers of water bodies in the Region

Objectives and Strategies

Objective 2.1: Manage surface and groundwater flows to achieve sustainable use, while protecting environmental values

Strategy 2.1.1: Develop and implement programs to achieve Environmental Water Provisions in the Region

The WA Government has a commitment under the Council of Australian Governments' (COAG) water reform process to establish Environmental Water Provisions (EWPs) for priority waterways and groundwater bodies in WA. This process is being managed by the Water and Rivers Commission through the *Environmental Water Provisions Policy*. Establishing EWPs and having them implemented will be critical for the maintenance and recovery of riparian ecological health in the Swan Region.

Item	Response
Lead Organisation	Water and Rivers Commission
Role	Occurring now as part of COAG requirements
Key Partners	Water Corporation, Department of Environmental Protection, local governments, other government agencies, Regional NRM Groups
Target	Environmental Water Provisions defined and implemented by all water managers
Indicator of success	Improved condition of all waterways to meet defined targets
Priority	Essential and immediate – program is underway
Resources	Some additional resources required to accelerate the program

Strategy 2.1.2: Meet environmental objectives in waterway management, water supply catchments and groundwater

The *Environmental Protection (Swan and Canning Rivers) Policy* is a statutory policy that specifies requirements for environmental outcomes in protected waterways and watercourses in the Region. The purpose of the policy is 'to restore, enhance, preserve and protect the environmental quality, ecological processes and ecological integrity' in the Swan and Canning Rivers and their catchments, excluding water reserves and catchment areas constituted under Part IV of the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*. The Policy will be implemented through a comprehensive management plan and is also supported by the *Swan-Canning Cleanup Program and Action Plan* and the work of the Swan River Trust.

Achieving environmental outcomes in artificial drainage is a special need. Considerable work has been done in defining best environmental management practice in artificial drainage design and management, with a focus on increasing the capacity for in-stream assimilation of nutrients and reductions in other pollution accessions (using traps, filters, point source monitoring). This work which is proceeding under the 'water sensitive urban design' banner needs to progress in tandem with:

- setting objectives for urban water management;
- strategic planning for urban water management on urban-zoned land prior to structure planning;
- incorporation of water sensitive urban design principles in new artificial drainage works;
- the comprehensive delineation of the artificial drainage networks across the coastal plain, and
- increased resourcing for artificial drainage re-design, retro-fitting and management to achieve the environmental objectives.

'Urban water management' needs to consider:

- maintenance of natural urban water management networks, groundwater and aquifer systems;
- groundwater recharge;
- run-off water quality;
- environmental values and physical characteristics of receiving domains or watercourses;
- protection of people, property and built environment from stormwater and flooding;
- developer cost contribution arrangements, and
- on-going management arrangements and responsibilities²¹.

Item	Response
Lead Organisation	Water and Rivers Commission/Water Corporation
Role	Develop BMPs in association with key partners Set environmental objectives
Key Partners	Department of Environmental Protection, Office of Water Regulation, Ministry for Planning, Swan River Trust, local governments, universities, community groups, industry groups, regional NRM Groups
Target	BMPs are being developed; environmental objectives to be included in funding plans
Indicator of success	Reduced nutrient and pollution loads in drains Urban water management plans in place and implemented
Priority	Essential and immediate – government has committed to improved outcomes
Resources	Implementation of existing requirements and commitments will require increased resources

Strategy 2.1.3: Maintain a flood risk management program for the Region

The Water and Rivers Commission is responsible for flood prediction and management in the Region. Given rapidly changing landscape characteristics, due to increased clearing, area of hard surface, artificial drainage and urbanisation, combined with rising groundwater levels in the Avon River Basin there is a need to ensure that flood risk assessment is current. Actions being led by the Water and Rivers Commission include:

- establishment of a Working Group for Flood Management, that is guiding the development of a State Flood Management Strategy;
- determining flood risk for specific areas using climatic data and landscape run-off characteristics;
- ensuring that land use accounts for flood risk;
- developing prevention and mitigation measures with emergency services, and
- providing advice and information to the public.

Given the increased flood risk in the Avon River Basin that can impact upon the Swan Region, there is also a need to build the networks between the managers of natural resources in the Swan and Avon Regions through the *Swan-Avon ICM Program*.

Item	Response
Lead Organisation	Water and Rivers Commission
Role	Increase investment in flood forecasting, prevention and floodplain management planning
Key Partners	Department of Industry and Energy, Emergency Management Australia, Western Australian Planning Commission, WA State Emergency Service, Swan River Trust, Main Roads Department, local governments, insurance companies, research organisations
Target	Community awareness of flood risks and mitigation measures Mitigation and prevention measures in place
Indicator of success	Development accounts for flood risk in planning phase
Priority	Essential requirement, with actions already in place
Resources	No additional resources needed

Objective 2.2: Improve the quality of the Region's water bodies by reducing point and diffuse source pollutants.

Strategy 2.2.1: Reduce discharge of point source and diffuse source water-borne pollutants into water bodies

The *Swan-Canning Clean-up Program and Action Plan* notes that most major sources of point source pollutants from residential, commercial and industrial sources have been removed or are now controlled through licensing and monitoring activities. WA's contribution to the *National Pollutant Inventory* will also encourage improved identification and management of contaminated sites, with monitoring and reporting of point source pollutants.

However, increased action is required to manage diffuse pollutant sources generated by inappropriate domestic and commercial fertiliser use on public and private land, poor use of herbicides and pesticides; hazardous substances released from past land uses, inadequate management of contaminated sites, and commercial management of potential pollutants, such as hydrocarbons. Implementation of water sensitive urban design in urban areas (see Strategies 2.3.2 and 5.2.3) and increased public education activities (see Strategies 4.2.2 and 5.2.1) will contribute to reduced diffuse source pollution.

Additional actions specified under *Swan-Canning Cleanup Program and Action Plan* include encouraging individual commercial operations to rehabilitate contaminated sites; developing and implementing improved practices for handling potential contaminants, including risk management strategies (to deal with accidental spills), and developing strategies for reduced discharges from defined industrial areas within the Region. This is relevant for those organisations outside the licensing process. Improving waterway management will also contribute to reduced water pollution (Strategy 2.1.2).

Government needs to increase its monitoring and enforcement activities to ensure improvement across this very important NRM issue.

Item	Response
Lead Organisation	Water and Rivers Commission/ Department of Environmental Protection/ Swan River Trust
Role	Pollutant management occurring as part of the EIA and licensing requirements Implementation of <i>Swan-Canning Cleanup Program and Action Plan</i>
Key Partners	Water Corporation, Swan River Trust, Agriculture WA, local governments, industry groups, other government agencies, community groups
Target	Managers of potential pollutants aware of responsibilities Water sensitive urban design accepted as normal practice
Indicator of success	Improved condition of all waterways
Priority	Essential – actions occurring now need to be increased over the short term
Resources	Some additional resources will be required

Strategy 2.2.2: Complete in-fill sewerage and connections across the Region.

Deep sewerage connection removes an important source of nutrient pollution of ground and surface waters. Government is committed to increased sewerage connections within the Region and funds the in-fill sewerage program with Commonwealth funding support. A 10 year program is underway that will provide connections to deep sewers for approximately 74,000 metropolitan and 37,000 country properties at an estimated cost of \$800 million. This program will be completed by 2004.

Landholders pay between \$1,500 and \$2,000 for a connection. To increase the rate of connection to sewerage mains, consideration could be given to providing financial assistance in the form of grants or interest-free loans where assistance is warranted.

Pumping out the contents of disused septic tanks is also required, and financial assistance should be provided as an incentive for householders to have this done at the same time sewerage connection occurs.

Item	Response
Lead Organisation	Water Corporation
Role	Design and funding of in-fill sewerage in negotiation with local governments and Commonwealth funding support.
Key Partners	Water and Rivers Commission, Swan River Trust, local governments, private landholders
Target	Progress towards comprehensive sewerage service across the Region
Indicator of success	In-fill sewerage program proceeding to completion All connections completed
Priority	Essential and immediate need – program is underway
Resources	Additional resources may be needed to facilitate connections

Objective 2.3: Promote environmentally sensitive water use and management within the Region**Strategy 2.3.1: Support community groups managing water bodies in the Region**

Community groups make a significant contribution in protecting and managing the environmental values in water bodies and riparian areas along the Swan and Canning Rivers and their tributaries and along some major artificial waterways. Their contribution includes management planning, lobbying for protection of threatened areas, aquatic and riparian weed management, monitoring and streamlining. As in bushland protection and management, they form a critical part of the government-community partnership in NRM.

Advice in this role is available through Water and Rivers Commission training activities and *Ecoplan*. To maintain and encourage this contribution, community groups require additional support in:

- technical expertise, both direct and in training programs;
- assistance from government agencies and local governments in planning and authorisation for their activities;

- funding for on-ground works and monitoring, and
- formal recognition of their role and contribution.

The *Waterways WA Program* initiated by Water and Rivers Commission provides a suitable vehicle for meeting these additional requirements. The needs of community groups and the advantages of working with them should be considered as the program develops its strategy and action plan.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Facilitate support for community groups managing water bodies
Key Partners	Community groups, Water and Rivers Commission, Department of Environmental Protection, Department of Conservation and Land Management, local governments
Target	Existing resourcing levels doubled
Indicator of success	Measurable improvements in water quality due to community groups recognised by agency and local government
Priority	Essential and immediate – community groups are valuable partners in water management
Resources	Additional resources required over the long-term

Strategy 2.3.2: Foster implementation of ‘Water Sensitive Urban Design’ in all developments.

The Ministry for Planning is committed to Water Sensitive Urban Design (WSUD) through the environmental objectives in its *State Planning Strategy*, in *Liveable Neighbourhoods* and in specific recommendations contained in the *Swan-Canning Clean up Program and Action Plan*. Full implementation of planned WSUD developments will require the commitment of landholders, local governments and the building industry. WSUD aims are ‘to reduce the impact of rapid stormwater conveyance to streams and wetlands, remove pollutants from the stream flow to improve water quality, retain habitat, conserve water and integrate recreational opportunities through multiple use artificial drainage systems’²¹. Actions will include:

- development of urban stormwater management plans;
- provision of advice and direction to local governments and the building industry for new developments;
- provision of advice to landholders, particularly those living in a WSUD suburb;
- encouragement for local governments to consider retro-fitting older suburbs according to WSUD principles, and
- promotion of advantages and success stories.

Item	Response
Lead Organisation	Ministry for Planning/Water and Rivers Commission
Role	Establish rules for implementation of WSUD across the Region for use by the Ministry for Planning and developers
Key Partners	local governments, Water Corporation, Western Australian Municipal Association, the building industry, Department of Land Administration, LandCorp, private landholders
Target	WSUD implemented in all new developments
Indicator of success	Improved water use management
Priority	Essential – current effort needs to be enhanced over the medium term
Resources	Additional resources needed to increase effectiveness

Strategy 2.3.3: Promote efficient water use in the Region

People in the Swan Region are high per capita users of potable water resources, which are drawn equally from groundwater and surface storage supplies. Government has an objective of keeping consumptive water use within ecologically sustainable limits and the Water Corporation is implementing a water efficiency program as part of Perth's future water strategy⁴. The 'Water Wise' concept has also been very successful where it has been implemented – as in Kalgoorlie. Additional support through peak community groups will provide encouragement to government to increase its commitment to ecologically sustainable water use in the Region. These efforts are complemented by Strategy 4.2.1 which focuses on government actions to use incentives and disincentives to reduce water use.

Item	Response
Lead Organisation	Water Corporation
Role	Facilitate and encourage programs in water conservation for domestic and commercial users
Key Partners	Water and Rivers Commission, Department of Environmental Protection, local governments, Ministry for Housing, Swan Catchment Council, industry groups, community groups
Target	Water Wise programs in place in all local governments
Indicator of success	Per capita water use reducing annually.
Priority	Essential and immediate – need to build on existing actions
Resources	Resources are adequate

Goal 3 – Improve land condition

All peri-urban and rural land to be used within its capability and suitability.

A large part of the Region consists of peri-urban and rural land supporting a range of land uses including grazing, viticulture, horticulture, rural subdivisions and recreation areas. These uses are of significant economic benefit to local towns and Perth. Sound land use and management practices are essential for maintaining landscape integrity, ecosystem function and soil and land health and productivity. Both on-site and off-site impacts need to be managed.

Current status

While the area used for agriculture within the Swan Region is comparatively small compared to other regions, the value of production is high, because of the intensive nature of production of high value commodities such as fruit and vegetables and wine. Pressures are being placed on available high value rural land through special rural subdivisions and the demand for urban land.

Considerable areas of land are being used beyond their capability and suitability. The evidence is the persistence of high nutrient levels in some streams, especially Ellen Brook, obvious soil erosion on grazing and horticulture land and examples of inappropriate housing location and design in some situations. Increased secondary salinity, rising saline water tables and accelerated erosion are affecting existing infrastructure and new developments. The above issues must be addressed to maintain or improve land condition and productivity in the Region, and to reduce 'off-site' problems.

Across the Region, salinity, erosion and deteriorating soil structure and soil fertility are issues predominantly in the Ellen Brook, Brockman and Wooroloo catchments. However erosion is also common in the Hills catchments, around Armadale, and along water courses and new building sites on the coastal plain. Poor land management is contributing to eutrophication of streams such as Ellen Brook and the Southern River-Wungong Brook.

Issues

- Land capability and suitability have not been defined at appropriate scales to guide all land uses.
- There is a need to protect agricultural beneficial uses for current land uses and for emerging industries.
- The need to manage land use conflicts.
- Continued high demand for 'hobby farms'.
- Increasing land use for urban development, including road, rail, power, water and communications infrastructure is putting pressure on available land resources for high value agriculture.
- Poor land management practices (excessive fertiliser and chemical use, increased hard surfacing increasing run-off, site contamination, inadequate weed control, inadequate protection of native habitats).

- Development at the urban/rural interface where bushfires are a problem.
- Rural Land Use Strategies that do not address environmental issues adequately.
- The large number of catchment plans across the Region are ineffectively linked and integrated.
- Inadequate incentives and disincentives to direct land use and management.
- The maintenance of the rural character of the peri-urban areas as an attractive feature of the Region.
- Increasing soil and stream salinity.
- Erosion of roads, fence lines, fire breaks and watercourses.
- Erosion from building sites and new developments.
- Sedimentation of watercourses.

Existing arrangements

Land use and management in the Region is subject to a range of statutes as shown in Table 2.3. For rural land, the principal statute is the *Soil and Land Conservation Act 1945* which includes measures to prevent degrading activities and requires private landholders to address existing land degradation problems. The Act also empowers community action through its support for LCDCs and catchment groups. A great deal of catchment management planning has occurred through these groups. This legislation will be replaced by an Agricultural Management Act that will address a wider array of environmental concerns related to rural land use.

The State planning legislation and regulations requires peri-urban shires to establish *Rural Land Use Strategies* that can be used to regulate land use and management in non-urban parts of the Region. A separate *Swan Valley Planning Act* applies in the Swan River Valley to ensure the protection of the rural character of that part of the Region. The Draft *Agricultural and Rural land use Statement of Planning Policy* delineates areas where local shires need to consider the economic, social and environmental requirements for agricultural land use.

Other government agencies with responsibilities for land use and management undertake activities on land vested in them under a range of Acts (e.g. Department of Conservation and Land Management, Main Roads, Western Power, LandCorp, Department of Land Administration).

The *Future Perth* planning process being managed by the Ministry for Planning is considering issues such as the size of the 'Perth footprint' and limits to future expansion of the urban areas that will impact directly on the peri-urban and rural land resources in the Region. Opportunities exist for strong community input to this planning process.

Ten year outcomes and indicators

Key outcomes	Suggested indicator items
Land capability and suitability recognised in all decisions made about current and intended land uses	Information on land capability and suitability is readily available Land use and management matched with land capability and suitability in all cases
Sustainable land use strategies implemented in peri-urban and rural areas	Rural Land Use Strategies address natural resource management issues and needs.
Protection of high value agricultural land in the Region	Area devoted to high value agricultural production Value of agricultural production in the Region
Best management practices used in all land management	Improving land condition Reduced nutrient loss from rural land Reduced erosion Increased use of high water use species Water Sensitive Design used at all stages of planning , development and management of new urban developments
Rural character of peri-urban area maintained	Area of rural land within easy access of the metropolitan area
Rural land use conflicts managed	Reduced level of formal disputation

Objectives and Strategies

Objective 3.1: Use all peri-urban and rural land in the Region within its capability and suitability

Strategy 3.1.1: Use local area land capability and suitability information in land use planning and allocation

Activities required include:

- identifying localised areas or precincts where existing land capability information is at an inappropriate scale for immediate land use and management planning needs;
- developing land suitability protocols for the suite of uses under consideration if these do not already exist;
- developing a plan that includes priorities for accumulating the land suitability and capability data, and
- ensuring that planning agencies including local government have access to these data and use them in decision making for land use planning and allocation.

Item	Response
Lead Organisation	Local governments
Role	Review existing coverage of land capability and suitability mapping. Agree on further requirements. Develop plan to address requirements
Key Partners	Agriculture Western Australia, Department of Environmental Protection, Water and Rivers Commission, Department of Conservation and Land Management, Ministry for Planning, other government agencies, Swan Catchment Council, community groups
Target	Plan to address requirements in place
Indicator of success	Agriculture WA commissioned and resourced to undertake additional land capability and suitability studies as required Land use and management matched with land capability and suitability in all cases
Priority	Essential, to be completed over a medium timeline
Resources	Additional resources may be required

Objective 3.2: Promote sustainable land management for all rural land uses.

Strategy 3.2.1: Develop and implement land management technologies and planning for rural land to improve environmental and economic outcomes.

While not extensive in area across the Region, agricultural activities on peri-urban and rural land include high value activities such as viticulture and horticulture. These activities are an important part of the Swan Region's economic and cultural base. Land management planning at small and large catchment scales is proceeding in these areas and is being undertaken by catchment groups and Land Conservation District Committees with support from government agencies and programs under the Natural Heritage Trust.

An important focus is the development and encouragement of improved management practices for agricultural land use that reduce sediment and nutrient run-off. Other priority issues are remnant vegetation management; stable fly management; herbicide and pesticide best practice and weed control. Extension of these practices to small 'hobby-farm' landholders is an important component of the work. Another focus should be the linking of catchment and land use plans prepared by a range of stakeholders, including agencies, local governments and community groups.

Item	Response
Lead Organisation	Agriculture Western Australia
Role	Work within established community networks to develop and implement improved approaches to land management on rural land. Develop awareness and extension capability
Key Partners	Swan Catchment Council, Land Conservation District Committees and catchment groups, other community groups, government agencies, local governments, educational institutions
Target	Land management plans in place for rural land within the Region Environmental sustainability criteria for farming systems Best Practice manuals available for farming and landuse systems
Indicator of success	Rural land managed in accordance with property management plans Integrated pest management systems in place Reduced sediment, nutrient and pesticide/herbicide run-off from rural land Reduced soil and stream salinity
Priority	Highly desirable and immediate need – build on current actions
Resources	Resources adequate for now – will need securing for long-term

Strategy 3.2.2: Develop and promote an on-line knowledge base for Best Management Practices in the Region

The agricultural industry capacity to access and use on-line electronic information is increasing rapidly. Services are being developed and marketed commercially (e.g. by the Kondinin Group) and the Avon Working Group is developing an electronic networking capability in the Avon Basin. This capacity needs to be developed for the Swan Region, where the number of agricultural enterprises is very large and diverse.

The strategy includes:

- development of a data information and storage retrieval system (Web based);
- capture of existing Best Management Practice publications and ensure electronic access
- capture of oral and documentary sources of local NRM history from European and Indigenous sources;
- identification and capture of innovative approaches to NRM that have been developed within the community, and
- use of the information collected in the development of local plans and in refining existing Best Management Practices.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Work within established networks to develop a web-based data base of NRM knowledge Facilitate incorporation of knowledge into BMPs established for government or private land managers
Key Partners	Community groups, NGOs, government agencies, History Departments in Universities, commercial knowledge managers, educational institutions
Target	Web-based Data base in place and operational by June 2003 Protocols for input of local knowledge into BMPs established by June 2003
Indicator of success	Community knowledge being used pro-actively by third parties in environmental management
Priority	Essential, plan for implementation over long-term
Resources	Additional resources will be required

Strategy 3.2.3 Promote and implement Environmental Management Systems with landholders to guide land use and management practices

Environmental management systems have been widely adopted by industry to provide a coherent and systematic approach to management of potential impacts of their operations on the environment. Systems can be formalised under a range of internationally recognised standards (e.g. ISO 14001) and the marketplace is beginning to demand this level of commitment to the environment. Agriculture has been slower than other industries to pick up the need for quality assurance in environmental management, with development focused mainly on the intensive industries, such as occur in the Swan Region. Further activities include:

- Review/Rework Environmental Management Systems (EMS) frameworks being developed by Agriculture Western Australia for local conditions in the Swan Region, and
- Work with landholders and grower groups to encourage adoption of EMS.

Item	Response
Lead Organisation	Agriculture Western Australia
Role	Working with landholders and catchment groups to develop and implement EMS
Key Partners	Local governments, agricultural industry groups, LCDCs, Swan Catchment Council
Target	Acceptable EMS available for individual landholder use
Indicator of success	Number of landholders / area of land with an EMS
Priority	Highly desirable, build on current activities for implementation over a medium timeline
Resources	Adequate resources available

Objective 3.3: Address salinity and erosion hazards in the Region.

Strategy 3.3.1. Develop a management capability to deal with salinity in the Region.

Action includes:

- evaluation of the extent of secondary salinity and risk of salinity in the Region using high technology systems (aerial and ground based);
- interpretation of the results and ground truthing with landholders;
- development of management strategies for areas already saline or at high risk of losing significant environmental values and beneficial uses, and
- Obtaining resources for implementation of recommended action.

Item	Response
Lead Organisation	Agriculture Western Australia/ Water and Rivers Commission
Role	Determine the current and predicted impact of rising salinity on land and water resources in the Region
Key Partners	Department of Conservation and Land Management, Department of Environmental Protection, Water Corporation, Swan River Trust, local governments, Swan Catchment Council
Target	Management strategies in place across the Region
Indicator of success	Actions in place to manage current and predicted salinity
Priority	Essential and immediate need
Resources	Additional resources required through State Salinity Strategy

Strategy 3.3.2. Develop policy and actions to ensure erosion and sedimentation are managed at all stages of land development

The Strategy focuses on ensuring that the transition between land uses does not increase the erosion potential on the land in question. The most normal transition will be between rural land use and 'special rural' land uses. Actions include:

- review recommendations in reports of erosion status in the Hills catchments, especially in the Armadale area;
- evaluation of erosion risk areas;
- development of draft policy/tools;
- development of Best Management Practices Toolkit (Including Water Sensitive Design), and
- development of a learning/accreditation scheme to ensure developers and operators (builders, equipment operators, shire staff) use BMP to avoid erosion.

Item	Response
Lead Organisation	Agriculture Western Australia
Role	Document the erosion risk at spatial scale and develop BMPs Facilitate management capacity to limit erosion in current and future developments
Key Partners	Ministry for Planning, local governments, Department of Environmental Protection, Swan Catchment Council
Target	Best Management Practices in place
Indicator of success	Developers using BMPs Shires only using accredited operators and contractors
Priority	Essential and immediate – build on current actions
Resources	Additional resources may be required to address emerging problem areas

Goal 4 – Improve management processes

Legislation, statutory processes, programs and strategies to be integrated to improve natural resource management

Given the projected growth in population and industry within the Region and the subsequent pressures on the environmental values; it is essential that environmental considerations are fully and formally integrated into statutory land use planning and land management and all other aspects of State and local government decision-making. It is also important that the plethora of environmental legislation, policies, programs and strategies maintained by a large number of agencies is rationalised and integrated to increase the efficiency and effectiveness of the investment into NRM.

Current status

Government is moving to integrate planning and natural resource management functions through its *State Planning Strategy*, a significant environmental presence in the Ministry for Planning and closer liaison between the Ministry and the Department of Environmental Protection. There is already abundant legislation for natural resource management. Moves have also been made to revise, consolidate and replace some of the key pieces of natural resource related legislation to improve their ability to address current environmental issues (e.g. *Environmental Protection Act 1986*; *Metropolitan Region Scheme Act 1963*; *Soil and Land Conservation Act 1945*; *Town Planning and Development Act 1928*; *Waterways Conservation Act 1976*; *Western Australian Planning Commission Act 1994*; *Wildlife Conservation Act 1950*).

A significant part of the Region is covered by statutory instruments and environmental policies. The *Environmental Protection (Swan and Canning Rivers) Policy* and its attendant Comprehensive Management Plan will require a strong commitment to effective action by State agencies and local governments in achieving the desired outcomes. The *Swan-Canning Cleanup Program and Action Plan* provides a key strategy for agency action along Swan and Canning waterways.

Bush Forever is a powerful tool for improved NRM in the Swan Region. As implementation proceeds, *Bush Forever* will protect regionally significant bushland in the coastal plain portion of the Perth Metropolitan Area and move towards a Comprehensive Adequate and Representative (CAR) Reserve System on the coastal plain. However, 7 of the 26 vegetation types have already been cleared to below 10 per cent of their original area. Even with full reservation of the remainder, they will be under-represented.

Issues

- Need for closer integration of planning and environmental laws, regulations, policies and programs.
- Need for clearer allocation of complementary roles and responsibilities between partners involved in NRM.

- Some parts of the Region are not completely covered by comprehensive statutory environmental plans – for example the Hills areas and the coastal plains not in the Swan and Canning River catchments.
- Communities are seeking more effective input into all stages of land use planning at State and local government level.
- Community perception that the planning appeals process is not sufficiently open or transparent and that reform is needed.
- Need to ensure that the government-community partnership is secured and resourced for the long-term.
- Not all peri-urban and rural land is being used, or is planned for use, within its capability or suitability.
- Much greater resourcing of NRM activities is required to address existing and proposed statutory requirements (e.g. the *Environmental Protection (Swan and Canning Rivers) Policy*) and government plans (e.g. *Bush Forever*).
- Management is not aligned or resourced to achieve targets and standards for natural resource management.
- Monitoring of NRM outputs and outcomes is fragmented and incomplete.

Existing arrangements

As well as implementing key instruments (e.g. *Bush Forever*, *Swan-Canning Cleanup Program and Action Plan*), government and community are working to bring disparate NRM plans and activities together under comprehensive regional strategies that link, integrate and extend the wide range of programs being undertaken at all levels by government, community, industry and individuals. An important need in this integration is for a clear specification of roles and responsibilities for all partners. For example, a common community view is that it is difficult to engage constructively with the planning process at agency and local government level.

The process of integrating environmental management and planning functions is proceeding. The *Environmental Protection (Swan and Canning Rivers) Policy* is a powerful statutory mechanism that through implementation will address a number of significant environmental issues for the Swan Region. However, its requirements and the existing needs of *Swan-Canning Cleanup Program and Action Plan* and other government environmental programs would suggest that current resourcing levels the responsible agencies are inadequate to achieve these mandated outcomes.

The Western Australian Planning Commission has established the Environment and Natural Resources Management Committee to investigate the role of planning in environmental protection and natural resource management. Initiatives are in place in the *State Planning Strategy* which commits government to a range of principles that will protect:

- key environmental resource areas and cultural heritage;
- water resources, and
- prime agricultural land and infrastructure from incompatible development.

Documents and programs that will help address these principles include *Liveable Neighbourhoods*, and *Bush Forever*. Given the continued demand for land and water resources

for urban and industrial development in the Region, furthering the level of integration will be a critical element in ensuring achievement of the goals defined for natural resources in this Strategy.

The Regional Forest Agreement which applies to State Forest in the Hills provides for the achievement of conservation outcomes. Other land vested in government agencies for conservation and other purposes should be managed to achieve required environmental outcomes. Current government action is often confined to simple fire prevention techniques (firebreaks), while community groups in many situations have taken on a voluntary responsibility for weed eradication and monitoring – usually with inadequate resourcing. A further need is for increased presentation of research information as practical management packages that are readily accessible and easily implemented. An increase in management commitment can be delivered through more formal community-agency partnerships, set up with agency commitment, resourcing and support.

Current knowledge of trends in key indicators of the state of natural resources in the Region is incomplete, inadequate and sometimes difficult to access (e.g point source pollutant levels in drains). The lack of relevant information severely limits the quality of decision-making in NRM – in short, ‘if we can’t measure, we can’t manage’. Responsibility for developing a comprehensive bio-physical monitoring program lies with a range of agencies, in line with different statutory and administrative requirements. The National Land and Water Resources Audit is making a significant contribution to natural resources data bases and an understanding of trends. Additional actions are highlighted in later sections.

Finally, it is important to recognise the role of monitoring information in management. A responsible investment by society in managing and monitoring natural resources requires:

- models of system behaviour (describing the relationship between action and outcome) that are able to generate agreed targets;
- information to validate models, measure performance against targets and support decisions on resource allocation;
- full accounting for the impacts of human activities on natural resource outcomes, and
- commitment to act on the information provided through the monitoring system.

Endorsement and implementation of the *Swan Strategy* will be an important part of the process of improving NRM management at all scales. At the regional scale, the Swan Catchment Centre, the Swan Catchment Council and the network of community groups provide a strong basis on which to ground natural resource management at all scales.

Ten year outcomes and indicators

Key outcomes	Suggested indicators items
Integration of government environmental management and planning processes.	Environmental issues adequately addressed at all stages of statutory planning processes <i>Bush Forever</i> implemented Urban Bushland and NRM Statements of Planning Policy implemented
Comprehensive coverage of the Region by statutory environmental policies and strategies.	Agreement on need for strategies across agencies; commitment to strategy development
Planning processes based on ESD principles	Acts, strategies and statutory plans specifically acknowledges ecological, economic and social sustainability
Effective and early community input to planning processes and an independent, transparent and accountable planning appeal processes	Level and quality of community input into planning processes and support for the Appeals process
Full implementation of all endorsed government environmental policies and programs (e.g. <i>Environmental Protection (Swan and Canning Rivers) Policy, Swan-Canning Cleanup Program and Action Plan</i>)	Audit / review of Programs indicates satisfactory performance against objectives and actions
Local environmental strategies implemented across the Region	All local governments with local environmental strategies being implemented
Environmental management plans across the Region linked and integrated	Consistent approach to planning methodology and 'seamless' boundaries between planning areas
Standards and targets defined at regional and local scales and included in management programs	A comprehensive suite of standards and targets is in place and recognised by all managers of natural resources
Increased monitoring capability in agencies and community with monitoring linked to management planning and action.	Future strategies and actions are clearly influenced by information about the changes in the status of natural resources.

Objectives and Strategies

Given the pressures from population and industrial use in the Region, government is strongly committed to environmental protection and good management across the Region. The goal for the Region is to enhance the efficiency and effectiveness of natural resource management through the closer integration of existing legislation, policies and programs that impact on the environment.

The main thrust of the Strategies involve implementation of significant government initiatives such as the *Environmental Protection (Swan and Canning Rivers) Policy* and the improved coverage of the Region by suitable policies and programs and increased capacity for community to work with government in designing the future for the Region.

Objective 4.1: Full coverage of the Swan Region with integrated statutory environmental policies and plans that implement ESD principles

Strategy 4.1.1: Implement existing government programs and coordinate activities across them.

Major government initiatives such as the *Environmental Protection (Swan and Canning Rivers) Policy*, *Bush Forever* and the *Swan-Canning Cleanup Program and Action Plan* commit government agencies to a range of actions. These commitments are being secured through inter-agency coordination and Memoranda of Understanding (MOUs). Government will report performance through the Annual Reports of individual agencies and in formal reviews of the initiatives. These requirements will extend to other government programs as these are formally endorsed and implemented.

A specific requirement will be the allocation of responsibility for environmental management to meet the objectives listed in the *Environmental Protection (Swan and Canning Rivers) Policy*. The Policy notes that:

'10(2)(b) the Comprehensive Management Plan is to establish a framework for the coordinated management of the protected waterways and the protected catchments and specify the persons, bodies, agencies or organisations responsible for that management;'

Government will establish the responsibility for each agency in contributing to the achievement of these outcomes within the policy area.

Item	Response
Lead Organisation	Auditor-General
Role	Use statutory role to ensure that government agencies commit sufficient resources to achieve agreed actions and outcomes under a range of programs. Negotiate the basis for auditing performance against objectives with the Auditor-General and participating agencies
Key Partners	Agencies with major NRM responsibilities, other government agencies, local governments, Swan Catchment Council, industry groups, major community groups
Target	Key Performance Indicators in place for assessing performance against commitments
Indicator of success	MOUs in place for agreed contributions to existing programs Favourable reporting on the performance of existing programs
Priority	Essential and immediate – actions are in place to address existing commitments
Resources	Additional resources will be required to meet all commitments

Strategy 4.1.2: Secure comprehensive regional coverage with statutory NRM policies and plans

Given the pressures on natural resource management and the trends for population growth over the next 30 years, it is critical that the whole Region is covered by targeted NRM policies that carry statutory authority.

The Swan and Canning Catchments are already included within the scope of the *Environmental Protection (Swan and Canning Rivers) Policy* and *Swan-Canning Cleanup Action Plan*. No similar over-arching statutory or program coverage exists for the remainder of the coastal plan or the Hills area, although the Regional Forest Agreement covers State Forest areas. Comprehensive statutory plans for these areas are needed to determine the key roles and responsibilities of government agencies and local government, to coordinate existing efforts and to secure their commitment and accountability for desired environmental outcomes. The completion of the following plans and policies will be important steps.

- 'Bushplan' type planning for the Hills area, through the Regional Forest Agreement and completion of System 6.
- A system of environmental performance bonds for development in the Region to be managed by the Environmental Protection Authority with advice from the Department of Environmental Protection.
- The proposed Statement of Planning Policy for Environment and Natural Resource Management.
- Recognition of environmental considerations in defining planning precincts.
- The Environmental Protection Authority and Western Australian Planning Commission to determine the basis for assessment of sites designated in *Bush Forever*.
- COAG Environmental Water Provisions.
- The proposed Statement of Planning Policy for urban bushland.
- The revised Memorandum of Understanding to ensure clearing regulations apply to rural and peri-urban land throughout the Swan Region.

Some of these proposals are already underway. The Statement of Planning Policy for Urban Bushland is specified in *Bush Forever* and will be prepared over the next 5 years to provide recognition and protection of both regionally and locally significant bushland in the Region. In preparing Statements of Planning Policy, the Ministry for Planning will ensure community and local government involvement.

Item	Response
Lead Organisation	Ministry for Planning/Department of Environmental Protection/Water and Rivers Commission
Role	Negotiate support for the development of comprehensive Hills and Coastal Plain strategies Complete works in progress, prepare strategies and Statements of Planning Policy and secure sign-off from key partners for implementation
Key Partners	Government agencies, local governments, Swan Catchment Council, community groups
Target	Commitment to prepare new strategies and Statements
Indicator of success	All commitments completed and signed-off.
Priority	Essential and immediate – continue with current activities
Resources	Additional resources may be required to meet all commitments

Objective 4.2: Develop and implement plans for reduced natural resource use and improved waste management

Strategy 4.2.1: Implement government programs for more efficient use of energy and water resources

The Western Australian Government's response *State of the Environment Report 1998* commits the government to a range of actions that will lead to less per capita use of energy and water¹². Western Australia is a signatory to the National Greenhouse Strategy and is preparing a separate State strategy. The Office of Energy has committed to a *Green Power Policy* for WA, in part to meet the Commonwealth's requirement for two per cent of all power to be delivered from renewable energy generation. Other mechanisms include introducing efficiency standards for electricity generating equipment. These could be complemented by pricing mechanisms that encourage efficient use of energy.

In promoting water use efficiency in domestic and industrial consumption, government has committed to:

- provision of advice to the community and industry on water use efficiency (see Strategy 2.3.3);
- Water Auditor Training that aims to promote best practice water management, and
- assessing the possibility of using recycled water in the Perth Groundwater Area.

These measures could be complemented with further reform in water pricing that encourages more efficient water use.

Performance in these areas is reported in the *State of the Environment Report* (1998) and in the State Government's response¹².

Item	Response
Lead Organisation	Department of Premier and Cabinet
Role	Enhance existing programs that promote more efficient energy and water use
Key Partners	Department of Environmental Protection, Office of Energy, Water and Rivers Commission, Water Corporation, Western Power, Office of Water Regulation, Department of Transport, Department of Resources Development, industry, Swan River Trust
Target	Effective schemes for increased efficiency of energy and water use
Indicator of success	Reduced per capita consumption of energy and water
Priority	Essential and immediate – enhance existing programs
Resources	May require additional resources over long term

Strategy 4.2.2: Promote waste reduction and management programs at state, regional and local levels

The Region's people are large producers of solid waste. Based on 1997 data, approximately 1.05 tonnes of waste per person, or a total of 1.31 million tonnes is disposed each year to landfill. Predicted population increases will lead to more waste being generated in future years. Excessive waste generation puts pressure on available land resources for location of landfill sites and can lead to localised pollution from the storage of low hazard materials and increases the potential for pollution of groundwater bodies⁴ (see Section 2.2.1).

Activities to reduce waste generation are increasing – principally through the encouragement of recycling at local government levels. The amount of material recycled in 1999 varies greatly between local governments in the Region – from 19.5 kg/head in Wanneroo to 182.5 kg/head in Mundaring²². Clearly, there is an opportunity for dramatic increases in recycling activity in some areas.

The WA Government has an objective to reduce overall production of waste material and its impact on the environment and public health. The Draft *Waste 2020* strategy released in August 2000 sets a goal of ‘zero waste’ by 2020. It contains strategies that

- encourage consumption patterns that will reduce waste generation – e.g. pricing policies, cleaner production;
- promote community understanding of waste management issues, including the need to regard waste as a resource;
- increased recycling activity and use of recycled goods, and
- will administer the Waste Management and Recycling Fund (WMRF).

Item	Response
Lead Organisation	Department of Environmental Protection
Role	Foster waste-reduction and recycling programs
Key Partners	Local governments, industry, government agencies
Target	State waste reduction and recycling program in place – <i>Waste 2020</i>
Indicator of success	Reduced volume of waste to landfill Increased per capita recycling
Priority	Essential and immediate – waste reduction programs already in place
Resources	Adequate resources at state level. Additional resources may be required by local governments

Strategy 4.2.3: Encourage improved management of extractive industries and improved site rehabilitation

The Region is an important source of basic raw materials – such as building limestone, sand, and road metal. Government is committed to good practice in the management of extractive industries, in particular acceptable site rehabilitation at the conclusion of the extraction period. Most extraction activities occur on private land and are managed by local governments. They are required to address the industries’ needs and obligations through Town Planning Schemes in accordance with the *Basic Raw Materials Statement of Planning Policy*. Additional instruments including the *State Gravel Strategy* and the *State Lime Strategy*.

Good management requires operators to submit site management and closure plans. To enhance NRM objectives, consideration needs to be given to conservation of biodiversity and physical diversity when approving an extractive site and in ensuring best practice rehabilitation that is consistent with the structure and function of surrounding ecosystems. The use of performance bonds should be considered where appropriate by local governments to ensure compliance.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Work with local governments to encourage improved performance in management of extractive industries
Key Partners	Department of Environmental Protection, Western Australian Planning Commission, Department of Resources Development, Department of Conservation and Land Management, Botanic Gardens and Parks Authority, local governments, Chamber of Commerce and Industry
Target	Improved site management and rehabilitation
Indicator of success	Area of land 'open' for extractive resources Quality of land rehabilitation
Priority	Highly desirable over medium term
Resources	Additional resources will need to be committed by local governments and industry

Objective 4.3: Encourage local government and community input into natural resource management and planning

Strategy 4.3.1: Encourage local environmental planning and reporting in local government

An increasing number of local governments are involved in environmental planning, with several involved in Agenda 21 activities. Other activities include programs to improve environmental performance through staff training, minimise waste, promote Water Sensitive Design, and provide support to 'Friends' groups. Further involvement in local environmental planning and activities will be promoted through this Strategy.

Previous strategies emphasise the importance of closer integration between planning and environmental functions at State government level. This integration needs to be extended into the planning functions that are the responsibility of local governments.

Rural land use strategies are a special case that are important for municipalities with significant areas of peri-urban and urban land. Addressing environmental outcomes can be achieved through these strategies, which are required by the Western Australian Planning Commission under the Draft *Agricultural and Rural Land Use Statement of Planning Policy* (SPP 11) which is relevant to areas within the Region (mainly adjacent to Great Northern Highway - Swan Valley, and the Great Eastern Highway - Mundaring). This Draft SPP notes that natural resources in these areas used for agriculture should be carefully managed to achieve specific objectives.

Some local governments have committed to the presentation of 'State of the Environment Reports' (SoE). Publication of these data enables local community groups and government agencies to track performance and determine priorities for resourcing. The Reports should harmonise with State SoE reporting format in content and style. A SoE group has been established by the Western Australian Municipal Authority to promote quality reporting.

Item	Response
Lead Organisation	Local governments, Western Australian Municipal Association
Role	Negotiate assistance from government agencies for local governments preparing and reviewing Environmental Strategies and Plans Ensure that new or revised Rural Land Use Strategies address environmental needs (as defined elsewhere) before sign-off Review existing Rural Land Use Strategies against environmental criteria Encourage and support 'State of Environment' reporting
Key Partners	Department of Environmental Protection, other agencies, local community groups
Targets	Existing Rural Land Use Strategies reviewed A program to foster environmental reporting
Indicator of success	Improved environmental outcomes from implementation of Rural Land Use Strategies Increased number of 'State of Environment' Reports
Priority	Essential, to be achieved over medium timeline
Resources	Additional resources will be need to be committed by local governments

Strategy 4.3.2: Link and periodically review all catchment management plans, river foreshore management plans, and integrated natural resource management plans

There are up to 100 separate NRM-related management plans covering areas of the Region. Some of these plans are very local area specific (e.g. a management plan for Point Resolution); while others cover a much larger area (e.g. Canning River foreshores plan). Spatial consistency between objectives and methods in plan implementation is needed to avoid duplication and to address gaps. This lack of integration is a significant problem in natural resource management in the Region. A working group needs to:

- ensure Management Plans are included in a central GIS / data base which can be easily accessed by community and government;
- provide advice to Plan owners about the issues and actions that may require modification to ensure consistency across an area;
- provide advice to local governments about the coverage in their jurisdiction and the gaps that need addressing;
- ensure harmonisation between jurisdictions and statutory requirements;
- ensure that plans are reviewed 5 yearly, with community input, and
- Seek resources for these activities.

Item	Response
Lead Organisation	Department of Environmental Protection
Role	Establish a Working Group to review plans for spatial compatibility
Key Partners	Community groups, local governments, Ministry for Planning, Agriculture WA, Water and Rivers Commission, Department of Conservation and Land Management, Community Groups
Target	Working Group in place to review plans
Indicator of success	Plans integrated spatially
Priority	Essential, to be implemented over longer-term
Resources	Additional resources will be required

Strategy 4.3.3: Improve community participation throughout the planning process

A prevailing view amongst the community is that its capacity to engage with the planning process is inadequate and that the planning process itself is not sufficiently 'community-friendly'. As a consequence, the Western Australian Planning Commission is reviewing the process. Additional procedures identified by the community that are suggested to raise awareness of the planning process and improve the mechanisms and opportunities for public involvement include assurances that:

- effective public participation occurs from the beginning of a land use change project (e.g. residential development);
- appropriate and adequate community representation on decision-making bodies;
- standards for public participation to be set by the Ministry for Planning and local government to ensure that the process is comprehensive and satisfactory to all parties;
- additional interpretative services about the planning process in the Ministry for Planning and local governments to assist the public in developing knowledge and understanding;
- the Ministry for Planning has staff who are able to guide community members through the planning process, and.
- community members are trained in public participation techniques and in the workings of government in general.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Negotiate with government for opportunities to improve community engagement with the planning process Seek support for a project to train community representatives nominated by Swan Catchment Council in these procedures.
Key Partners	Ministry for Planning, government agencies, local governments, Environmental Defenders Office, Western Australian Municipal Association
Target	Procedures in place Training program established
Indicator of success	Increased effectiveness in community participation, with participation welcomed by key partners
Priority	Essential and immediate – establish dedicated project
Resources	New resources needed for training project

Strategy 4.3.4: Promote increased community access to the planning appeals process

The current Planning Appeals process has low community support. The community concerns are being addressed through lobbying of government by the Conservation Council of Western Australia and other peak community groups. Government is being requested to implement reforms to the planning process that address the following specific issues of:

- accessibility to the community;
- transparency and equity in the process, and
- accountability.

The preferred outcome is a constructive partnership between community and government that addresses valid community concerns about the planning appeals process on an on-going basis; and which promotes quality community input.

Item	Response
Lead Organisation	Conservation Council of WA
Role	Promotion of opportunities to address community concerns about the planning appeals process
Key Partners	Environmental Defenders Office, Swan Catchment Council, community groups, Ministry for Planning, Western Australian Municipal Association
Target	Improved partnership between government and community in addressing valid concerns
Indicator of success	Government commitment to address valid community concerns on an on-going basis
Priority	Essential and immediate – increase the level of activity
Resources	Resources need to be diverted into this area

Objective 4.4: Base NRM on monitored standards and targets for environmental outcomes and reviews of environmental programs**Strategy 4.4.1: Establish environmental management standards and targets for environmental outcomes in the Swan Region with an allocation of responsibilities and monitoring and reporting capabilities**

The *State of the Environment Report 1998* provides indicators of Natural Resource Management performance, which are linked to national standards developed by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ). These are matched with locally-regulated standards for some important pressures on the environment, most notably airborne and waterborne emissions. These are strictly enforced through environmental legislation where they can be managed at point source. Other standards are presented in *Bush Forever* and the *Environmental Protection (Swan and Canning Rivers) Policy* notes that levels of phosphorous, nitrogen and other pollutants may be prescribed in the Management Plan. Levels of these elements are included in the *Swan-Canning Cleanup Program and Action Plan*. Targets have been set for waste disposal to landfill, and for energy use¹².

However, across the range of NRM issues in the Region, the list of defined standards and targets is incomplete. In establishing standards and targets, the first requirement is to define outcomes.

This is being done through statutory Environmental Protection Policies, and through State of the Environment Reporting. This work must incorporate community views about desired outcomes. Further commitment to setting binding standards is needed *inter alia* in:

- bushland conservation;
- energy and water use;
- Fertiliser and chemical use on residential, urban and peri-urban land; and
- In breaking regional standards and targets down to levels that apply at local scales.

Item	Response
Lead Organisation	Environmental Protection Authority
Role	Negotiate involvement of government agencies and major community groups in setting standards and targets where these do not currently exist Ensure adequate monitoring activity
Key Partners	Department of Environmental Protection, other agencies, local governments, Swan Catchment Council, other community groups
Targets	Agreement on the specific requirements for additional environmental standards and targets; and monitoring activity
Indicator of success	A comprehensive suite of environmental standards and targets Ability to audit, review and report against them.
Priority	Essential and immediate – continue existing commitment
Resources	Resources are adequate

Strategy 4.4.2: Formally review government performance in environmental programs

Existing major policies and programs such as the *Environmental Protection (Swan and Canning Rivers) Policy*, *Bush Forever* and the *Swan-Canning Cleanup Program and Action Plan* have commitments to periodic review included in them. Similar review processes should apply to other NRM programs and policies. If programs are short-term, mid-term reviews should still take place to ensure that a program is delivering. The quality of the review process and outcomes will be enhanced through formal involvement of the Swan Catchment Council and representatives of community groups.

Item	Response
Lead Organisation	Environmental Protection Authority
Role	Determine appropriate time to review performance of the <i>Swan-Canning Cleanup Program and Action Plan</i> , <i>Bush Forever</i> and the Comprehensive Management Plan for the <i>Environmental Protection (Swan and Canning Rivers) Policy</i>
Key Partners	Participating State agencies and local governments, Swan Catchment Council, community groups
Targets	Review completed satisfactorily Adequate community involvement in the process
Indicator of success	Performance against outcomes, standards and targets is satisfactory Community satisfaction with opportunities for involvement
Priority	Essential, for later action as indicated in individual strategies
Resources	Will require dedicated resources at the time of review

Goal 5 – Achieve culture change

Government, community and individual behaviours enhance the understanding and management of the Region's natural resources.

The Region's 1.25 million people seek a high quality of life, with clean air and water and access to open space and attractive landscapes. However, their demand for products and services to maintain current lifestyles puts enormous pressures on the natural resources in the Region. As a result, current use of the natural resources in the Swan Region is not sustainable – a change in how we live is required. The pressure from current and projected population on these resources is a fundamental issue addressed by the *Swan Strategy*.

Culture change recognises the importance of an environmental ethos linked to every-day activities in government, industry, business, recreation and daily life. It is about changes to government, community and individual behaviours that ensure they are matched to the capability of the Region's natural resources. It recognises that everybody living in the Region has a stewardship responsibility to the environment – a 'duty of care'.

Changed behaviour of the magnitude required to attain sustainable use of the natural resources by the projected population of 2 million people in 2030 will be very difficult to achieve. It will require a degree of leadership, political will and community engagement that is outside the scope of any single agency or community group. The role of the *Swan Strategy* is to encourage culture change through strategies that inform and guide the Region's residents on the issues and encourage changed behaviour at all levels of decision-making from the personal to government/corporate scale.

Current status

- Seventy five per cent of the residents live in detached houses surrounded by garden. The preference for a European style of garden, when combined with the nature of the soils and climate means that Perth has a high per capita domestic water consumption – with 80 per cent of domestic water used on gardens, parks and turf surfaces.
- Urban sprawl has created a huge demand for land for housing and roads and a high dependence on personal vehicles⁴.
- There is steady demand for land for conversion to roadways and waste storage, and for service facilities and corridors for telecommunications and power.
- The increasing area of hard-surface in the Region, constructed drainage and the filling-in of wetlands has altered local hydrology.
- The demand for land for agriculture (primarily), and for urban development has led to the loss of 70 to 80 percent of the Region's wetlands⁶.
- Compared to other Australian Capital Cities, the relative area of remaining natural bushland on the Swan Coastal Plain in and around Perth is high (28 per cent).
- There is increased personal commitment to recycling and composting. A number of Perth local governments are recycling over 100 kg per head per annum, with residents in Mundaring shire achieving the state maximum of 182.5 kg per annum²².

Issues

- Current government plans anticipate that Perth's population will expand to 2 million over the next 30 years, increasing the pressure on the Region's natural resources.
- The high per capita consumption of water, energy and land resources and large emissions of solid, liquid and gaseous waste.
- Absence of clear overall leadership for NRM in the Region.
- Current coordination between government and community activities in encouraging improved NRM behaviours is insufficient.
- The comparatively large area of bushland on the Swan Coastal Plain is a valuable asset that is under pressure.
- Technical knowledge and skills for natural resource management is inadequate.
- Integrated Catchment Management (ICM) principles and processes have not been adopted comprehensively at State or local government levels.
- Industry involvement in natural resource management is inadequate.
- Funding support for effective community NRM initiatives, which is a critical component of the NRM framework is unsecured.
- Volunteer and community burnout.

Existing arrangements

Influencing behaviour in the management of natural resources is achieved in a range of ways which includes the use of regulation, market-based mechanisms, incentives/disincentives, voluntary codes of practice and education. These activities are not well coordinated across the Region, with no clear targets or goals for the levels of per capita use of natural resources within the Region, for example. Planning to account for predicted population growth in the metropolitan area has traditionally encouraged linear urban spread with a large emphasis on private car use for transport.

Subsequent planning amendments, policies and guidelines now has a greater focus on achieving good environmental outcomes than has traditionally been the case. The *Future Perth* planning process is dealing with fundamental issues about the desired size of Perth, the nature of the desired lifestyles and the level of natural resource use to sustain these lifestyles.

In recent years, education activity in developing skills and knowledge in natural resource management has become fragmented at primary and secondary school levels and a re-vitalisation is warranted. At the same time, additional resources are needed in raising awareness and encouraging participatory action throughout the community. The education discussion paper developed by the Department of Environmental protection provides an opportunity to re-invigorate this area.

Good examples of local environmental strategies are evident in the *Eastern Metropolitan Regional Council's Regional Environmental Strategy* and the development of rural land use strategies for shires located in the peri-urban and rural areas. Overall, the current coverage of local environmental strategies is incomplete and inconsistent and does not provide sufficient assurance to government and community that essential environmental issues and needs are being

addressed. Agenda 21 (the Rio de Janeiro Convention) urges that global environmental needs be met through actions taken at local levels and some urban local governments (e.g. Nedlands, Fremantle) are working on these. However, coverage needs to be much broader.

Current support for community groups, their activities and structures such as the Swan Catchment Centre is strongly reliant on project-based funding from the Natural Heritage Trust, *Swan-Canning Cleanup Program and Action Plan* and the Gordon Reid Foundation which lacks long-term security. This hinders the effectiveness of these groups and in particular the development of the Swan Catchment Centre's role as an important link between government and community. Volunteer burn-out is an issue facing many groups as they endeavour to contribute to improved NRM.

The current level of technical NRM skills available in agencies, education institutions and the community is not sufficient to support the growing demand for on-the-ground skills. Increased investment in providing accredited training in the technical aspects of natural resource management is warranted.

Ten year outcomes and indicators

Key outcomes	Suggested indicators items
State agencies and local governments demonstrate integrated management of natural resources.	ICM principles evident in all LG and State agencies operating plans Level of integration between State agencies in managing natural resources Baseline environmental data available
The environment and ESD principles is recognised as core business by all local governments	Increased proportion of local governments with dedicated environmental staff Number of local governments working on SoE reports and Agenda 21 items with budgetary implications
Substantially reduced per capita energy and water use; and solid waste generation for the metro area	Levels of per capita energy and water use and waste generation Increased community demand for environmentally sensitive design
Strong community support for retention of bushland and wetlands in the Region	Level and consistency of resources provided by government for bushland conservation management
Aboriginal and European heritage valued and protected	Effective heritage protection that links with NRM outcomes
Community groups managing natural resources are adequately supported with funds, expertise and in-kind contributions	Increased level of all resources available for community NRM groups Area of bushland receiving appropriate management

Objectives and Strategies

There is a fundamental need to develop collective and individual behaviours that are conducive to good Natural Resource Management. Our demands on the Region's natural resources need to be better aligned with their capacity to deliver beneficial uses while at the same time ensuring the protection of the Region's environmental values.

This is a big task, which will require strong long-term leadership, education, reform and commitment from all levels in society. As described in previous Sections, there is already a lot happening, but further actions are needed to build on, reconfigure, or harmonise existing institutions, mechanisms and programs that operate at the different levels of government and in the community.

The role of the *Swan Strategy* is to develop processes that add value to existing activities, to address and bridge the gaps in current activities, to coordinate actions in a manner that ensures an efficient use of resources.

Objective 5.1. Promote environmental principles and best practices as core business by all levels of government, community and individuals

Strategy 5.1.1 – Incorporate Ecologically Sustainable Development principles and practices at all levels of government in the Swan Region

The Western Australian Government endorsed *the National Strategy for Ecologically Sustainable Development* in 1992. Ecologically sustainable development (ESD) involves '... 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).

A significant policy response in WA has been the development of the 'Whole of Government' approach to Natural Resource Management, led by the Department of Premier and Cabinet with government activities coordinated across agencies with major natural resource management responsibilities (see Figure 5).

A cornerstone to ESD is building government-community partnerships in NRM through the development and formal endorsement of regional NRM strategies (including the *Swan Strategy*) and in the adequate resourcing and full implementation of these strategies. Extension of the NRM model over time into all agencies and local government is required.

Item	Response
Lead Organisation	Department of Premier and Cabinet
Role	Provide leadership and support for implementation of ESD principles throughout government and community Support resourcing of Regional NRM strategies at State level
Key Partners	Environmental Protection Authority, Department of Environmental Protection, Agriculture WA, Department of Conservation and Land Management, Water and Rivers Commission, Ministry for Planning, Western Australian Planning Commission, other government agencies, local governments, Western Australian Municipal Association, Regional NRM Groups
Targets	<i>Swan Strategy</i> endorsed by governments and resourced Development of agreed future through <i>Future Perth</i> process All local governments involved in Agenda 21 or SoE reporting
Indicator of success	ESD principles evident in government and community action in the Swan Region Agreed limits established for Perth's future impact on natural resource use 'Whole of Government' NRM framework in place and MOUs established for delivery ESD principles in place in all relevant government agencies and local governments
Priority	Essential and immediate – enhance existing commitments
Resources	Adequate resources available

Strategy 5.1.2: Establish Best Management Practice (BMPs) for public and private land managers through existing government instruments

Best Management Practices (BMPs) are needed for the whole range of activities that use or impact upon the Region's natural resources. Their development and implementation is a statutory requirement in *Environmental Protection (Swan and Canning Rivers) Policy* and is also required in the *Swan-Canning Cleanup Program and Action Plan*. Best practice for agricultural developments is required in the Draft *Agricultural and Rural Land Use Statement of Planning Policy* (Draft SPP 11) and the planned a Statement of Planning Policy for Environment and Natural Resource Management is also likely to emphasise the need to consider NRM outcomes at the time of land use change.

Item	Response
Lead Organisation	Environmental Protection Authority, Water and Rivers Commission, Western Australian Planning Commission
Role	Working in cooperation with key partners, secure establishment of BMPs
Key Partners	Government agencies as appropriate, local governments, other Regional NRM Groups, industry groups and local community groups
Targets	Program in place to complete BMPs
Indicator of success	BMPs used by key partners and used by government agencies, local governments and private landholders
Priority	Essential and immediate – continue existing activities
Resources	May need additional resources

Strategy 5.1.3: Develop knowledge and skills in Natural Resource Management through research, accredited training programs and promotion of the bushland management industry.

Management of the Region's natural resources requires a wide range of technical knowledge and skills. Building this capacity needs to occur at several levels. An important element will be improving the coordination across existing activities.

At the cutting edge of knowledge, the complexity of the Region's biological resources requires that a continued commitment to building knowledge excellence in the tertiary educational institutions, and in organisations such as the Botanic Gardens and Parks Authority, and the Departments of Conservation and Land Management and Environmental Protection. Concern has been expressed that the basic research work and training of natural resource scientists is not keeping pace with demand. Suggested research areas are weed control, re-integration of fragments, and best management of vegetation remnants. Research requirements include:

- promoting and supporting existing work being done by government and private research agencies;
- actively seeking funding partners for expanded research effort, and
- increasing the regional profile of key research issues and workers.

Building community capacity through skilling programs will be important in increasing the net contribution made by the residents to improved management of their own environments. A wide range of activities already occurs through bodies such as (e.g. *Ecoplan*), Water and Rivers Commission and Greening Australia (WA) and individual community groups, but there is a need to develop further accredited courses to ensure that community groups can access readily the knowledge and skills they need for their projects. At the same time, the training needs to be broad enough to cover what individuals can do in their own right (as in creating a biodiversity-friendly garden) and in how they can contribute to local 'Friends' groups.

The work being done through *Ecoplan* for community groups needs to be extended into the commercial bushland management industry. The first requirement is the design of Best Management Practices. Considerable work has already been done in defining these for peri-urban and rural land use and management by Agriculture Western Australia; and in bushland management by the Department of Conservation and Land Management. Other groups that have an interest include Western Australian Department of Training, Education Department of Western Australia, Agriculture Western Australia and the Water Corporation. The approach used, where BMPs are defined through government-community participation and sharing of information should be extended into areas such as:

- use of land for urban development;
- artificial drainage design and management;
- domestic and industrial water use and waste management;
- bushland management during development;
- landscaping adjacent to bushland, and
- re-establishment of native vegetation on previously cleared land.

These BMPs should then be used as the basis for developing an accreditation scheme for nursery operation, bushland regeneration, landscapers, architects and contractors. Ultimately, it will be desirable to link the use of accredited operators to development approvals established by the Ministry for Planning, Department of Environmental Protection and local governments.

A further requirement to be promoted is the increased availability of indigenous genetic material, especially for wetland planting.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Work with existing training and research providers and industry groups in looking for opportunities to develop increased levels of activity. Facilitate key partner involvement.
Key Partners	Universities, Botanic Gardens and Parks Authority, Department of Conservation and Land Management, Department of Environmental Protection, Education Dept (TAFE), Greening Australia (WA), Nursery industry, landscapers, architects, contractors, managers of riparian habitats, community groups, Australian Association of Bush Regenerators, Environmental Weed Action Network.
Target	Proposal for increased activity endorsed by key partners Possible Centre of Excellence in bushland management at University level
Indicator of success	Increased investment into bushland research Range of courses available and number of people involved in training Accreditation schemes in place Nursery industry able to propagate all Swan coastal plain species
Priority	Highly desirable – increase existing activity
Resources	Additional resources will be needed

Objective 5.2: Promote values and behaviours that reduces people's demands for natural resources in the Swan Region

Strategy 5.2.1: Develop, promote and coordinate a community natural resource management awareness program

A range of activities are already occurring under the broad heading of 'community environmental education'. Significant additional intellectual effort and resourcing is needed to build on the foundation already established in changing values, attitudes and behaviours. Increased individual and community capacity to use and manage the Region's natural resources wisely is the major objective.

Existing activities need to be lifted into the arena of ICM/natural resource management by showing the interrelationships between human behaviour and environmental outcomes that are consistent with the scope of this Strategy. This Strategy will require the Swan Catchment Council to lead in design and support of a project(s) that coordinates existing activities into a 'higher order' ICM/NRM awareness program. Specific activities include high level conferences, support for academic studies and research projects and targeted communications to opinion leaders. An important area for developing capacity is in building skills in conflict resolution in NRM.

The programs need to be extended into the use of land for urban living, with encouragement of reduced requirements for single detached dwellings and greater use of passive solar house design.

Item	Response
Lead Organisation	Swan Catchment Council
Role	Commission and support a project(s) that develop awareness programs that coordinate existing activities and develop new 'higher level' programs
Key Partners	Department of Environmental Protection, Ministry for Planning, Department of Minerals and Energy, Water Corporation, Water and Rivers Commission, Swan River Trust, Office of Energy, other government agencies, local governments, Greening Australia (WA), industry groups, universities, community groups
Targets	Project Brief(s) prepared High profile established for programs
Indicator of success	Industry and government partners engaged Project funded
Priority	Essential activity, to be implemented over a medium timeline
Resources	New resources will be required

Strategy 5.2.2: Develop and implement a business and industry sector awareness program of NRM principles and practice.

The business and industry sectors in the Region are significant users of the Region's natural resources. It is important that they are included in the regional NRM network through communication and direct involvement in activities. An industry-funded awareness raising program could address:

- the environmental value of natural resources in the Region (beneficial uses, ecosystem health values);
- the NRM framework for the Region and its goals (as defined in the *Swan Strategy*);
- regional and local impacts of industrial and commercial activity;
- opportunities for commerce and industry to contribute to NRM through programs including ISO standards, Environmental Management Systems (EMS), Best Management Practices, pollution minimisation, nutrient management, cleaner production etc., and
- promotion and rewarding of models of good practice.

A specific area for action is in nutrient management, which can build on existing project or site specific regulations applied through the Environmental Impact Assessment process for nutrient management. Existing work in this area can be extended into established sites and industries which have not encountered the EIA process. An example is the Swan-Canning Industry Working Group, which is implementing better practice within smaller industries to minimise point source pollution. Improving awareness and behaviour in nutrient management is also an area where the Swan Catchment Council can make a significant contribution to improved water quality.

Item	Response
Lead Organisation	Department of Commerce and Trade/ Chamber of Commerce and Industry
Role	Facilitate development of an industry-funded Program with key industry partners Build on existing work in commissioning a project that is funded and supported by key partners to develop an education program suitable for promotion through mass media
Key Partners	Swan-Canning Industry Working Group, Water Corporation, Water and Rivers Commission, Department of Resources Development, Department of Environmental Protection, Chamber of Minerals and Energy, major corporates, government agencies, Swan Catchment Council
Target	Working party to develop Education Program established
Indicator of success	Program established and funded by industry High level of recognition of NRM needs amongst Perth business and industry enterprises; reduced levels of nutrients in waste water
Priority	Highly desirable activity, build on existing work
Resources	Additional resources will be required

Strategy 5.2.3: Promote environmentally sensitive design in all future development activities (urban, regional, industrial)

The *State Planning Strategy* commits the government to ensuring that new major housing developments incorporate the principles of low energy use and Water Sensitive Urban Design. This is being promoted through *Liveable Neighbourhoods* and in the planning work being managed by the Ministry for Planning through the *Future Perth* process. Links have been established with the Housing Industry Authority, Office of Energy and the building industry in promoting the concepts of low resource intensity construction. Substantial increased effort will be required to develop a culture of low resource use.

Item	Response
Lead Organisation	Western Australian Planning Commission
Role	Negotiate inclusion of environmentally sensitive design with key partners
Key Partners	Government agencies, Office of Energy, local governments, construction and housing industry, Housing Industry Authority, planning consultants
Target	Agreements on progressive inclusion of environmentally sensitive design reached with key partners
Indicator of success	Environmentally sensitive design seen as standard industry best practice Reduced resource use per capita
Priority	Essential and immediate – commitments in place
Resources	Adequate resources in government

Strategy 5.2.4: Foster increased interest and understanding of Aboriginal and European heritage in the Region

The Swan Region has a rich Aboriginal history that is deeply significant to the Nyungah peoples. Although it has occurred over a much shorter time-scale, the Region is also important for its role on European habitation in WA. Sound NRM recognises the maintenance of natural and cultural heritage as an important task in building people's understanding of and respect for the whole environment in which they live.

Actions required include:

- assessment, recognition and documentation of places of natural and cultural significance;
- assurance that Aboriginal people are consulted about NRM activities, especially local works;
- inclusion of Aboriginal resource management in education curricula;
- development of heritage trails;
- renaming of places with traditional Aboriginal names;
- publication of stories of prior occupancy, and
- increased heritage interpretation in areas accessible to the public

Item	Response
Lead Organisation	Swan Catchment Council
Role	Develop partnerships in providing an NRM focus in heritage programs
Key Partners	Swan Valley Circle of Elders, other Nyungah communities, Swan Catchment Council, WA Museum, Department of Aboriginal Affairs, universities, historical Societies, Education Department, other government agencies, local governments
Targets	NRM focus in heritage programs
Indicator of success	Support by Nyungah people for concept
Priority	Essential, develop the focus over medium term
Resources	Current resources are adequate

Strategy 5.2.5: Coordinate existing school-based environment and monitoring education programs

Externally supported school-based environmental education has been around for about 20 years, with funding support from Natural Heritage Trust, Greening Australia and corporate support being used to enhance the contribution made by the Education Department. Current programs, training opportunities and experiential activities include:

- *Ecoplan* (Department of Environmental Protection);
- *Bushrangers* (Department of Conservation and Land Management);
- *Waterwise Schools Program* (Water Corporation)
- *Ribbons of Blue* (Water and Rivers Commission);
- *Frogwatch* (WA Museum, Education Department);
- *Greenskills* (APACE);
- Conservation Volunteers Australia, and
- The City Farm (Men of the Trees).

Coordination of these individual programs in the Region will ensure increased access to a seamless set of activities that address all the key elements of NRM in the Region, while retaining the diversity in the existing programs. An important element will be to commit resources to evaluation of education programs to determine their value and contribution in encouraging culture change.

Item	Response
Lead Organisation	Education Department of WA
Role	Integrate existing environmental education programs under a single banner and promote use in schools
Key Partners	Swan Catchment Council, government agencies, independent education sector, Greening Australia (WA), Australian Association of Environmental Educators, TAFE, Geographical Association of WA
Targets	Inter-agency working party established
Indicator of success	Coordinated Program with inter-related activities in place
Priority	Highly desirable, integration to occur over medium timeline
Resources	No additional resources required

Objective 5.3: Recognise and adequately resource government-community NRM partnerships

Strategy 5.3.1: Increase corporate sponsorship and support for specific integrated catchment management and NRM initiatives

Considerable corporate support for NRM is provided already, with Alcoa, for example, being a very significant contributor in the Region. The WA Landcare Trust was established recently to secure resources for NRM from the private sector and has an active marketing program to seek support.

Corporations are increasing their commitment to beneficial environmental, economic and social outcomes in their area of influence, as shown through the move to 'triple bottom-line reporting'. The opportunity exists to build on this trend in forming partnerships between local businesses and industries and community groups involved in managing natural resources, as in the investment being made by WMC Resources Ltd in native vegetation restoration in Kings Park.

Item	Response
Lead Organisation	WA Landcare Trust/ Swan Catchment Council
Role	Increase funding flow from Corporate entities into NRM; provide sustainable source of funding
Key Partners	Cabinet Standing Committee, Chamber of Commerce and Industry, Chamber of Minerals and Energy, Department of Commerce and Trade, Swan Catchment Council, <i>Swan-Canning Urban Landcare Program (SCULP)</i> , Kwinana Industries Council
Targets	Already established by the Landcare Trust at state scale – target for Swan Region to be developed
Indicator of success	Sustainable funding available for expenditure within the Swan-Canning Region
Priority	Essential, build corporate commitment over medium term
Resources	May require additional resources to engage corporate sector

Strategy 5.3.2: Further develop NRM partnerships by building the roles and functions of Community NRM Groups, the Swan Catchment Council and the Swan Catchment Centre.

This strategy recognises common objectives between community and government. The government-community partnership inherent in good NRM requires that the community receive assured and adequate support for the partnership to realise its full potential.

An estimate of 10,000 members of the Perth community contribute directly to NRM through membership of over 250 groups involved in a very wide range of activities^{19,20}. These include protection and management of specific areas of habitat ('Friends' groups), management of issues such as nutrients, integrated catchment activities at small and large catchment scale and membership of government NRM bodies. As well as their tangible support for an improved physical environment, these people and their activities make a vital contribution to culture change across the Perth community. Resourcing of the positive contribution made by the community arm of the NRM partnership is critical.

Investment by government in supporting the community contribution is substantial. The dollar value of the community involvement across all activities is immense and government would not be able to provide this level of resourcing if the voluntary contribution was withdrawn. At the same time, there is evidence that community and voluntary 'burn out' is beginning to affect some groups and activities. Addressing this serious issue requires technical support, and assistance with administrative requirements that detract unnecessarily from their NRM activities.

Beyond these people are the hundreds of thousands of people in Perth who limit domestic resource use, participate in recycling programs managed by local governments, recycle garden waste as compost and remove exotic weeds during their recreation activities.

Current resourcing is dependent on only a few sources of funds, principally:

- the Commonwealth's Natural Heritage Trust, which terminates in its current form in 2002, and
- Alcoa World Alumina and the Swan River Trust which support the Swan Catchment Urban Landcare Program.

The Swan Catchment Council needs to work closely with NRM agencies, current funders and NRM Regional Chairs to secure adequate and consistent support for the succeeding years. The Council and the Swan Catchment Centre need to be positioned to respond and contribute to implementing new government policies and programs as they emerge. For instance, the Commonwealth has recently announced (May 2001) a new funding program for the next five years under the *Natural Heritage Trust Act 1997*. Securing funding from this source will be important in implementing a number of items listed in the Swan Strategy.

Support is required for:

- activities undertaken by community groups that lead to improvement in the condition of natural resources;

- funding support for people working with community groups;
- securing the leadership and coordinating role of the Swan Catchment Council;
- increasing the capacity of the Swan Catchment Centre to be a resource for community groups;
- developing local resource centres – such as at Muchea, Canning, and Bannister;
- building community and individual capacity to contribute to natural resource management;
- providing administrative and accountancy services to community groups (in progress);
- developing long-term sustainable funding sources, and
- leveraging additional support from third parties (local government, industry).

Item	Response
Lead Organisation	Swan Catchment Council
Role	Ensure Swan Catchment Council, Catchment Centre and community groups are adequately supported and resourced Working with key partners in designing new funding mechanisms
Key Partners	Commonwealth Government, State Government, Agriculture WA (NHT Secretariat), Water and Rivers Commission, Regional Chairs, community groups, local governments, industry and commerce
Target	New support mechanisms in place
Indicator of success	Level of resources available Quality of service from the Swan Catchment Centre
Priority	Essential and immediate – need to secure post-NHT funding
Resources	Resources are adequate for the roles, assuming continued support

3 Implementation and evaluation

3.1 Implementation

3.1.1 Priority strategies for implementation

Table 8.1 shows the Strategies arranged in priority for 'importance' and 'urgency'. In summary, the most urgent and important Strategies can be grouped into four areas as follows.

a. Integrate principles and planning for natural resource management into all levels of government (State, regional, local)

Increasing government capacity for effective natural resource management by:

- incorporating ecologically sustainable development principles into decision-making at all levels of government;
- further integrating environmental protection and planning functions, and
- establishing a comprehensive set of baseline data and targets for natural resource management outcomes in the Swan Region.

b. Implement existing and draft programs and plans

Government has a large number of policies and programs for NRM either endorsed, or in draft, or planned that must be fully implemented. The most significant for the Region are:

- the *Environmental Protection (Swan and Canning Rivers) Policy* and its Comprehensive Management Plan;
- the *Environmental Protection (Swan Coastal Plain Lakes) Policy*;
- the Draft *Environmental Protection (Swan Coastal Plain Wetlands) Policy*;
- The *Infill Sewerage Program*;
- *Bush Forever*;
- the *Swan-Canning Cleanup Program and Action Plan*;
- the Draft *Agricultural and Rural Land Use Statement of Planning Policy* (SPP 11);
- Environmental Water Provisions in the Region's waterways;
- the planned Urban Bushland Statement of Planning Policy;
- the planned Environment and Natural Resource Management Statement of Planning Policy, and
- extension of the 'Bushplan' planning process into the Hills (remainder of System 6) through the Regional Forest Agreement and the *Darling Range Regional Park Forest Management Plan*.

c. Support community groups

The community provides significant and irreplaceable direct input into NRM. This arm of the government-community partnership needs continued support through:

- effective and expert assistance and support for landcare/catchment officers;

- technical skills and training;
- increased capacity to contribute to planning outcomes, and
- increased access to a range of funding sources for on-ground environmental management and protection work.

d. Improve on-ground management and monitoring of resources

The priorities for direct delivery are:

- development and promotion of Best Management Practices and standards for environmental protection and management;
- increased use of regulatory mechanisms, market-based instruments, incentives and disincentives, and
- increased capacity to monitor trend in the condition of natural resources.

3.1.2 Develop an implementation plan

The Strategy as presented in this document needs to be complemented with an Implementation Plan. This plan will confirm the priorities for action shown in the previous section and in Table 8.1 and will establish responsibilities and resourcing implementation. It should also firm up the outcomes and indicators shown for each of the five Goals and for the individual Strategies.

3.2 Evaluation

The Strategy will not be complete without an over-arching evaluation plan. Outcomes, targets and indicators are shown throughout the Strategy. Many of these will be evaluated through agency Annual Reports and auditing by the Auditor-General. In other situations, separate processes will be required. This section spells out the requirements for effective evaluation, which will need to be secured with Memoranda of Understanding between the Cabinet sub-committee, individual agencies and the Auditor-General.

For the *Swan Strategy*, agencies and community should focus on evaluating effectiveness and cost-effectiveness. An effective evaluation strategy needs to:

- use sensible units for measuring change;
- be able to distinguish between outputs and outcomes;
- measure effectiveness and cost-effectiveness;
- use leading and lagging indicators, and
- deal with qualitative and quantitative data.

These points are elaborated in the sections below.

3.2.1 Indicators and measurement

Outputs vs Outcomes

The ultimate return to investment in NRM in the Swan Region is the improved condition of the environmental values in the Region, as described in the goals and their outcomes. Since these

outcomes may take some time to be realised - because of the time frame for change in NRM - it is useful to use leading as well as lagging indicators in evaluation.

- **Leading indicators** are those relating to outputs and other changes which are expected to result in changes in the state of the natural resources over time. For example, implementation of a local bushland management strategy would be expected to result in improved condition of the bush in that area.
- **Lagging indicators** measure outcomes in terms of improved environmental values in the Region. For example, the area of land contained within the CAR reserve system is a lagging indicator resulting from implementation of *Bush Forever*.

Qualitative and Quantitative Change

The indicators shown for the five goals include examples of both leading and lagging types. An ability to measure these is required. Where the indicator relates to a quantitative measure - for example, the area of land acquired for the reserve system, measurement is straightforward. In some other cases, the evaluation may be a simple yes/no, as in assessing whether a particular program has been implemented.

However, many of the outcomes identified for the five goals will be difficult to measure using quantitative methods. For example, effective community input to planning processes is difficult to quantify. Evaluation of outcomes such as these requires estimation of values for qualitative change. Robust qualitative methodologies are required. These are available and are used by a number of organisations in evaluating their own programs. A useful method employed at international and corporate level is Goal Attainment Scaling.

Table 8.1: Priority for strategies

Importance / Urgency	Immediate need (or occurring now)	Medium timeline	Later action
Essential	<p>1.1.1 Expand existing research programs to prioritise habitat and biodiversity needs</p> <p>1.1.3 Apply biodiversity planning principles for use in regional and local land use and management planning throughout the Region</p> <p>1.2.1 Develop a CAR Reserve system within the Region.</p> <p>1.2.2 Conserve the physical diversity in the Region</p> <p>1.3.1 Formally recognise and support the community's contribution to bushland protection and management</p> <p>1.3.2 Implement effective weed strategies within the Region</p> <p>2.1.1 Develop and implement programs to achieve Environmental Water Provisions in the Region</p> <p>2.1.2 Meet environmental objectives in waterway management, water supply catchments and groundwater</p> <p>2.2.1 Reduce point source and diffuse source water-borne pollutants into water bodies</p> <p>2.2.2 Complete In-fill sewerage and connections completed across the Region</p> <p>2.3.1 Support community groups managing water bodies in the Region</p> <p>2.3.3 Promote efficient water use in the Region</p> <p>3.3.1 Develop a management capability to deal with salinity in the Region.</p> <p>3.3.2 Develop policy and actions to ensure erosion and sedimentation are managed at all stages of development</p> <p>4.1.1 Implement existing government programs and coordinate activities across them</p> <p>4.1.2 Secure comprehensive coverage with statutory NRM policies and plans</p> <p>4.2.1 Implement government programs for more efficient use of energy and water resources</p> <p>4.2.2. Promote waste reduction and management programs at state, regional and local levels</p> <p>4.3.3 Improve community participation throughout the planning process</p> <p>4.3.4 Promote increased community access to the planning appeals process</p> <p>4.4.1 Establish environmental management standards and targets for environmental outcomes in the Swan Region with an allocation of responsibilities and monitoring and reporting capabilities</p>	<p>1.3.4 Support LG remnant native vegetation protection strategies</p> <p>1.3.5 Government to ensure management of all publicly owned bushland protects environmental values</p> <p>1.3.6 Foster waterways, floodways, lakes and wetlands protection and restoration</p> <p>2.1.3 Maintain a flood risk management program for the Region</p> <p>2.3.2 Foster implementation of 'water sensitive design' in all developments</p> <p>3.1.1 Use local area land capability and suitability information in land use planning and allocation</p> <p>4.3.1 Encourage local environmental planning and reporting by LGs</p> <p>4.2.5 Ensure effective water sensitive design in all future developments (urban, regional, industrial)</p> <p>5.2.1 Develop, promote and coordinate a community natural resource management awareness program</p> <p>5.2.4 Foster increased interest and understanding of Aboriginal and European heritage in the Region</p> <p>5.3.1 Increase corporate sponsorship and support for specific integrated catchment management and NRM initiatives</p>	<p>3.2.2 Develop and promote an on-line knowledge base for BMPs</p> <p>4.3.2 Link and periodically review all catchment management plans, river foreshore management plans, and integrated natural resource management plans</p> <p>4.4.2 Formally review government performance in environmental programs</p>

	<p>5.1.1 Incorporate ESD principles and practices at all levels of government in the Swan Region</p> <p>5.1.2 Establish BMPs for public and private land managers through existing government instruments</p> <p>5.2.3 Promote environmentally sensitive design in all future developments</p> <p>5.3.2 Further develop NRM partnerships by building the role and functions of Community NRM Groups, the Swan Catchment Council, and the Swan Catchment Centre</p>		
Highly desirable	<p>3.2.1 Develop and implement land management technologies and planning for rural land to improve environmental and economic outcomes.</p> <p>4.2.6 Improve community participation throughout the planning process</p> <p>5.1.3 Develop knowledge and skills in natural resource management through research, accredited training programs and promotion of the bushland management industry</p> <p>5.2.2 Develop and implement a business and industry sector program of NRM principles and practice</p>	<p>1.3.3 Apply effective clearing controls in the Metropolitan area</p> <p>1.3.7 Support bushland and wetland retention schemes on private land</p> <p>3.2.3 Promote and implement Environmental Management Systems with landholders to guide land use and management practices</p> <p>4.2.3 Encourage improved management of extractive industries and improved site rehabilitation</p> <p>5.2.5 Coordinate existing school-based environment and monitoring education programs</p>	1.1.2 Increase the focus on fauna management across the Region
Desirable		1.3.8 Implement corridor plantings of native vegetation on road reserves, Public Open Space, UCL and freehold land.	

4 Sources and Acknowledgments

4.1 Sources

The documents and sources below have been cited in the text.

1. Government of Western Australia (1999). *Western Australian Government framework to assist in achieving sustainable natural resource management*, Draft (25.6.1999 version). Standing Committee on NRM.
2. Agriculture, Fisheries and Forestry Australia (1999). *Managing natural resources in rural Australia for a sustainable future. Discussion paper*. Commonwealth Government, Canberra.
3. Commonwealth of Australia (1992). *National strategy for ecologically sustainable development*, Australian Government Publishing, Canberra.
4. Government of Western Australia (1998). *State of the Environment Report*, Western Australia, 1998
5. Personal communication, Dr Richard Hobbs, Murdoch University.
6. Government of Western Australia (2000). *Environmental Protection (Swan Coastal Plain Wetlands) Policy*, (Draft) Department of Environmental Protection,
7. Personal communication, Department of Conservation and Land Management, Perth
8. Western Australian Planning Commission (2000). *Bush Forever. Keeping Bush in the city*. Two volumes, Government of Western Australia.
9. Government of Western Australia (1998). *Environment Protection (Swan and Canning Rivers) Policy*, Department of Environmental Protection, Perth
10. Swan River Trust (1999). *Swan-Canning Clean-up Program. Action Plan*, Government of Western Australia.
11. Western Australian Planning Commission (1999). *Future Perth Indicators*. Ministry for Planning, Government of Western Australia.
12. Government of Western Australia (1999). *Environmental action. Government's response to the State of the Environment Report*, Department of Environmental Protection
13. Government of Western Australia (2000). *Waste 2020 Draft Strategy*. Department of Environmental Protection
14. Avon Working Group (2000). *Avon River Basin natural resource management plan. Draft Summary*.
15. Personal communication, David Mitchell, Department of Conservation and Land Management.
16. Commonwealth of Australia (1996). *National Strategy for the Conservation of Australia's Biological Diversity*, Canberra.
17. Personal communication, Gerry Parlevliet, Agriculture Western Australia
18. Water and Rivers Commission (2000). *Waterways WA Program* (Draft).
19. Personal communication, Mary Gray, formerly Department of Environmental Protection
20. Swan Catchment Council records
21. Western Australian Planning Commission (2000). *Introducing Livable Neighbourhoods: A Western Australian Government Sustainable Cities Initiative* Edition 2. Ministry for Planning.
22. Department of Environmental Protection (2000). *Annual Report 1999-2000*
23. Government of Australia (1996). *State of the Environment, Australia 1996*. Canberra.

4.2 Additional reading

- Swan-Avon Integrated Catchment Management Coordinating Group (1997). *Working together. A recovery action plan for the Swan-Avon catchment*, Swan-Avon Integrated Catchment Management Coordinating Group, Western Australia.
- House of Representatives Standing Committee on Environment and Heritage (2001). *Co-ordinating catchment management. Report of the inquiry into catchment management*, 2000. Parliament of the Commonwealth of Australia, Canberra.
- Department of Conservation and Environment (1984). *Conservation reserves for Western Australia. The Darling system - System 6*, Report No. 10, Department of Conservation and Environment, Perth
- Western Australian Planning Commission (1995). *Proposals for Darling Range regional park. Final*, prepared by the Ministry for Planning for the Western Australian Planning Commission.
- Forests Taskforce (1999). *Towards a regional forest agreement for the south-west forest region of Western Australia*, Public consultation paper, Department of Prime Minister and Cabinet, Canberra.
- Swan River Trust (2000). *Swan-Canning cleanup program. Action plan implementation. Year 1 in Review Summary*, Swan River Trust, East Perth.
- Council of Australian Governments (1995). *Water reform agreement*, Council of Australian Governments, Canberra.
- Agriculture Western Australia (1999). *The land is in your hands. A practical guide for owners of small rural land holdings in Western Australia*, Agriculture Western Australia, Perth.
- Western Australian Planning Commission (1999). *Agricultural and rural land use planning policy*, Public comment paper, Western Australian Planning Commission, Perth.
- Western Australian Planning Commission (1996). *State planning strategy*, Western Australian Planning Commission, Perth.
- Department of Environmental Protection (2000). *Environmental education. A discussion paper*, Department of Environmental Protection, Perth.
- Shire of Mundaring (1996). *Environmental management strategy*, Shire of Mundaring, Mundaring.
- Eastern Metropolitan Regional Council (2000). *Regional environmental strategy*, Eastern Metropolitan Regional Council, Perth.
- Department of Planning and Urban Development (1992). *Foothills structure plan*, Department of Planning and Urban Development, Perth.
- Western Australian Planning Commission (2000). *North-eastern corridor extension strategy*, prepared by the Ministry for Planning for the Western Australian Planning Commission.
- Western Australian Planning Commission (2000). *North-eastern Hills settlement pattern plan*, prepared by the Ministry for Planning for the Western Australian Planning Commission.
- State Salinity Council (2000). *The salinity strategy. NRM in Western Australia*, State Salinity Council in association with community groups and government agencies, Government of Western Australia, Perth.
- State Salinity Council (2000). *Salinity actions. NRM in Western Australia*, State Salinity Council, Government of Western Australia. Perth.
- Ministry for Planning (2001). *Development of environment and natural resources management and planning policy. Summary report (Draft, March 2000) to Environment and Natural Resources Management Committee*, Ministry for Planning, Perth.

4.3 Acknowledgments

During the preparation of the Strategy, the consultant, URS, was supported by a Swan Catchment Council sub-committee comprising: Mike Grasby (Chair, Swan Catchment Council), Peter Nash (Program Manager, Swan Catchment Council), Angela Carr (Urban Bushland Council), Andrea Zappacosta and Shelley Shepherd (Ministry for Planning), Gerry Parlevliet (Agriculture Western Australia), Kerry Traylor and Clare Taylor (Water and Rivers Commission), David Mitchell (Department of Conservation and Land Management), Jan-Paul Van Moort (Department of Environmental Protection, and Jeanette Conacher (Urban Hills Land Conservation District Committee).

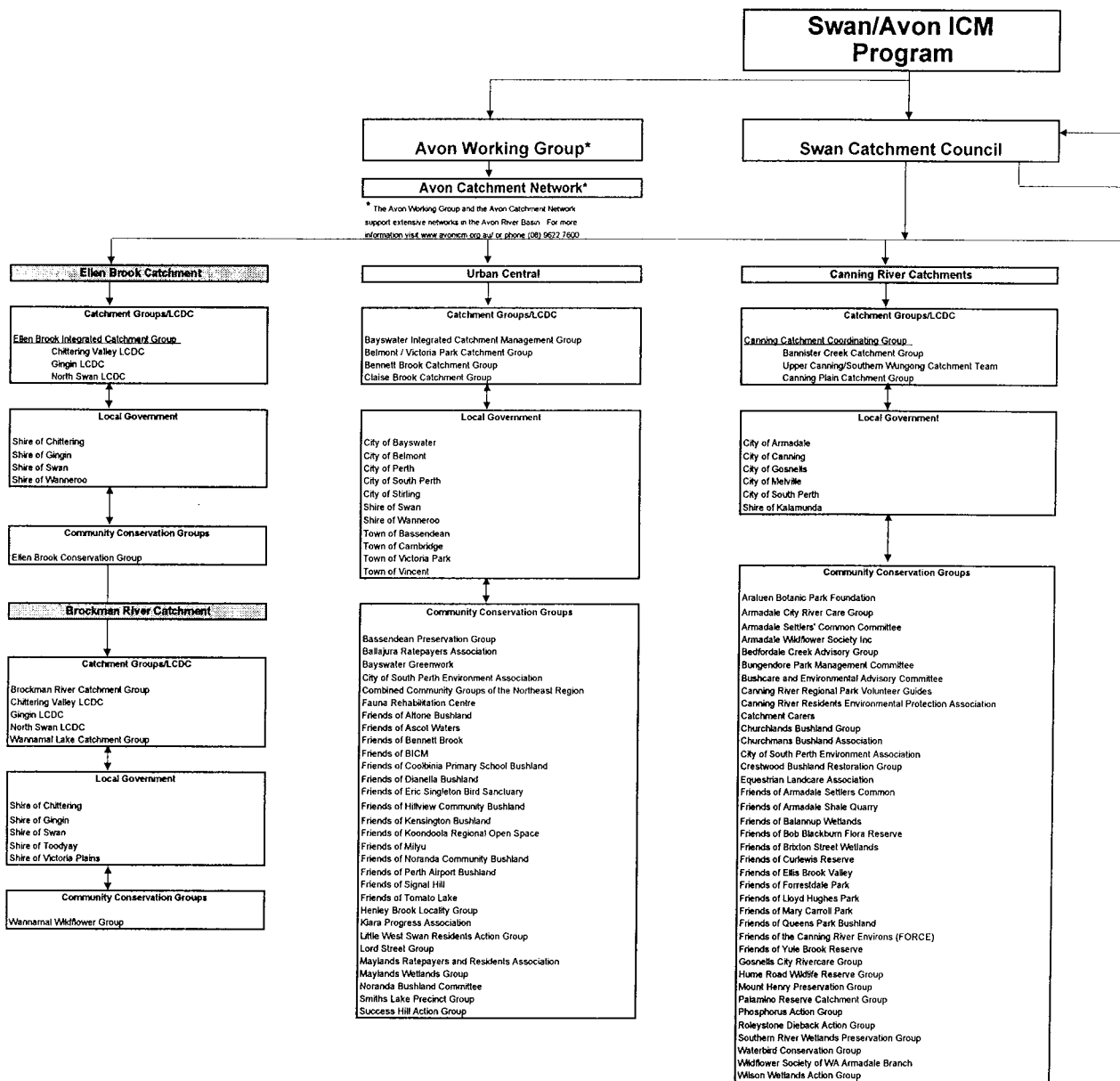
Various community and government representatives participated in discussions at different times. Particular acknowledgment is given to Bronwyn Keighery (Wildflower Society) and Mary Gray (formerly of the Department of Environmental Protection).

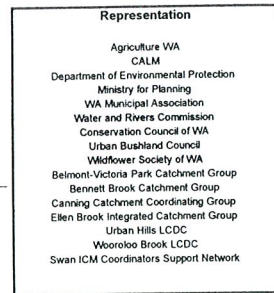
During the various drafts of the Strategy, input from community members, agency and local government personnel, catchment officers and members of the full Swan Catchment Council are gratefully acknowledged.

Abbreviations

AGWEST	Agriculture Western Australia
AWG	Avon Working Group
BMP	Best Management Practice
EWPs	Environmental Water Provisions
CALM	Department of Conservation and Land Management
CAR	Comprehensive, Adequate and Representative (reserves systems)
CEO	Chief Executive Officer
CMP	Comprehensive Management Plan
DEP	Department of Environmental Protection
EPA	Environmental Protection Authority
EPP	<i>Environmental Protection Policy</i>
ESD	Ecologically Sustainable Development
IBRA	Interim Biogeographic Regionalisation of Australia
ICM	Integrated Catchment Management
LCDC	Land Conservation District Committee
MfP	Ministry for Planning
NHT	Natural Heritage Trust
NRM	Natural Resource Management
RFA	<i>Regional Forests Agreement</i>
SAICMCG	Swan-Avon Integrated Catchment Management Coordinating Group
SCC	Swan Catchment Council
SCCP	<i>Swan-Canning Cleanup Program and Action Plan</i>
SCULP	<i>Swan Catchment Urban Landcare Program</i>
SPP	<i>Statement of Planning Policy</i>
SRT	Swan River Trust
UCL	Unallocated Crown Land
WAMA	Western Australian Municipal Association
WAPC	Western Australian Planning Commission
WRC	Water and Rivers Commission
WSUD	Water Sensitive Urban Design

Figure 6: Catchment and landcare groups in the Swan Region





Swan Catchment Centre

Urban Hills Catchments

Catchment Groups/LCDC

Urban Hills LCDC
 Blackadder-Woodbridge Catchment Group
 Helena River Catchment Group
 Guildford Catchment Group
 Jane Brook Catchment Group
 Rocky Gully Catchment Group

Local Government

Shire of Kalamunda
 Shire of Mundaring
 Shire of Swan

Community Conservation Groups

Bugle Tree Creek-Jane Brook Protection Society
 Community Environmental Advisory Committee
 Darlington Residents and Ratepayers
 Dieback Working Group
 Eastern Hills Branch Wildflower Society
 Friends of Alice Hebb Reserve
 Friends of Alps Rd Reserves
 Friends of Andrew/Mcrae Street Reserve
 Friends of Barlee St Reserve
 Friends of Beacon Rd Reserves
 Friends of Bending Gully
 Friends of Bindle Trail East
 Friends of Bindle Trail West
 Friends of Brookside Park
 Friends of Bugle Tree Creek
 Friends of Buninyong Park
 Friends of Callan Rd Reserve
 Friends of Centenary Pk/Jarrah Ck
 Friends of Clare Rd Reserve
 Friends of Clifton Rd Reserve
 Friends of Crocus Road Reserve
 Friends of Crumple Creek Reserve
 Friends of Darlington Station Reserve
 Friends of Dundas Road Reserve
 Friends of Elizabeth Street Reserve
 Friends of Falls Park North
 Friends of Falls Park South
 Friends of Forrest Ave Quarry Reserve
 Friends of Giffellon Park Reserve
 Friends of Glen Forrest Reserve
 Friends of Goodall Street Reserve
 Friends of Greenmount
 Friends of Hawkeville Bushland Reserve
 Friends of Hicks Road Reserve
 Friends of Hovea Conservation Park
 Friends of Hudman Road Reserve
 Friends of Huntley Street Reserve
 Friends of Kadina Brook Reserve
 Friends of Kalla Place Reserve
 Friends of Kershaw Avenue Reserve
 Friends of Kintore/Coppin Rds Reserve
 Friends of Ledger Road Reserve
 Friends of Lesmurdie High School Reserve
 Friends of Lion Mill Creek Reserves
 Friends of Mandon Park
 Friends of Marriott Park
 Friends of Mundaring Reserve
 Friends of Nestle Brae Creek Reserve
 Friends of Nicholson Crescent Reserve
 Friends of Noblewood Reserve
 Friends of North Darlington/Bilgoman
 Friends of Parkerville Quarry
 Friends of Parkerville Village (South)
 Friends of Poison Gully Reserve
 Friends of Quenda Creek Reserve
 Friends of Railway Reserve
 Friends of Railway Reserve (Other End)
 Friends of Spring Road Reserve
 Friends of Statham Reserve
 Friends of Stone Road Reserve
 Friends of Strettle Rd Reserve
 Friends of Talbot Rd Reserve
 Friends of Taree Rd Reserve
 Friends of The Superblock
 Friends of Tonkin Highway
 Friends of Toomart Creek Reserve
 Friends of Turner Grove Reserve
 Friends of Vernalden Way Reserve
 Friends of Victor/Glen Rds Reserve
 Friends of Vveash
 Friends of Walker St/Jarrah Rd
 Friends of Wilson/Beacon Rd Reserve
 Friends of Woodlupine Brook Reserve
 Gidgegannup Progress Association
 Glen Forrest Residents and Ratepayers
 Hazelmere Progress Association
 Hovea Bush Regenerators Group
 Hovea Residents and Ratepayers
 Midland Frogs Inc.
 Midland Society
 Nature Reserves Preservation Group
 WA Naturalists Club Darling Range Branch
 Wildflower Society (Darling Range Branch)

Wooroloo Brook Catchment

Catchment Groups/LCDC

Wooroloo Brook LCDC
 Coates Gully Catchment Group
 Cookes Gully Catchment Group
 Joseph Creek Catchment Group
 Upper Gidgegannup Catchment Group

Local Government

Shire of Mundaring
 Shire of Northam
 Shire of Swan

Community Conservation Groups

Friends of Chidlow Reserves
 Friends of Chidlow Parklands
 Friends of Cookes Brook Reserve
 Friends of Quail St. Reserve
 Gidgegannup Progress Association

State-wide and Special Interest Groups

APACEAID
 Australian Association of Bush Regenerators
 Australian Association of Environmental Education
 Australian Marine Conservation Society
 Conservation Volunteers Australia
 Birds Australia WA
 Conservation Council of WA
 Edith Cowan Conservation Organisation
 Environment Centre
 Environmental Defenders Office WA (Inc)
 Environmental Weeds Action Network
 Frogwatch
 Green Teams Project
 Greening WA
 GreenSkills
 GreenLeach
 Herdman Lake Wildlife Centre
 Land for Wildlife
 Land Management Society
 Landscape Architecture Group
 Marine and Coastal Community Network
 Men of the Trees
 MUENSA
 Murdoch Campus of TAFE
 National Park Rangers Association
 Recfishwest
 Roadside Conservation Committee
 Science Teachers Association of WA
 Swan Valley Nyungah Community
 Tree Society
 Urban Bushland Council
 WA Gold League
 WA Insect Study Society
 WA Native Orchid Study and Conservation Group
 WA Naturalists Club
 WA Speleological Group Inc
 Western Australian Society of Amateur Herpetologists
 Wetland Conservation Society
 Wetlands Conservation Group
 Wildflower Society of WA
 WSH

Coastal Zone

Local Government

City of Fremantle
 City of Joondalup
 City of Melville
 City of Nedlands
 City of South Perth
 City of Stirling
 Shire of Peppermint Grove
 Shire of Wanneroo
 Town of Cambridge
 Town of Claremont
 Town of Cottesloe
 Town of East Fremantle

Community Conservation Groups

Ashburton Drive Primary School Wetland Sanctuary
 Bold Park Bushland Regeneration Group
 Cottesloe Marine Protection Group
 Craigie Bush
 Foreshore and Waterways Protection Council
 Friends of Allen Park
 Friends of Bibra Lake
 Friends of Blue Gum Lake Reserve
 Friends of Bold Park Bushland
 Friends of Cantonment Hill
 Friends of Cockburn Wetlands Education Centre
 Friends of Deepwater Point
 Friends of Dianella Bushland
 Friends of East Fremantle Foreshore Inc.
 Friends of Hepburn and Pinjarra Bushland
 Friends of Hollywood Reserve
 Friends of Kings Park
 Friends of Korella Park Bushland
 Friends of Lake Gwelup
 Friends of Lake Jaulup
 Friends of Manning Bushland
 Friends of Marmion Marine Park
 Friends of Montreal Park
 Friends of Mt Claremont Banksia Bushland
 Friends of Neerabup
 Friends of North Fremantle Foreshore
 Friends of Samson Hill
 Friends of Samson Park
 Friends of Shenton Bushland
 Friends of Star Swamp Bushland
 Friends of Trigg Bushland
 Friends of Warwick Open Space
 Friends of Warwick SHS Bushland
 Friends of Wireless Hill Park
 Friends of Yellagonga Regional Park Inc.
 Greening Leeming
 Greening Point Walter
 Habitat Herdsman
 Landsdale Conservation Park
 Local Plants Group
 Melville Environment Group
 Palmyra Community Association
 Parkway Bush Preservation Group
 Quinns Rocks Environmental Group
 Stirling Wetlands Action Group
 Wanneroo & Northern Suburbs Branch of the Naturalists Club
 Wildflower Society of WA Murdoch Branch