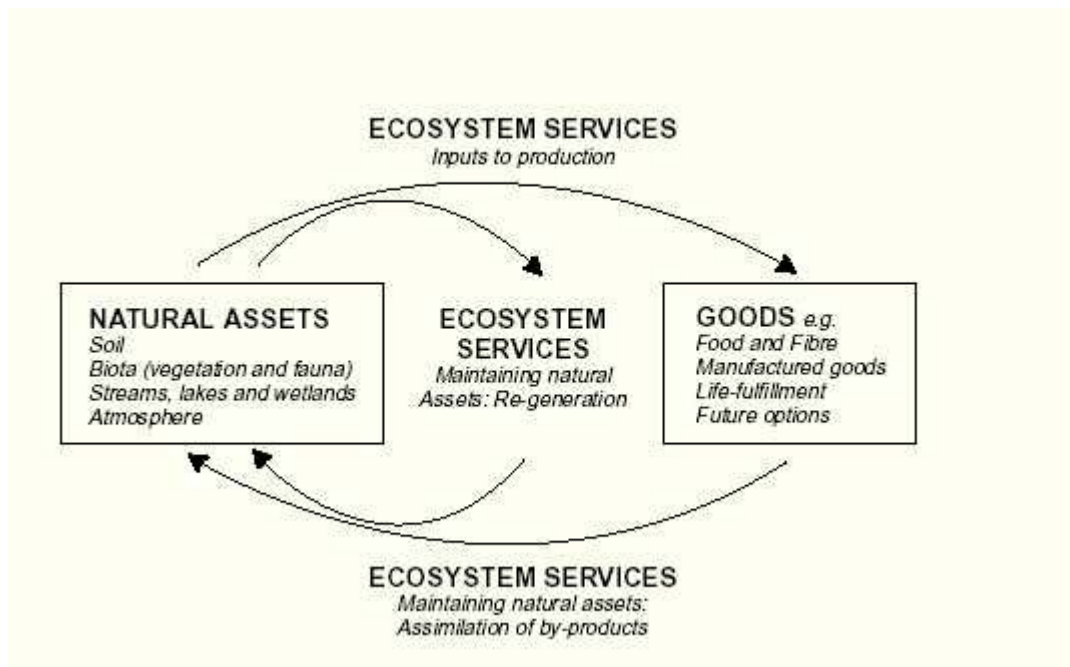


## Section 2 Threatening Processes

### 2.1 Introduction

Sustainable management of the Region's natural resource assets requires an analysis of threatening processes to identify and address the causes of degradation, diminished quantity, quality, productive capacity, or environmental values of an asset. Severe and often irreversible degradation of many of the Region's natural resource assets demonstrates that there is a limited knowledge and understanding of the constraints on development or commitment to working within those constraints.

Threatening processes can be defined as processes that threaten or may threaten the quality or quantity of a natural resource, or may threaten the survival, abundance or the evolutionary development of a native species or ecological community. Natural resource assets in the Region are under constant and increasing pressure from threatening processes. As these assets are degraded or in some cases destroyed, the quantity, quality, amenity or productive capacity of an asset is diminished, and the environmental values and ecosystem services are also lost or destroyed (Figure 9).



**Figure 9:** *Ecosystem services involved in maintaining the productive capacity and ecosystem services of natural resource assets (Source: CSIRO 2001)*

Effective planning for NRM at the regional scale requires the identification of threats to natural resources, accessing the appropriate scientific and technical information for threat abatement, and the development of visions and strategies with the wider regional community and key stakeholders to develop mitigating measures.

Integration of all relevant scientific and technical information is essential to determine the consequences of human activities upon the Region's natural resource base. Assessment of the relationship between cause and effect is fundamental to the understanding of the overall threatening processes impacting an asset. This approach enables the development of potential management response options for mitigating causal pressures or adapting to negative impacts. Using this approach enables threatening processes to be classified as follows:

- **Cause** – the underlying fundamental pressures impacting the Region's assets and associated values.
- **Process** – processes that occur as a result of the underlying fundamental pressures.
- **Effect** – the symptoms of the pressures impacting the Region's assets and associated values, degrading the condition, amenity or productive capacity of those assets.

Individual pressures may have multiple impacts across several natural resource asset categories. Assessing the importance of each causal pressure requires an examination across all the assets affected. In most cases, pressures are interdependent, rather than having independent impacts. For example, in a waterway system, weed invasion and loss of riparian vegetation is often directly related to inappropriate land management practices and a lack of adequate development controls. Similarly, multiple pressures are associated with single issues such as eutrophication, loss of biodiversity and salinity. Therefore, by identifying priority causal pressures and threatening processes an objective of this Strategy is to promote multiple benefits for investment.

## 2.2 Identification of Threatening Processes

A range of threatening processes impact on the Region's natural resource assets and associated values (Table 5). For the purpose of this Strategy, these threatening processes have been classified according to the following categories:

- Population growth and urbanisation
- Limited knowledge and awareness
- Incompatible planning and development
- Unsustainable resource use and inappropriate management practices

All identified regional threats are related to these four key threatening processes.

### 2.2.1 Population Growth and Urbanisation

The principle threatening process in the Region is the depletion and degradation of natural resources to meet the demands of a growing population. This is compounded by the impacts of urbanisation and the associated generation of wastes that pollute and contaminate the Region's soils, water and air.

The threatening processes and effects associated with these causal pressures can be defined as either resource depletion and degradation or pollution and contamination.

Resource depletion and degradation includes biodiversity loss and the depletion and degradation of land and water resources. Pollution and contamination includes pollution of land, soil, inland waterways, coastal - marine environs and air.

The sustainable management of natural resources is closely linked to maintaining development in the context of population growth and urbanisation at a sustainable level. As is stated in Agenda 21 of the 1992 United Nations Conference on Environment and Development (Chapter 4):

*“Achieving the goals of environmental quality and sustainable development will require efficiency in production and changes in consumption patterns in order to emphasize optimisation of resource use and minimisation of waste.”*

The planning process developed for the *Greater Perth* initiative is being managed by the Department of Planning and Infrastructure (DPI). This planning process considers issues such as the size of Perth's 'ecological footprint' and limits to future expansion of urban areas. This was also identified within the *State Sustainability Strategy* (Government of Western Australia 2003b). The wider regional community also contributed through "Dialogue with the City" (Department of Planning and Infrastructure 2003) consultation forums. The purpose of these forums were to guide future planning through deliberative democracy process based on the following principles:

- To enhance efficiency of urban land and infrastructure
- Improve resource efficiency and energy use and protect the environment
- Enhance community vitality and cohesiveness

The result was a draft vision from the wider regional Perth community, stating that by 2030, Perth people will have created a world-class sustainable city; vibrant, compact and accessible, with a unique sense of place.

### 2.2.2 Limited Knowledge and Awareness

Knowledge and awareness of NRM issues in the Region is primarily dependant upon and determined by the use and management of natural resources. Improved regional NRM outcomes can only be achieved if the wider regional community has the required knowledge and awareness to protect, sustain and enhance the natural resources of the Region.

There are considerable gaps in the data relating to many aspects of NRM. Limited knowledge and awareness may result in inappropriate management practices and land use planning decisions. Ultimately, this may cause losses to and impacts on the natural resource base of the Region. The “Dialogue with the City” process, managed by the Department of Planning and Infrastructure, provides a significant planning mechanism to deal with this threatening process.

Increasing public knowledge and awareness will lead the wider regional community to increase its appreciation of natural resource assets. This includes the value of visitor experience of natural areas as an educative tool in encouraging people to appreciate natural areas and biodiversity. In the long-term this will lead to support for the allocation of resources for the protection and sustainable management of those assets.

**Table 5 Key regional threatening processes (threats not ranked)**

Asset Category	Aspirational Target	Threatening Processes
<b>Land</b>	Improve land condition in the Region and ensure land use planning and development is sustainable and appropriate to the land capability and suitability.	<ul style="list-style-type: none"> <li>• Recreation</li> <li>• Altered hydrology</li> <li>• Native vegetation clearing</li> <li>• Chemical and pesticide contamination</li> <li>• Exotic plants</li> <li>• Feral animals</li> <li>• Plant diseases</li> <li>• Animal diseases</li> <li>• Salinity</li> <li>• Acidification</li> <li>• Climate change</li> <li>• Development and/or change in land use</li> <li>• Fragmentation of natural resources</li> </ul>
<b>Water</b>	Improve the quality, ensure appropriate and environmentally sustainable use and minimise impacts to maintain water resources in all aquatic systems in the Region.	<ul style="list-style-type: none"> <li>• Nutrient export and enrichment</li> <li>• Native vegetation clearing</li> <li>• Erosion / sedimentation</li> <li>• Chemical and pesticide contamination</li> <li>• Salinity</li> <li>• Acidification</li> <li>• Ecosystem fragmentation</li> <li>• Drainage modification</li> <li>• Exotic plants and animals</li> <li>• Introduced aquatic pests</li> <li>• Recreation</li> <li>• Industrial discharge</li> <li>• Groundwater and surface water contamination</li> <li>• Water abstraction</li> <li>• Stormwater discharge</li> <li>• Chemical and pesticide contamination</li> <li>• Altered hydrology</li> <li>• Climate change</li> <li>• Fragmentation of natural resources</li> </ul>
<b>Biodiversity</b>	Conserve, maintain and enhance the biodiversity and natural habitat of all species in the Region and the functionality of the ecosystems which contain these species.	<ul style="list-style-type: none"> <li>• Habitat loss</li> <li>• Ecosystem fragmentation</li> <li>• Native vegetation clearing</li> <li>• Fire management regimes</li> <li>• Altered hydrology</li> <li>• Chemical and pesticide contamination</li> <li>• Exotic plants</li> <li>• Feral animals</li> <li>• Plant diseases</li> <li>• Animal diseases</li> <li>• Clearing and filling wetlands</li> <li>• Climate change</li> <li>• Fragmentation of natural resources</li> </ul>

Asset Category	Aspirational Target	Threatening Processes
<b>Coastal and Marine</b>	Conserve, maintain and enhance coastal and marine biodiversity, and improve marine water quality to ensure the ecological integrity of coastal and marine systems.	<ul style="list-style-type: none"> <li>• Recreation (including fishing)</li> <li>• Native vegetation clearing</li> <li>• Chemical and pesticide contamination</li> <li>• Exotic plants</li> <li>• Feral animals</li> <li>• Plant diseases</li> <li>• Animal diseases</li> <li>• Coastal and maritime infrastructure developments</li> <li>• Coasts and marine biodiversity decline</li> <li>• Disruption to coastal and marine processes</li> <li>• Marine water contamination</li> <li>• Stormwater discharge</li> <li>• Industrial discharge</li> <li>• Chemical and pesticide contamination</li> <li>• Climate change</li> <li>• Fragmentation of natural resources</li> </ul>
<b>Air</b>	Improve air quality in the Region to ensure healthy ecosystems.	<ul style="list-style-type: none"> <li>• Fossil fuels consumption and use</li> <li>• Industrial pollution and accidents</li> <li>• Loss of vegetation</li> <li>• Fire management regimes</li> <li>• Agricultural management practices</li> <li>• Climate change</li> </ul>
<b>Cultural Heritage</b>	Protect, enhance and incorporate cultural heritage values within the Region to achieve sustainable natural resource management outcomes.	<ul style="list-style-type: none"> <li>• Access to cultural sites and information</li> <li>• Lack of political will to acknowledge cultural values</li> <li>• Negligence</li> <li>• Ignorance and intolerance</li> <li>• Pests and disease</li> <li>• Recreation</li> </ul>
<b>Regional Capacity</b>	Build regional capacity to promote attitudinal, behavioural and institutional change to achieve sustainable natural resource management outcomes.	<ul style="list-style-type: none"> <li>• Inadequate Government/community NRM activity coordination</li> <li>• Adoption of NRM principles and processes at State or Local Government levels</li> <li>• Inadequate industry involvement NRM</li> <li>• Inadequate funding support for effective community NRM initiatives</li> <li>• Volunteer and community burnout</li> <li>• Willingness in the community for change</li> </ul>

There are a range of factors inhibiting public knowledge and awareness of NRM issues and associated threatening processes. These include a low level of general knowledge and awareness of NRM, coupled with a lack of accessible information about the condition of natural resources in the Region. In addition, wider regional community production and consumption patterns are often incompatible with sustainable NRM. Execution of the *Environmental Protection Act (1986)* has traditionally been limited and there is also a lack of accepted environmental standards and monitoring programs.

The concept of land use management needs to be consistently and clearly defined. Poor coordination between State NRM agencies is compounded by a lack of resources. The efforts of individuals and community groups are diluted by the lack of a coordinated approach to the promotion of wider regional community participation.

The quality and quantity of information is directly related to attempts to improve public knowledge and awareness about NRM. There is a strong need to make the information accessible to a broader audience (including all NRM decision-makers) and it should be “translated” and presented for public use.

### 2.2.3 Unsustainable Resource Use and Inappropriate Management Practices

Community lifestyle, consumer and commercial choices drive resource use and management practices. These socio-economic factors govern how sustainably resources are used and managed.

This Strategy is based on principles of sustainability that state the use of natural resources should not cause future generations to inherit a diminished natural and cultural heritage, polluted air, polluted water, contaminated lands and degraded landscapes.

Sustainable NRM will require a long-term commitment from the wider regional community towards the goal of achieving healthy waterways, wetlands and groundwater, productive soils, clean air, diversity of flora and fauna, and respect for cultural heritage. Many of the threatening processes impacting on the Region’s natural

resources demand management responses that are beyond the capacity of existing institutional arrangements and individuals alone. Overcoming the unsustainable use of resources and the application of inappropriate management practices is a challenge for all. This will involve investments by the wider regional community in the protection, restoration and management of natural resource assets and a reassessment of the rights and responsibilities of resource users and resource managers.

For the purpose of this Strategy the threatening processes of unsustainable resource use and incompatible management practices have been identified as being comprised of the following indicative factors:

### **Climate Change**

It is generally accepted by the scientific community that climate change is occurring on a global scale, largely due to increased greenhouse emissions, with the south west of Western Australia already affected by this to some extent.

Climate change presents some major challenges for sustainable natural resource outcomes. NRM in the Region is likely to be heavily influenced by climate change. There is new and stronger evidence that most of the warming observed over the last 50 years (0.7 degrees Celsius in Australia) is attributable to human activities. Global average temperature is projected to increase by 1.4 - 5.8 degrees during the 21st century with a projected warming in Australia significantly greater (1 - 6 degrees Celsius by 2070) than the global average (Department of Environment and Heritage 2003).

The impacts of climate change are potentially severe at a regional level. The Intergovernmental Panel on Climate Change expects Australia's water resources, terrestrial and aquatic ecosystems, agriculture and forests to be vulnerable. The latest climate change scenarios developed by CSIRO for Australia include increased risk of drought, increased soil erosion and dryland salinity, more hot days and greater bushfire risk. Long-term planning is essential to minimise the future impacts of climate change on natural resources. Under the Kyoto Protocol to the United Nations Framework Convention on Climate Change, Australia and other developed countries agreed to targets and mechanisms to limit greenhouse gas emissions. The Kyoto Protocol describes the sources of emissions that need to be accounted for from a number of sectors including agriculture, land use change and forestry.

NHT and NAP and other initiatives support complementary greenhouse and NRM outcomes through actions including management of native vegetation, revegetation and increased adoption of sustainable agricultural practices. The Australian Greenhouse Office (AGO) is promoting integration of greenhouse considerations into NRM initiatives.

The Greenhouse Gas Abatement Program (GGAP) is a \$400 million Australian Government initiative aimed at achieving large-scale, cost effective emission reductions or sink enhancement. GGAP provides opportunities for integrated regional greenhouse actions that may include establishment of carbon sinks, renewable energy, agricultural practices and achievement of high priority NRM.

The State Government's Indian Ocean Climate Initiative (IOCI) has been established to investigate changes to, and causes of, climate change and variability in the south-west of Western Australia. Additionally, it will inform decision-making to adapt accordingly. As this initiative continues it will become more refined and so will pinpoint local level climate changes. (Indian Ocean Climate Initiative, 2003). The draft State Greenhouse Strategy (2004) and draft guidance statement for Minimising Greenhouse Gas Emissions (EPA 2002) also provide strategic and policy guidance for State action.

International Council for Local Environmental Initiatives (ICLEI) Cities for Climate Protection program represents a significant and leading program by Local Governments in the metropolitan area to meet greenhouse gas reduction targets.

Climate change has significant implications for the biodiversity of the Region, in terms of the continued survival of many species, and shifts in the areas where species can survive and successfully breed. This is likely to result in limited ability for biota to be translocated to areas where there are more suitable conditions for their wellbeing (including effective breeding). The knowledge and tools that will become available from IOCI and other initiatives, such as the Commonwealth's Climate Change Impacts on Biodiversity in Australia will assist in taking appropriate measures for biodiversity conservation in the face of climate change.

Water use and management practices are driven by community lifestyle, consumer and commercial choices. These socio-economic factors govern how sustainably water is actually used and managed. Specifically this is in terms of groundwater abstraction, irrigation and the management of stormwater and other drainage. In

recent years drought, coupled with the impacts of climate change, have compounded the need for strategic planning and increase in the adoption of sustainable water management practices.

Changes in the hydrology underlying natural systems results from inappropriate use and management of water resources. This may exacerbate general drought conditions, induce localised droughts or lead to waterlogging. These impacts disrupt ecosystem functionality and may cause significant stress to flora, which is often compounded by interactions with pests and diseases. Decline in habitats, shelter and food sources for native fauna may also result from changes in hydrology. There are some groundwater dependent ecosystems in the Region that are under critical threat, including Yanchep cave ecosystems, several critically endangered species and Threatened Ecological Communities and local extinctions possibly may have already occurred.

### **Land Clearing**

The clearing of native vegetation has been listed as a Key Threatening Process by the Commonwealth's *Environment Protection and Biodiversity Conservation Act (1999)*. Clearing occurs for a wide range of purposes, from commercial operations (eg. mineral extraction, forestry) to the clearing of small patches of remnant vegetation on private land. As much as 72 per cent of the original native vegetation of the Swan Coastal Plain has been cleared for development and there is continuing loss of biodiversity. Of the 28 per cent that still remains over 50 per cent has been zoned for development.

### **Salinity**

Large scale replacement of natural vegetation with agricultural crops that have limited growing periods reduces evaporation and increase groundwater recharge. This has resulted in a subsequent rise of groundwater tables in some areas of the Region where salts accumulated in the soil profile have been mobilised and concentrated at the soil surface. Impacts occur in the Ellen Brook, Brockman and Woorlooloo catchments to the east and north of the Region, In these areas salinity is found on privately owned land (mostly agricultural), and in reserves such as Julimar, waterways, seeps, wetlands and valley floors. The effects of salinity can be severe and widespread including large scale vegetation death and ecological destruction.

### **Over Grazing**

Inappropriate or poorly managed grazing of stock can impact on both flora and fauna. Riparian zones along watercourses and around wetlands are particularly sensitive to stock pressure from grazing and trampling.

### **Pollution of waterways & coastal and marine environments**

The pollution of waterways and of the coastal and marine environment is an important threatening process in the Region. Pollution may be either chemical or through accumulation of solid waste. The contamination of water resources has significant impacts upon biodiversity, creates risks to human health, limits the options for use of untreated water, and imposes increasing water treatment costs. The cause of water resources contamination in rural and semi-rural areas is often linked with land clearance, stock grazing along watercourses, incompatible land uses and inappropriate management practices. In urban areas it is often associated with wastewater from treatment plants, septic systems and contamination of stormwater from household, industrial and road run-off.

### **Toxic waste or chemical pollution**

Most pollution of aquatic systems comes from the land, either as diffuse pollution (eg. run-off of agricultural pesticides and fertilisers into waterways which flow into the sea) or as point-source discharges (eg. concentrated pollution from heavy industries, sewage treatment plants and stormwater drains). Marine-based sources, such as oil spills, sewage and sometimes other chemicals from boats can also detrimentally affect the marine environment. For example, anti-foulant particles containing lead and copper are often directly washed from slipways into the coastal waters, causing toxic pollution.

### **Feral animals and pests**

Feral cats and foxes are thought to be the most significant source of predation, although domestic cats and dogs can also cause considerable damage. Feral Honeybees compete with native pollinators for resources, native hollow-dependent fauna for the scarce habitat resources of hollows and may be causing long-term damage to the integrity and longevity of regeneration of native plant species due to the ecological impacts of their pollination techniques.

Agricultural and horticultural industries are also at risk from a suite of introduced pests that impact on productivity. A set of measures have been designed to protect the land from these pests, referred to as biosecurity (Department of Agriculture, 2003).

### **Introduced marine pests**

Several introduced marine pests are present along the coastline causing great concern.

### **Introduced plants (“weeds”)**

A weed is often defined as “a plant growing where it is not wanted”. In bush and coastline that is managed for nature conservation, this means any plant introduced from overseas, or Australian natives that do not grow naturally in that location. Weeds are widespread and well established in the Region and can be classified into two groups:

- Those species that require long-term management and do not directly affect threatened species, and
- Those species that have the potential to directly affect threatened plant species and should therefore be given priority in any weed control programs.

Genetically Modified Organisms (GMOs) or Genetic Engineering (GE) technologies, particularly in the development in agricultural and herbicide resistant crop species have the potential to have a huge impact on biodiversity conservation and on-ground management activities in the long-term.

Plant pests and diseases are a threat to sustainable agricultural production and human health. Costs associated with managing weeds in agricultural practices impact on agricultural value. A set of measures have been designed to protect the land from these pests, referred to as biosecurity (Department of Agriculture, 2003).

### **Disease**

The threat of plant and animal diseases to agricultural production and human health as well as its impact on biodiversity is a significant issue for the management of natural resources in the Region. *Phytophthora cinnamomi* (dieback) is a plant disease that poses the most serious threat to the Region’s biodiversity. This pathogen has the capacity to substantially change the nature of susceptible plant communities, and has the potential to drive rare plant species and their dependant flora to extinction (see Section 3.4.3). It is listed as a Key Threatening Process in the Commonwealth’s *Environment Protection and Biodiversity Conservation Act (1999)*.

### **Habitat disturbance**

The physical disturbance of habitats by human activity is an important threatening process in the Region.

### **Recreation**

Recreation activities such as fishing, boating, water-skiing and four wheel driving may inadvertently lead to disturbance of sensitive areas and cause asset degradation.

## **2.2.4 Incompatible Planning and Development**

Pressures from population growth and urban expansion lead directly to the negative impacts caused by incompatible planning and development. Planning decisions are often perceived by the regional community to be environmentally unsustainable and incompatible with the objectives of NRM. For example, issues such as the fragmentation of rural land resources and the loss of prime agricultural land are considered to be direct consequences of incompatible planning and development.

The planning system in Western Australia is led by the Western Australian Planning Commission (WAPC), which is constituted under the *Western Australian Planning Commission Act (1985)*. Functions of the WAPC include preparation of a State Planning Strategy, Statements of Planning Policy, regional planning schemes, consideration of Local Government Town Planning Schemes (TPS) and the exercise of subdivision control throughout the State.

The State Planning Strategy (1997) prepared by the WAPC, sets out the key principles relating to environment, community, economy, infrastructure and regional development to guide the way in which future planning decisions are made. It also provides a range of strategies and actions that support these principles.

The WAPC has also prepared a Statement of Planning Policy setting out a State Planning Framework, which unites existing State and regional policies, strategies and guidelines within a central framework to provide a context for decision-making on land use and development in Western Australia. It informs the WAPC, Local Government and others involved in the planning process on those aspects of State level planning policy

which are to be taken into account, and given effect to, in order to ensure integrated decision-making across all spheres of planning.

The State Planning Framework states that the primary aim of planning is to provide for the fair, orderly, economic and sustainable use and development of land.

The “Dialogue with the City” process, managed by the Department of Planning and Infrastructure, provides a significant planning mechanism to deal with this threatening process. In this context, the Council can play an integrating role in both building the capacity of the wider regional community and in facilitating the development of guidelines on sustainable development.

The central instrument of planning at the local level in Western Australia is the Local Government TPS. The *Town Planning and Development Act (1928)* empowers any local authority within the State to prepare a Town Planning Scheme. The general objective is to secure suitable land use and development and for the various purposes, provisions, powers or works contained in the First Schedule of the *Act*.

Land within the Perth Metropolitan Region is classified in the Metropolitan Region Scheme (MRS). The boundary of the MRS stretches from south of Rockingham to north of Yanchep and east of Mundaring (Figure 10). The MRS defines the future use of land, dividing it into broad zones and reservations (Western Australian Planning Commission, 2003).

MRS Clause 10 provides that approval is required prior to the commencement or continuation of development of any land within the Perth Metropolitan Region. The WAPC determines applications for approval to commence development on reserved land. Applications for development on land zoned under the MRS are determined by the relevant Local Government (except in circumstances including where a development is within a planning control area).

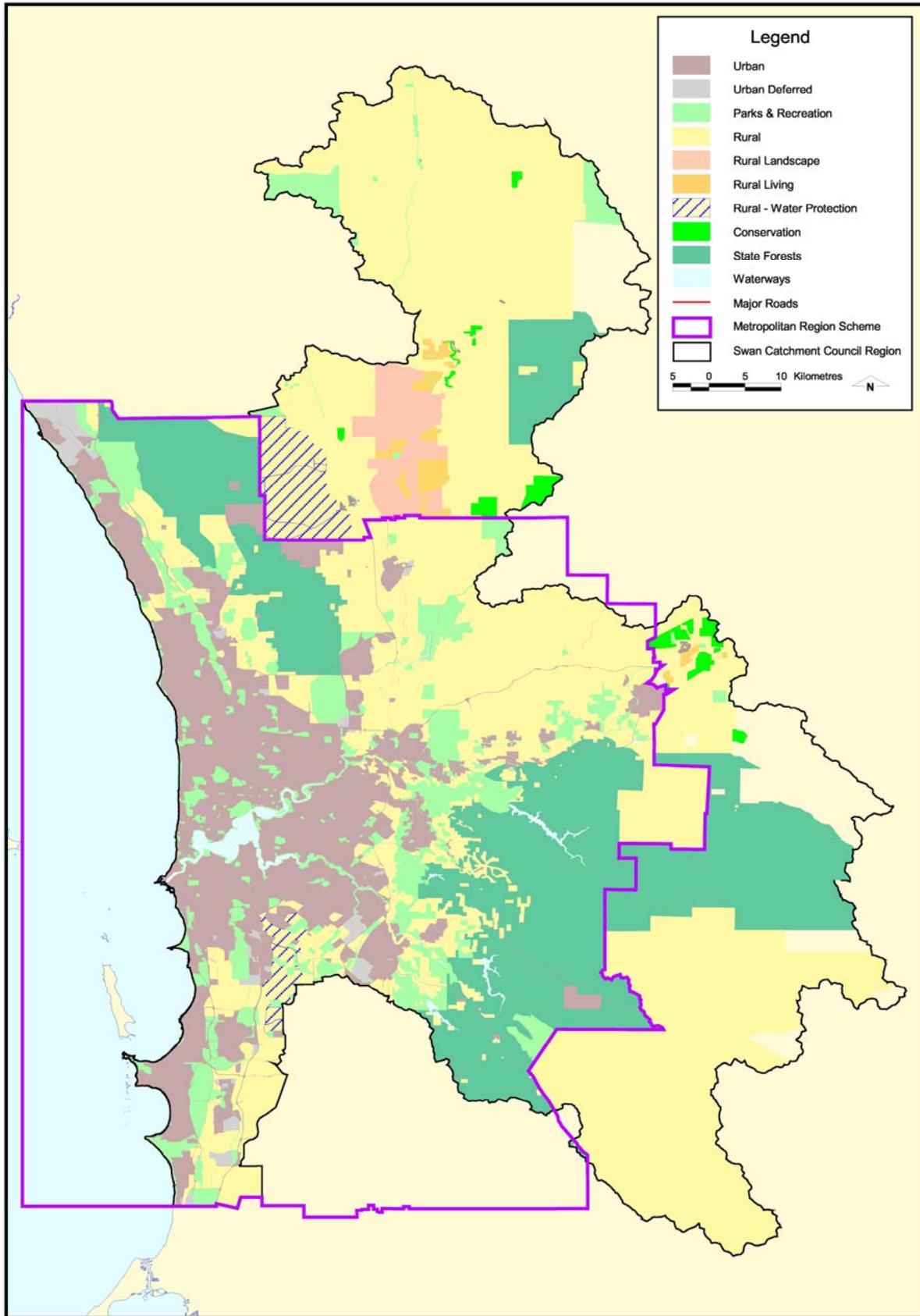
There is significant scope to integrate NRM into the decision-making process for planning, to enable the achievement of sustainable development outcomes in the Region. The statutory planning process, outlined above, has the potential to be extremely effective in controlling the impacts from the effects of population growth and urban expansion.

Compatible planning does provide potential NRM benefits. For example, the considerable areas of Perth that have already been reserved for Regional Open Space under the Metropolitan Region Scheme (acquisition funded by the WA Planning Commission); the significant areas of bushland and wetland protected under Bush Forever, and the scope for implementation of conservation of environmental values and NRM measures in decision-making under town planning strategies and schemes. This includes guides in planning documents such as the Environment and Natural Resource Statement of Planning Policy (ENT SPP) and Planning Bulletin No. 64 Acid Sulfate Soils.

However, poor planning decisions may still be made, either due to lack of understanding of the process, or of the information, or due to different priorities. For example, many planners in State and Local Government making decisions about statutory planning did not, until recently, consider protection of biodiversity as an issue that needed to be included.

The community consultation and stakeholder engagement process undertaken by the Council to develop this Strategy identified a widely held view that incompatible planning and development is a major threatening process to sustainable NRM outcomes in the Region. This is exacerbated by an inability by Local Government planners to easily access NRM information, and to integrate NRM into the planning decisions made through the TPS.

The threatening processes approach is important to assist the development of appropriate and effective NRM targets and management actions. There are numerous benefits for adopting a strategic and targeted approach for investment in NRM within the Region. Some of the benefits for adopting such an approach include the identification of key issues for management action, prioritising activities and maximising investment return. Targeted management approaches will also ensure a focus on key issues and will help to address underlying causes rather than symptoms.



**Figure 10: Metropolitan Region Scheme and Town Planning Scheme boundaries in the Swan Region (Source: Department for Planning and Infrastructure, 1999 and 2003)**

