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SCOTT COASTAL PLAIN - A STRATEGY FOR A SUSTAINABLE FUTURE

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SCOTT COASTAL PLAIN STEERING COMMITTEE



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SCOTT COASTAL PLAIN

A STRATEGY FOR A SUSTAINABLE FUTURE

Scott Coastal Plain Steering Committee

November 1999



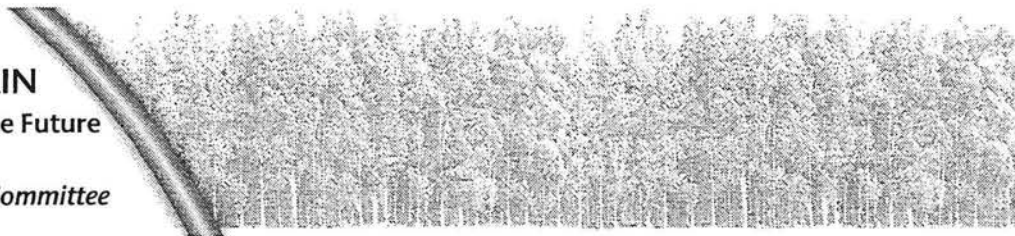
ACKNOWLEDGMENTS

The Steering Committee acknowledge the assistance and input of agency staff from various State agencies, and landholders and local people from the Scott River area in preparing this draft Strategy.

Mr Peter Iley and Cr Barbara Dunnet provided considerable local knowledge of agricultural land uses and history and assisted with preparation of the strategies and recommendations.

The Water Management Strategy was prepared by Water and Rivers Commission staff including the initial targets for water quality in Scott River and Hardy Inlet. The Vegetation Management Strategy was prepared by staff from Department of Conservation and Land Management and the Land Use Strategy was prepared by staff from the Ministry for Planning. The final maps were prepared and printed by the Ministry for Planning. The sub-catchment planning and drainage management section, the agricultural development potential section and the report card on sustainability indicators were prepared by staff from Agriculture Western Australia.

Mr David Galloway from Chambers and Galloway and Associates compiled the preliminary draft Strategy report and prepared the draft implementation section. John Monaghan and Associates prepared the initial background and issues report that is being reprinted as Part 1 to this Strategy, *Scott Coastal Plain Study – Background and Issues Paper for Landuse Development and Environment*.



Members of the Scott Coastal Plain Steering Committee

The members of the Scott Coastal Plain Steering Committee who prepared the *Scott Coastal Plain – A Strategy for a Sustainable Future* are:

Hon Barry House MLC	Chairman
Cr Barbara Dunnet	Shire of Nannup
Cr Barry Godley	Shire of Augusta–Margaret River
Mr Tom Fox	Western Australian Farmers Federation
Mr Robert Dunnet	Scott River Horticultural Growers Group
Mr Peter Iley	Lower Blackwood Catchment Land Conservation District Committee
Mr John Brown	Simplot (Australia) Pty Ltd
Mr Max Churchward	Conservation Council of Western Australia
Mr Ross George	Agriculture Western Australia
Mr Eric Wright	Agriculture Western Australia
Mr Robert Paulin	Agriculture Western Australia
Ms Kerry Dunn	Agriculture Western Australia (AGWEST Farm Business Development)
Mr Wayne Tingey	Water and Rivers Commission
Mr Jeff Kite	Water and Rivers Commission
Mr Kevin Martin	Ministry for Planning
Mr Murray Carter	Department of Conservation and Land Management
Ms Jane Taylor	Department of Environmental Protection
Mr Mike Freeman	Department of Minerals and Energy
Mr James Dee	Executive Officer, Agriculture Western Australia

Previous members of the Steering Committee include:

Mr Geoff Klem	Department of Commerce and Trade
Cr Lester Dickson	Shire of Nannup
Mr David Reid	Blackwood Basin Group

FOREWORD

The *Scott Coastal Plain – A Strategy for a Sustainable Future* presents a broad Strategy and vision for the future use and development of the area.

The Strategy represents the objectives of landholders, farmers, government agencies, industry groups, conservation groups and the general community. In exploring the region's potential, it recognises that the environmental values of the area and receiving water bodies such as Hardy Inlet, are important and susceptible to impacts from pollutants such as nutrients. In this spirit of careful stewardship for land and water management, the Strategy sets out a vision for the future for agricultural land use, as well as other land uses.

The Scott Coastal Plain has significant attributes that make it an area of State and regional significance for agricultural production. The climate, availability of good quality groundwater for irrigation, and large lot sizes provide opportunities for mechanised horticultural production which other parts of the State may not have. The nature of the soils, which range from excellent loams and clays to sandy soils with poor nutrient retention capacity and high winter groundwater levels, combined with the significance of receiving water bodies means land use and management practices are an important part of this Plan.

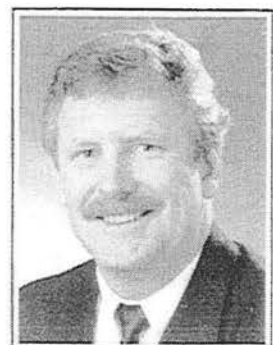
The Steering Committee has developed land and water management strategies based on the best available information and data, recognising that there is insufficient scientific data to be certain about impacts from current levels of development. The process is therefore adaptive and the Strategy will be reviewed in future years and possibly amended in light of subsequent changes in land use, monitoring of catchment and waterways and development of new techniques and technologies for agriculture.

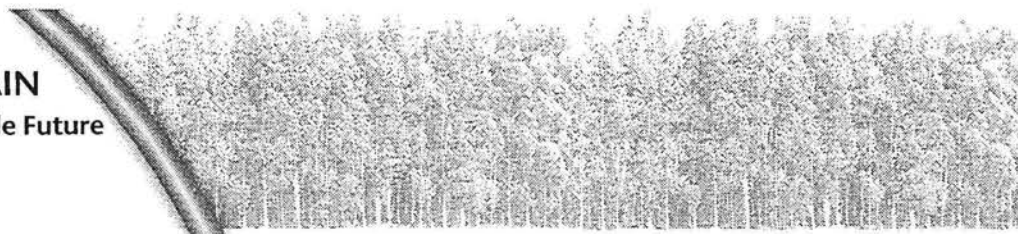
While accommodating growth and diversification in agriculture, the Scott Coastal Plain has potential for diversification of its economic base through tourism, agroforestry and mining. The potential for tourism in the area is significant, with unique vegetation communities, national parks and nature reserves and the increasingly popular south coast. The Strategy establishes principles for sensitive development of the coastal zone, by protecting the fragile areas and identifying access, accommodation and service opportunities.

Many of the ideas contained in this draft Strategy have started locally. The development of the Strategy has in itself been important in establishing better relationships and communication between government agencies and landholders and providing an opportunity for local people to have a say in how their area develops in the future. I am grateful for the advice and continuing interest of local residents, as well as the work of those who have contributed directly to its preparation, members of the Steering Committee and the technical officers from government agencies.

This Strategy is published in draft form for public comment. I urge you to make a contribution to the content of the *Scott Coastal Plain – A Strategy for a Sustainable Future* and, thereby, to the future of the area itself.

Barry House MLC
CHAIRMAN
SCOTT COASTAL PLAIN STEERING COMMITTEE





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– A Strategy for a Sustainable Future

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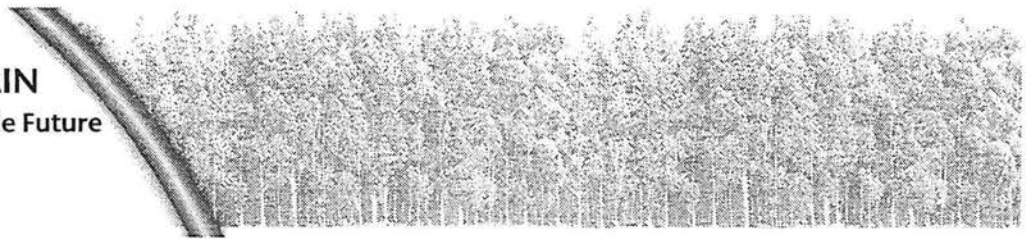
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Appendices

The appendices to this Strategy are too many to include with the document. However, the individual appendices listed here are available upon request by contacting Agriculture Western Australia, Busselton on (08) 9752 1688.

Strategy documents

1. Draft Land Use Strategy for Scott Coastal Plain (1999)
2. Draft Water Management Strategy for Scott Coastal Plain (1999)
3. Draft Vegetation Strategy for Scott Coastal Plain (1999)

Water Strategy supporting documents

4. Conceptual Surface Water Management within the Scott River Catchment
5. Draft policy on Drainage Management for the Scott Coastal Plain
6. Groundwater Well Licence Management Strategy – Draft guidelines for Scott Coastal Plain
7. Proposed Water Quality Monitoring Program for Scott River (1998)
8. Proposed Pilot Water Quality Monitoring Program for Hardy Inlet (1998)
9. Developing water quality targets for Hardy Inlet
10. Interim water quality targets for Scott River
11. Condition of wetlands within the Scott Coastal Plain

Vegetation Strategy supporting documents

12. Limitations to Capturing Remnant Vegetation
13. Threatened ecological community count on vegetation complex
14. DRF and priority flora count on vegetation complex
15. Areas of remaining vegetation by community within and outside the study area
16. Security of vegetation within the study area by vegetation complex
17. Scott Coastal Plain vegetation complex descriptions by Mattiske
18. Information package for land clearing proposals on land zoned rural

Agricultural development potential supporting documents

19. Land capability assessments for horticulture in the Scott River Catchment
20. Economic potential of the Scott Coastal Plain
21. Summary of rural development programs

Nutrient management documents

22. Management of diffuse nutrients of pasture land Scott River Catchment – Lower Blackwood LCDC Scott River Nutrient Management Project Review June (1999)
23. [This appendix item is being reviewed.]

Implementation documents

24. Assessment and approval process for new irrigated agriculture proposals Scott Coastal Plain (1998)
25. Preliminary guidelines for assessing the environmental risk of irrigated agriculture on the Scott Coastal Plain (1999)
26. Summary of references for recommended buffers and setback distances – Scott Coastal Plain
27. Protection of remnant vegetation on private land in the agricultural region of Western Australia (1997)

Best practice guidelines and supporting documents

28. Best management practice for vegetable production at Scott River [DRAFT]
29. Best practice for nutrient management of livestock grazing systems at Scott River [DRAFT]
30. Dairy effluent management guidelines
31. Code of practice for timber plantations in Western Australia [DRAFT]
32. Declared plant and weed pests protection program weed lists

SUMMARY

Background

In response to the interest in the Scott Coastal Plain for a range of development including irrigated agriculture, the Scott Coastal Plain Steering Committee was established by the Minister for Primary Industry, the Hon Monty House MLA, in 1996, to prepare an integrated land and water management plan for the Scott Coastal Plain area. The Steering Committee was established to:

- report on the agricultural potential of the Scott Coastal Plain;
- report on the impacts on the environment of current and any future developments;
- develop the formal planning and co-ordination process for the future management of the Scott Coastal Plain.

The *Scott Coastal Plain – A Strategy for a Sustainable Future* integrates the land and water management solutions with the future development potential for the Scott Coastal Plain. The Strategy provides a vision for the future developed by the local community and through the draft Land Use Strategy (LUS), a framework for development and implementation of the Strategy. The Strategy offers an opportunity to better coordinate activities of government in the region and will guide the future use and management of land and water on the Scott Coastal Plain.

Vision

The vision for sustainable development on the Scott Coastal Plain was developed by the Steering Committee in consultation with the community:

A vital sustainable agricultural community living in balance with economic development and the unique environmental values of waterway and vegetation systems of the region.



Figure 1. Location of Scott Coastal Plain.

General approach

The approach the Steering Committee took included a number of assumptions in preparing this Strategy to address the issues for land and water management, and development, on the Scott Coastal Plain. It has been assumed that an integrated strategy will produce a balance between land use and environmental maintenance and protection; stakeholder participation will provide ownership of outcomes and strategies, resolve conflicts and ensure commitment; and the resources required to monitor the sustainability criteria and to provide feedback to stakeholders will be available.

While this project had been triggered by the arrival of more irrigated agriculture, the Strategy has had to consider other land uses that have the potential to impact on the environment, to ensure fairness and equity between landholders and to properly integrate land and water management.

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Summary

Emphasis is on developing a regional or catchment area approach within the context of sustainable development. A draft Land Use Strategy has been prepared to guide future development of the area. There are a number of infrastructure issues to be addressed, such as provision of suitable power, roads and telecommunications, if the economic potential of the area is to be recognised.

The environmental condition of the Scott River and Hardy Inlet was a major determinant for the future of agricultural activities in the region. While the Scott River appears to be in reasonable ecological condition, particularly when compared with other rivers on the Swan Coastal Plain, it is showing elevated levels of nitrogen, which points towards a need for vigilance and good management.

There is insufficient monitoring information available on the Scott River and Hardy Inlet to determine the linkages between land management practices, water quality and river ecology. In this context it is important that development proceeds with caution so that irreversible damage does not occur and that the approach taken in the Strategy is flexible and able to adapt to take account of better information and improvements in technologies and practice.

Specific management strategies for water and drainage, vegetation and land use have been developed and the Steering Committee recommends that these be adopted by all decision-making authorities and practised by landholders and the general community as the best practice approach to land and water management. Regular monitoring will be carried out to determine how well the Strategy is progressing towards sustainable land use and land and water management.

Agricultural development potential

The Scott Coastal Plain has significant attributes that make it an area of State and regional significance for agricultural production. The climate, availability of good quality

groundwater for irrigation, and large lot sizes provide opportunities for mechanised horticultural production which other parts of the State may not have.

An estimate of the area that could be used for each agricultural land use has been developed, at a broad study area level. The figures presented in this report show that diversified production combining tree plantation and/or irrigation (cropping or hay/silage) with grazing enterprises provides for potential increases in gross margins and buffers against movements on commodity prices in any one industry.

This report calculates gross margins for existing enterprises that operate in the Scott Coastal Plain and potential enterprises that could operate in this area. These gross margins are then used as the basis for calculating the existing and potential gross value of agriculture able to be generated from the Scott Coastal Plain area. The existing and potential gross value of agriculture figures are then used in conjunction with total value adding ratios to calculate the existing and potential total value added to the overall State by agriculture on the Scott Coastal Plain.

Water Management Strategy

Guidelines for managing surface water flows and the impacts on waterways from a range of land uses have been developed. These guidelines cover irrigated agriculture, timber plantations, grazing and dairy production, road construction and maintenance, conservation areas and mining operations.

Water quality targets for Scott River and Hardy Inlet have been prepared, to provide a guide to future monitoring and management. These targets are 'interim' and will be updated based on additional monitoring over the next two years. Water quality monitoring programs have been prepared by Water and Rivers Commission (WRC) to provide the data and information required to analyse water quality against the interim targets.

General water quality standards, such as Australian and New Zealand Environment and Conservation Council (ANZECC) National Water Quality Guidelines, have set a national 'number' on parameters to determine how good your water is. However, a slightly different approach has been taken for setting the adaptive water quality targets for Scott River and Hardy Inlet.

The Scott River and Hardy Inlet are generally in reasonable health (after comparing them to other rivers and estuaries and National Standards). The Steering Committee decided that in the absence of baseline information on the health of Hardy Inlet and Scott River, that the current condition would be a reasonable basis for our targets, except where they might be above National Standards as is the case for Dissolved Inorganic Nitrogen levels for Scott River.

A sub-catchment planning approach is recommended to manage changes to and maintenance of drainage systems and streamlines and to avoid flooding and sedimentation problems on downstream properties. Sub-catchment plans are to be prepared, involving all landholders and stakeholders within each sub-catchment, identifying key streams and routing for safe disposal of surface waters and incorporating stream stabilisation works. A coordinating body will be required for this work and the Steering Committee has recommended that the Lower Blackwood Land Conservation District Committee (LCDC) take on this role, with technical support from WRC and Agriculture Western Australia (AGWEST).

Vegetation Management Strategy

The Vegetation Management Strategy identifies vegetation types and complexes that should be preserved across the study area. It identifies and sets management objectives for:

- threatened flora – flora listed on the rare and endangered species and Priority Species list;
- threatened ecological communities – associations of plants in a particular area that are under threat;
- vegetation representation – vegetation poorly represented in the region;
- corridors to link communities;
- other vegetation of importance;
- well represented vegetation.

The assessment of vegetation within the study area has determined there are vegetation complexes that may have the capacity to handle some level of disturbance. To comply with government policy and regulations, any proposal for clearing vegetation must be examined in the manner outlined in the Memorandum of Understanding governing the protection of remnant vegetation on private land within the agriculture region of Western Australia.

The Land Use Strategy

The Land Use Strategy recognises existing land uses and the need to consider a more diversified approach to agriculture in the catchment.

Assessment of land capability suggests that, subject to appropriate land management practices being undertaken, seasonal irrigated agriculture and other intensive agricultural activities could be undertaken on the Scott Coastal Plain, depending on soil types, depth to watertable and other factors including proximity to watercourses. The key factors for sustainability are implementation of best management practice (BMP), ongoing monitoring aimed at detecting undesirable impacts off-site and subsequent changes to land management if required.

The broad land use concept for the study area is for continued and enhanced agricultural uses on private land to the north of the Scott River and for a range of rural-type land uses and landscape conservation on the private lands to the south.

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Summary

The Strategy proposes that all the freehold land within the study area to the north of the Scott River and the Department of Conservation and Land Management (CALM) estate to the east be zoned 'Rural Agriculture'. This will enable the continued development of a wide range of intensive and extensive agricultural land uses in conjunction with appropriate land management practices.

The principal objective of the Rural Agriculture zone is to provide for the sustainable use of land for crop growing (including horticulture and timber production) and extensive animal husbandry (including dairying and grazing) and to protect the long-term productive capacity of agricultural land from incompatible land uses (including subdivision).

The freehold land areas to the south of the Scott River are characterised mainly by steep coastal dunes with relatively fragile coastal heath vegetation. The coastal belt is at risk of wind erosion and dunal blowouts and at the same time the coastal area has high and varied visual landscape values. In consideration of those factors, it is proposed that the freehold land south of the Scott River be zoned 'Rural Landscape and Conservation'.

The principal objective of the Rural Landscape and Conservation zone is to protect significant landscapes and environmental features and provide for development which is compatible with and will enhance the landscape and environmental qualities of the locality.

In recognition of the fragile coastal landscape, it is recommended that a coastal management strategy be prepared for the whole coastal strip extending from the western boundary of the D'Entrecasteaux National Park through to Hardy Inlet. Subdivision of land and increasing development potential will not be supported by the Western Australian Planning Commission (WAPC) until the issue of the vesting of the vacant Crown land coastal strip is resolved and a suitable coastal management strategy is approved and adopted.

The agricultural development potential of the Scott Coastal Plain has been assessed by AGWEST and the projections for agricultural land use includes three scenarios for various levels of agricultural diversification. From these projections the likely employment generation, resultant population increases, accommodation requirements and demands for additional infrastructure and community services and facilities have been estimated.

Vehicle movement on roads is estimated to increase significantly with expansion of both tree plantations and irrigated agriculture, requiring an urgent upgrading of principal roads within the Scott Coastal Plain. This development will also increase levels of demand for improved power supplies across the study area. This will come mainly from additional horticultural and dairying developments, the vast majority of which would be located to the north of the Scott River. To this should be added the potential for one or two townsites, the principal one which would more than likely be located to the south of the Scott River, in the vicinity of Milyeannup Coast Road, plus a range of low key tourist development along the south coast.

The extension and improvement of the power supply grid within the study area needs to be discussed with Western Power and should consider a possible connection to Jangardup Mine, provision for current levels and potential increases in irrigation and dairying and the potential for new townsites and/or tourist facilities.

Implementation

The implementation of the Strategy is based on the following principles:

- Appropriate effort for the appropriate level – this Strategy must work at both the farm and the regional level.
- Agreed ground rules – when implementing the Strategy what are commonly agreed information and approaches are important.

- Quality planning – planning should produce viable economic outcomes, agreement on acceptable environmental impacts and should enhance community well-being.
- A management group – is needed at the catchment or study area level to plan and respond to feedback on performance.
- Feedback/reporting mechanism – monitoring the success of the activity in meeting the objectives of the Strategy for land and water management on the Scott Coastal Plain.

At a catchment and study area level the Land Use Strategy defines recommended land use zones and land uses which are appropriate in different zones. At a local level the individual landowner is responsible for land use within the context of the Land Use Strategy.

Control over activities at the catchment level can be provided through the Town Planning Scheme of the Shire of Nannup and the Shire of Augusta–Margaret River, by incorporating this Strategy into the Schemes and also through the Warren Blackwood Regional Planning Strategy.

At a farm level control over land use activities is provided through:

- economic viability;

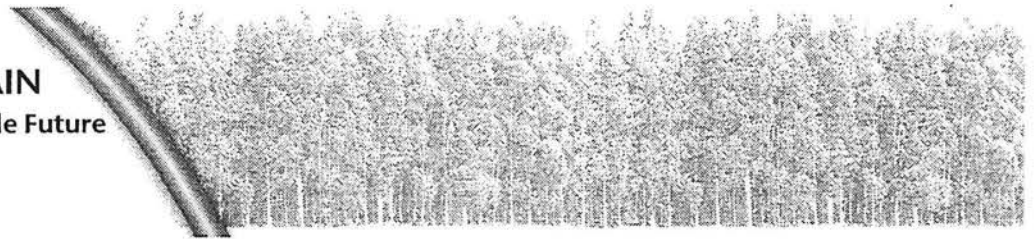
- a formal assessment and approval process for irrigated agriculture;
- assessment of vegetation clearing proposals through the Commissioner for Soil Conservation;
- drainage coordination through the sub-catchment planning process.

Planning and management at the farm or local level is the responsibility of the individual land owner using a combination of BMP and feedback from monitoring.

A Management Group is needed to oversee the implementation of this Strategy and to coordinate the report card on catchment performance and promote the results to landholders and the general community. The Steering Committee recommends that a new Zone Steering Committee of the Blackwood Basin Group be created within the Blackwood Basin Group to cover the Scott Coastal Plain.

The advantages of this include providing the local community with access to an established administrative group that has both State and Federal Government recognition and an existing infrastructure within which to progress the initiatives that have been developed in the *Strategy for a Sustainable Future*. Developing the Scott Coastal Plain area as its own catchment Zone ensures that local issues are dealt with by a local management group.

Level	Mechanism
Formal	Land Use Strategy incorporated into the Town Planning Scheme - Town Planning Scheme provisions for land use - Town Planning and Development Act 1928 Assessment and approval process for new irrigation proposals - Groundwater well licensing for irrigation (Rights in Water and Irrigation Act 1914) - Vegetation clearing controls (Soil and Land Conservation Act 1945, and Memorandum of Understanding between government agencies on clearing) Protection of Rare and Priority Species (Wildlife Conservation Act) Environmental Protection Act 1986, referral process
Informal	Integrated catchment management – the <i>Scott Coastal Plain – A Strategy for a Sustainable Future</i> guidelines for land and water management Groundwater well licensing guidelines (Water and Rivers Commission) Sub-catchment planning and drainage management Best practice guidelines for irrigated agriculture, grazing and dairy effluent management Shire Rural Strategies Monitoring and reporting against targets for water quality The Report Card on catchment performance Farm development plans



Reporting on sustainability

To ensure that the activities at both a regional and local level are moving towards sustainability, a report card of sustainability indicators will be prepared every three years. These indicators measure economic, social and environmental conditions at both the farm and catchment area level. Section 11 details indicators that will be measured to evaluate the sustainability of agricultural land use and the condition of land and water resources and report on trends over time.

Condition indicators for the catchment will be measured in monitoring programs carried out by WRC and soil condition surveys done by farmers. The condition data will be evaluated against agreed standards (targets for Scott River and Hardy Inlet, water quality standards from ANZECC etc.) and then interpreted in terms of local threshold values

or circumstances. The condition report card gives a view of the long-term health status of the catchment.

Trend indicators capture short-term changes in catchment health. Trend indicators relate to attributes of the catchment that can be modified in the short term by changes in land use and land management. Reporting on trend indicators will provide the first indications of how effective the management strategies are in addressing the needs of sustainable development on the Scott Coastal Plain.

The information from the report card will be used by the individual landowners and the regional Management Group and will provide useful land management information to a range of other stakeholders and local government. Where the report card shows ongoing problems, the Management Group will be able to modify the Strategy in consultation with the community.

RECOMMENDATIONS

Agricultural Development Potential

Recommendation 1

It is recommended that additional investigation and research on agricultural production and farming systems development for irrigation on the Scott Coastal Plain be carried out jointly by Agriculture Western Australia and local grower groups.

Recommendation 2

It is recommended that an economic development and marketing plan for agricultural production of the Scott Coastal Plain be prepared identifying production and marketing opportunities and to include alternatives for funding, horticulture research and marketing.

Water Management Strategy

Recommendation 3

It is recommended that investigation and research be conducted by CALM and AGWEST into minimising use of fertilisers and biocides in plantations and improved methods for control of the run-off of fertilisers and biocides during the establishment and ongoing maintenance of plantations.

Recommendation 4

It is recommended that the Water and Rivers Commission initiate a research project to determine the sources of the colour in the Scott River and their contribution to the river's quality and ecology.

Recommendation 5

It is recommended that CALM participate as a stakeholder in all sub-catchment planning for the Scott Coastal Plain. This process negotiates drainage options and is outlined in Section 7.11.

Recommendation 6

It is recommended that the Shires in association with the Main Roads Western Australia and local landholders investigate how their road building activities can be incorporated into sub-catchment drainage planning (Section 7.11). This investigation should particularly address improving road planning and construction so that the impacts of road construction and maintenance on the regional and local drainage regimes are minimised.

Recommendation 7

It is recommended that the Water and Rivers Commission coordinate the water monitoring programs as detailed in Appendices 7 and 8 and collates and reports on the data as required by the report card described in Section 11.

Recommendation 8

It is recommended that the Lower Blackwood LCDC coordinate the sub-catchment planning for drainage management in the Scott Coastal Plain area with technical assistance from Water and Rivers Commission and Agriculture Western Australia.

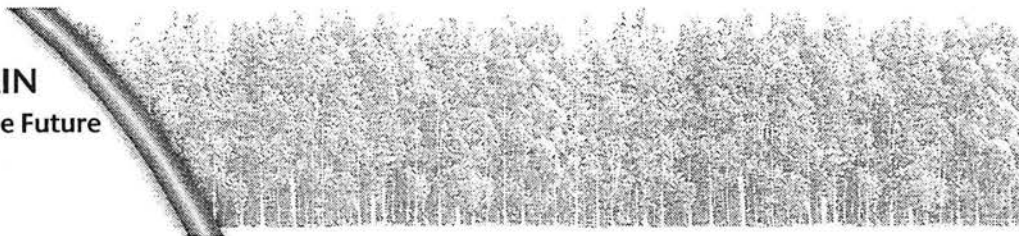
Vegetation Management Strategy

Recommendation 9

It is recommended that remnant vegetation that has DRF or Priority Species present be protected and clearing applications which contain vegetation complexes Swd, Sd and Swi require intensive flora survey during both spring and autumn to identify the occurrence of DRF or Priority Species.

Recommendation 10

It is recommended that no disturbance at all occur on any area containing Threatened Ecological Communities.



Recommendation 11

It is recommended a high degree of protection and management be given to the areas listed in Table 8 regardless of the presence of DRF or Priority Species.

Recommendation 12

It is recommended that the feasibility of acquiring remnants for conservation reserves within vulnerable or poorly represented vegetation complexes through appropriate land exchanges be examined. Any formal proposal to acquire land for conservation estate should be extensively examined in the field. CALM should liaise with Ministry for Planning and Department of Land Administration to identify appropriate locations and determine an approach to be taken for implementing this initiative.

Recommendation 13

It is recommended that as more consistent data relating to the viability of certain corridors for specific species becomes available, vegetation corridor assessment be undertaken.

Recommendation 14

It is recommended that the pressure to clear the remaining wetlands in the study area be resisted.

Recommendation 15

It is recommended that a high degree of protection be given to coastal areas. In addition a separate management Strategy for the coastal zone should be developed to address the unique issues associated with the area.

Recommendation 16

It is recommended that any potential future development involving clearing be examined in the appropriate manner outlined in the land clearing Memorandum of Understanding (AGWEST 1997).

Land Use Strategy

Recommendation 17

It is recommended that the Shires of Nannup and Augusta–Margaret River amend their district planning schemes to incorporate the zonings, zoning table and scheme provision recommendations set out in the Land Use Strategy.

Recommendation 18

It is recommended that as a pre-requisite to increased development along the coast and access to the foreshore area, the vesting of the coastal strip should be resolved and a Regional Coastal Management Strategy and a Local Coastal Management Plan prepared.

Recommendation 19

It is recommended that the accommodation growth demands within the study area be monitored and, as appropriate, detailed investigations be carried out into the preferred siting of a settlement/townsite and the associated infrastructure and community services and facilities requirements.

Recommendation 20

It is recommended that emerging product source locations and processing/transfer destinations be monitored to determine the routes, standards and timings of future road upgrading requirements.

Recommendation 21

It is recommended that a combined approach by landowners and producers within the study area be made to Western Power to determine the preferred option, connection points, grid layout, staging and associated cost contributions for three-phase power supplies to properties.

Implementation

Recommendation 22

It is recommended that the most appropriate Management Group for the Scott Coastal Plain is to create a Zone Steering Committee of the Blackwood Basin Group.

Recommendation 23

It is recommended that the role of the Zone Steering Committee should principally be one of review of the Strategy, coordination of activities and reporting to the community on the Strategy and the results of the Triennial report card. The Zone Steering Committee should not have the role of granting approvals or enforcing regulations. This function should remain with government agencies.

Report card – Using Sustainability Indicators

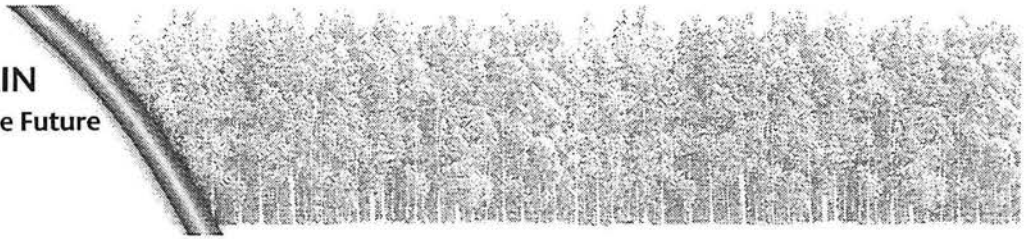
Recommendation 24

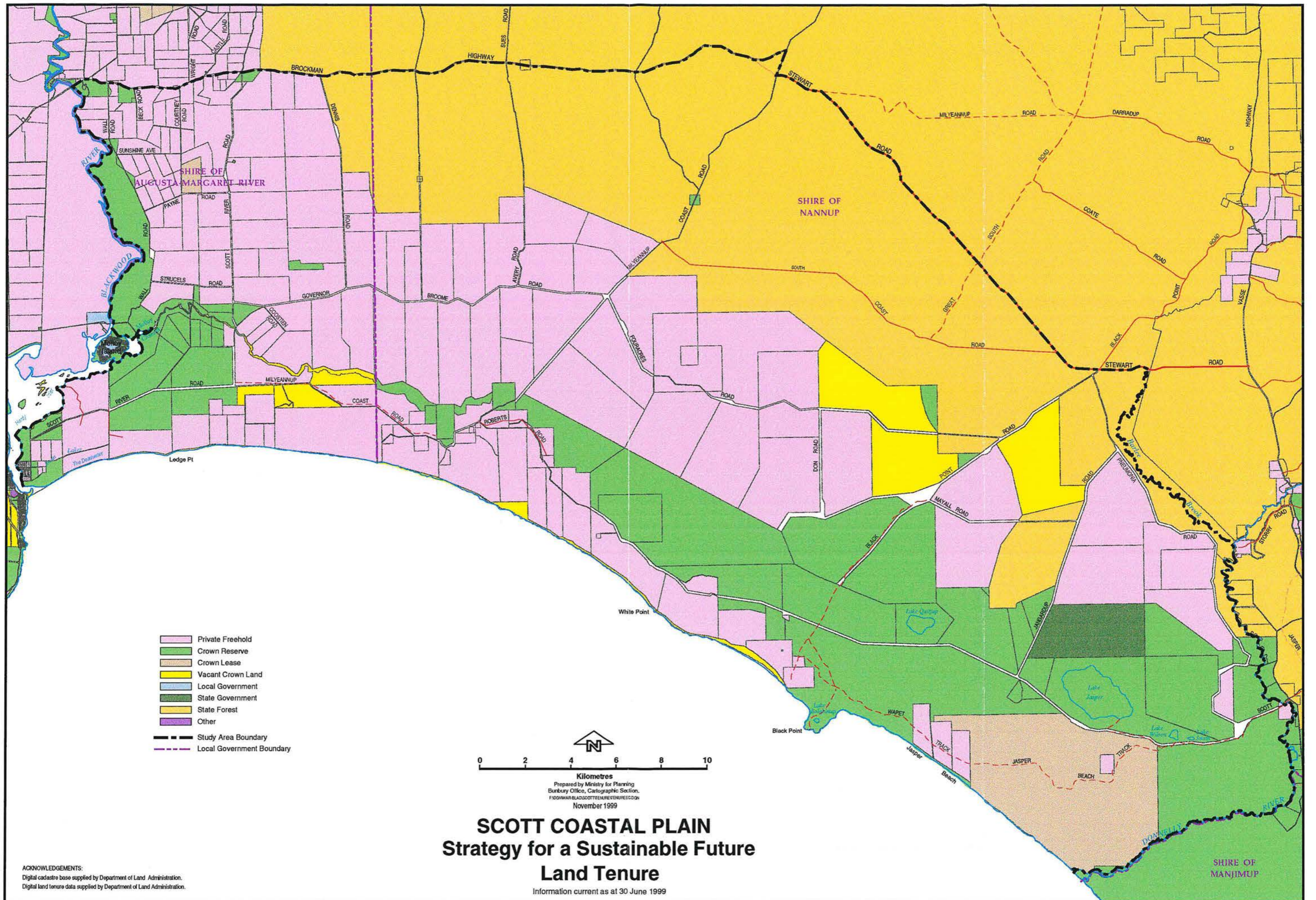
It is recommended that landholders provide farm level soil survey and business information, on a confidential basis, to assist with the preparation of the sustainability report card.

Recommendation 25

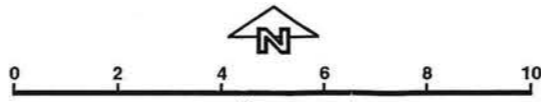
It is recommended that AGWEST coordinate the preparation of the report card on sustainability for the Scott Coastal Plain, to be prepared every three years. The report card will include analysis of monitoring information gathered by Water and Rivers Commission and the Lower Blackwood LCDC and farm level information provided by landholders.

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– A Strategy for a Sustainable Future





- Private Freehold
- Crown Reserve
- Crown Lease
- Vacant Crown Land
- Local Government
- State Government
- State Forest
- Other
- Study Area Boundary
- Local Government Boundary



Prepared by Ministry for Planning
Barbary Office, Cartographic Section,
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November 1999

SCOTT COASTAL PLAIN Strategy for a Sustainable Future Land Tenure

Information current as at 30 June 1999

ACKNOWLEDGEMENTS:
Digital cadastral base supplied by Department of Land Administration.
Digital land tenure data supplied by Department of Land Administration.

1. INTRODUCTION

1.1 Background

The Scott Coastal Plain Steering Committee was established by the Minister for Primary Industry, the Hon Monty House MLA, in 1996, to prepare a land use plan or catchment Strategy for the Scott Coastal Plain area. The Committee members are representatives of farmer organisations, producer groups, the Lower Blackwood Catchment LCDC, local government and State government agencies.

The formal terms of reference are to:

- report on the agricultural potential of the Scott Coastal Plain;
- report on the impacts on the environment of current and any future developments;
- develop the formal planning and co-ordination process for the future management of the Scott Coastal Plain.

The study area is referred to as the Scott Coastal Plain (SCP) and consists of the area bordered by Brockman Highway, Stewart Road, Barlee Brook, Donnelly River, the Southern Ocean coastline and the Blackwood River. Roughly rectangular in shape, it extends about 70 km along the coast and about 20 km inland, covering a total area of about 105,000 hectares. Private freehold land covers about 42,900 ha, with the remainder being State forest, national parks/nature reserves, Crown land and other minor uses.

Europeans first moved into the area in the 1860s when the Bussells, Brockmans and Longbottoms developed coastal cattle runs in the area. In the 1920s more permanent European settlement occurred with the Group Settlement in the west of the project area. Other lands were also opened up about this time around Milyeannup in the east.

The next major development occurred in the 1960s when a number of conditional purchase blocks were cleared. The land was mainly used for dairy in the west and grazing in the

east. In the 1990s, as returns from grazing diminished, farmers in the area began to diversify to other agricultural opportunities. This saw the eastward spread of dairying and the emergence of substantial blue gum (*Eucalyptus globulus*) plantations. With the availability of large quantities of high quality water from the underlying Yarragadee Aquifer, some farmers sank bores capable of drawing up to 1,000,000 m³ per annum and developed 40 ha centre pivot irrigation systems, principally for growing potatoes in a three-year rotation with grazing and other agricultural uses.

The emergence of substantial irrigated horticultural developments drew attention to the potential for environmental impacts arising from nutrient export and the longer term sustainability of the industry. In addition the high nutrient and biocide use in the early stages of tree plantation establishment was also of environmental concern.

If suitable land management practices and bore licensing conditions can be utilised to overcome those potential impacts, the opportunities for future development and production on the SCP is very substantial. The purpose of this Strategy is to address the land use planning aspects of an overall catchment management Strategy for the area.

The arrival of mining, tree plantations and the upgrading of agricultural and horticultural activities means that there are significant changes occurring on the SCP. There are greater demands for infrastructure to support these activities and the potential to change the social structure of the community.

To address the terms of reference set for the Steering Committee, this *Strategy for a Sustainable Future* has been prepared. This will incorporate management strategies for water and drainage, vegetation and land use. As a first stage of the overall study, the Steering Committee commissioned a Background and Issues Paper to form the basis

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Introduction

for all the subsequent work. That paper is presented as Part 1 of this Strategy and should be referred to for greater detail on the background to this report.

1.2 Current and future land use

There is a significant future in the SCP for a variety of land uses. Currently there is between 400 and 600 ha of land developed for irrigated agriculture in the SCP area. The main crop has been potatoes; other potential crops are carrots, sweet corn and onions. Despite the high cost of establishing irrigation systems, vagaries in the market and uncertainty over crop production and yields, this represents an area of significant potential for growth.

Plantation timbers are also becoming a significant land use presenting land owners with a confirmed income. However, the use of land for this purpose is seen in some sectors as taking up land that could be put to higher value agricultural production. There is also the perception in the local community that plantations pose a potential environmental threat through use of biocides and the creation of silt-laden run-off during their establishment phase.

Grazing and dairying have been the most common form of land use on the SCP in the past, however, these are being displaced by other land uses including tree plantations and irrigated agriculture. Despite this there is opportunity for these industries to continue to grow and operate in the region.

Mining also has been established in the last 10 years with a big increase in infrastructure (roads and electricity) as a result. While the Beenup Mine has been shut down, there are still potential mineral sand reserves that may be developed in the future. Similarly the potential of the south coast for tourism still has to be developed. The study area includes the Scott National Park and various nature reserves and provides a westerly access to the D'Entrecasteaux National Park.

A key characteristic of the future development of the SCP is increased integration of a variety of land uses. Using timber plantations in concert with irrigated agriculture, grazing and dairying can assist to diversify the economic potential of the region and to address a range of social and environmental issues.

1.3 Why have a Strategy

In the past the SCP has been used predominantly for grazing and dairying. In the 1990s the area began to be investigated and developed for intensive horticulture, tree plantations and mining with potentially significant economic benefit. Each of these developments focussed more attention on environmental quality, provided an impetus to ensure good management of the region and to ensure that the development is sustainable.

In 1996 a proposal to develop 200 ha of land for horticulture was referred to the Environmental Protection Authority (EPA) for assessment. This referral was made primarily because of possible substantial and long-term off-site environmental impacts.

Following consideration of the project the EPA made a series of recommendations including:

that the Minister for Primary Industry be requested to consider the preparation of a catchment management Strategy or land use plan for the area through the Scott Coastal Plain Steering Committee.

For any agricultural development to be sustainable it is important that the community well-being and the ecology of the area is improved, or at the minimum is not decreased, as a result of the development. The purpose of this Strategy is to place the future development of the SCP in the framework of sustainable development and to provide a vision for the future for agriculture.

1.4 Process description – How it was done

To initiate the project the Government, through AGWEST, established a Steering Committee. The Steering Committee contracted John Monaghan and Associates to prepare a background and issues report on land use, development and the environment on the SCP. This work provided the introduction to the project and is contained in Part 1 of this Strategy. The Steering Committee developed a project plan to direct activities and appointed a Project Manager to coordinate the development of the Strategy.

The Steering Committee delegated the responsibility of implementing the project plan to an Executive Committee comprising the Chairman, two landholders (one of which also represented local government being a Nannup Shire Councillor), WRC, AGWEST and the Project Manager. The major stages of the process in developing the Strategy are shown in Figure 2.

In late 1997, an agency Technical Advisory Group (TAG) was formed with representatives from AGWEST, WRC, CALM, Department of Environmental Protection (DEP) and Ministry for Planning. The TAG role was to develop the assessment and approval process to integrate government agency assessment for new irrigation proposals and oversee the technical and scientific aspects of work being done by agencies on project activities.

The CSIRO Australian Research Centre for Water in Society (ARCWIS) was contracted to determine the community's visions and requirements for input into the Strategy. The consultation was undertaken during August and September 1998 and identified issues relating to land use, the role of the Steering Committee, resolution of problems and conflicts, how people value the wetlands and Scott River, the future of Hardy Inlet and other matters.

Following the development of the project plan, the Executive Committee established several working groups to develop manage-

ment strategies for vegetation, water and drainage and land use in the study area.

The vegetation management Strategy was developed by CALM with DEP advising during the data acquisition and analysis stage of this work.

The Water Management Strategy group was led by WRC; members included Augusta Margaret River and Nannup Shires' engineering staff, WRC, AGWEST and the Lower Blackwood LCDC Catchment Landcare Coordinator. A number of landholders and a drainage contractor were also invited to join the working group, but declined.

The Land Use Strategy working group was led by the Ministry for Planning; its members coming from the Shires of Nannup and Augusta–Margaret River, landholders, Ministry for Planning, DEP, WRC and AGWEST.

The working groups documented and prepared natural resource data, guidelines for best practice, draft management strategies and draft policies on land use, for the Water Management Strategy and the Land Use Strategy. At various times, the community was consulted on the direction the strategies were taking, either at a full public workshop or at smaller targeted landholder meetings.

The Executive Committee supervised the project through each stage of the process and managed the budget for each task in the project plan. Despite delays in the preparation of individual management strategies the first draft of the complete Strategy was submitted to the Executive Committee prior to the end of June 1999.

Based on the comments of the Executive Committee, amendments and alterations were made to the Draft. This was then reviewed by the Steering Committee in July 1999 and then referral to the State government agencies for endorsement to advertise as a draft management Strategy for public comment. This last phase will be completed by the end of 1999.

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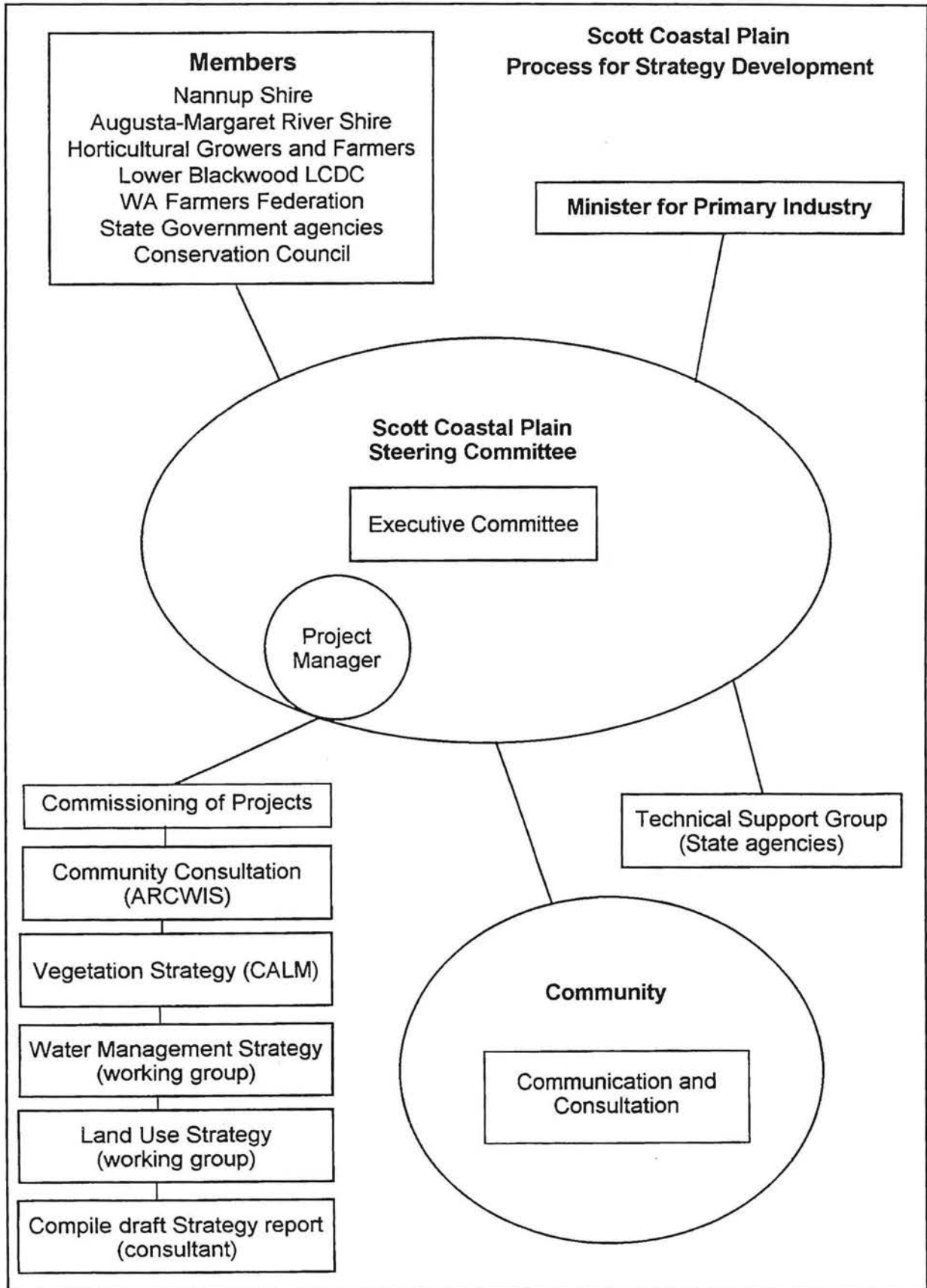
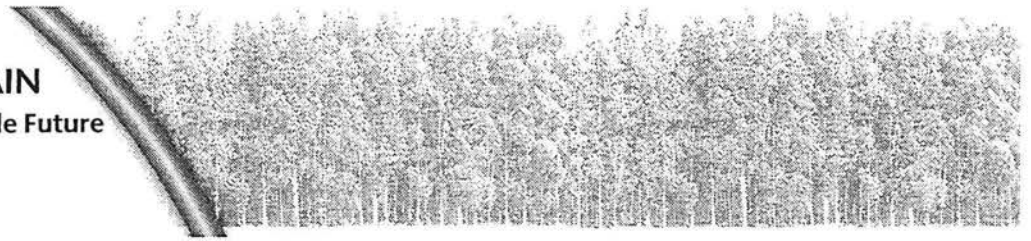


Figure 2. Major stages of the study.

2. COMMUNITY CONSULTATION AND INVOLVEMENT

2.1 Introduction

Community consultation and communication on the preparation of the draft *Strategy for a Sustainable Future* has been coordinated by the Executive Committee. This work has involved a number of public workshops, discussions and briefings on-site in Scott River for landholders and farmers and (initially) a comprehensive newsletter explaining the role of the Steering Committee and the process for preparation of the Strategy.

The consultation and communication activities carried out between June 1998 and June 1999 are shown in the following table.

Date	Action
July 1998	Newsletter on Steering Committee activities and process sent to stakeholders (> 140)
September 1998	ARCWIS community consultation project (stakeholder consultation)
October 1998	Meeting with irrigation farmers to review BMP for irrigation, and the draft assessment criteria for new irrigation proposals
December 1998	Public Workshop (Vision for the Future)
February 1999	Meeting with irrigation farmers to review groundwater licensing guidelines (Water and Rivers Commission)
February 1999	Public Workshop (Prelim Draft Water Management Strategy, catchment characteristics, nature and importance of aquatic ecosystems, Lower Blackwood LCDC)
May 1999	Public Workshop and Briefing (Scott Steering Committee process, direction of overall plan, draft management strategies, LUS directions)

The two principal consultation actions in obtaining input from the community on the preparation of the Strategy for a Sustainable Future were the ARCWIS project and the December 1998 'Vision for the Future' public workshop.

2.2 The ARCWIS Project

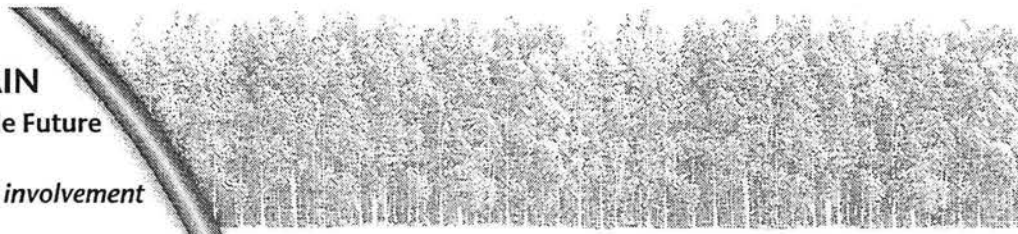
The Steering Committee commissioned ARCWIS to consult with the community on issues for land use, the role of the Steering Committee, resolution of problems and conflicts, how people value the wetlands and Scott River, the future of Hardy Inlet and other matters.

The consultation was carried out by interviewing a large number of stakeholders (> 80) including landholders, community groups and conservation groups, business and people in local government. Priority was given to community and other stakeholders in the interview process. State government stakeholders represented on the Steering Committee were not interviewed.

At the beginning of each interview, a broad explanation was given of the Steering Committee, its members and their work on the preparation of the Strategy. It was explained that the Steering Committee wanted to gain input on community issues, were wanting advice on whether people thought the Committee was addressing the right issues and the ongoing community participation process.

Almost everyone interviewed mentioned something positive about the SCP, whether it was the unique aspects of the land or climate that made it good farming country, the potential for further development of agriculture, the diversity, health or beauty of the environment, or the unique cultural aspects. People who lived in the area loved living there and enjoyed the lifestyle.

At the same time, it was evident that there were certain challenges facing the area, partly associated with its isolation. There was a lot of concern about relationships with govern-



ment departments, resulting in uncertainty about the future of the SCP. In addition, low incomes, rising costs, international markets, lack of political support, lack of resources, diversification, conflict and infrastructure were all mentioned as issues which were impacting on the area and at times limiting progress.

Decision making on water allocation and various aspects of vegetation were discussed by many individuals interviewed, including the degree of consultation by government departments in general. Issues regarding land and water management included water quality (of rivers, Hardy Inlet) monitoring, management of fertilisers, waterlogging, drainage and groundwater. Discussions of the impacts of different activities on the area covered blue gums, urban and agricultural development, tourism, mining and horticulture. Generally, the view was that both the environment needed to be protected and agriculture needed to be economically sustainable.

2.3 Vision for the future workshop

A facilitated workshop was conducted at the Alexandra Bridge hall in December 1998, to develop a vision for the future for agriculture and the SCP generally. The workshop provided an opportunity for landowners and the general community to have input into the preparation of the draft Strategy. The workshop was also successful in identifying a number of criteria for sustainability for land use in the SCP and these are documented in Section 11.

A large number of landholders and stakeholders from the study area worked through a set program to determine values for the area generally, for water management and vegetation and for land use. Many of the issues identified in the ARCWIS project were confirmed, however, the workshop also provided a mechanism to exchange views between government agency staff, and landholders and farmers.

The workshop results have provided valuable input into the preparation of management strategies for the SCP and ideas suggested by participants have enabled the Steering Committee to develop guiding principles for the *Strategy for a Sustainable Future*.

The participants generally believed that diversified agriculture has a future in the SCP area. It was generally considered that agriculture was an important land use in this area and its value to the State should be identified and promoted to the general community.

2.4 General issue identification

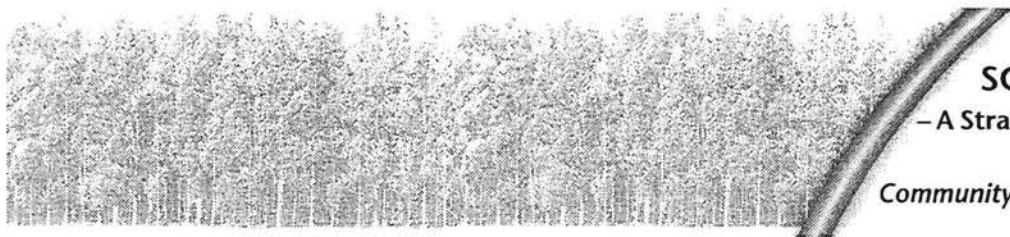
Based on the community consultation, the background and issues report and other work from the agencies, a number of issues were identified relating to the SCP. These are presented below.

2.4.1 Issues – Economic and infrastructure

The SCP has considerable potential for diversified agricultural land uses, particularly centre pivot irrigation for horticulture, continued beef and dairy farming, and timber plantations. This potential is discussed further in Section 5.

Key issues identified are:

- There is a demand from the industry to expand horticultural operations into the region.
- The capital investment required for irrigated agriculture is such that year-round operation is more economically attractive than summer-only production.
- To service these industries it is likely that certain infrastructure improvements such as power, roads and telecommunications will be needed in the region.
- Blue gum plantations are already present in the region and are expanding. In addition these plantations are occurring on productive agricultural land.



- There are best practice guidelines that can and are being employed to reduce nutrient loads entering rivers.
- The identification and development of suitable markets to support ongoing agricultural industry.

2.4.2 Issues – Environmental

The Steering Committee has set the objective that until more is known about the impacts on the ecology of the Scott River and Hardy Inlet from land use activities there should be no increase in the levels of nutrients in these waterways that are sourced from the Scott River Catchment.

Much of the landscape of the SCP is subject to high watertables and waterlogging in winter. There is significant drainage from the SCP to the Scott River and the Hardy Inlet. The drainage system of the SCP is complex and it is difficult to identify specific sources of nutrients across the catchment. The drainage pattern of the plain has been significantly modified increasing the likelihood of nutrients and sediment reaching the Scott River and Hardy Inlet.

Other issues include:

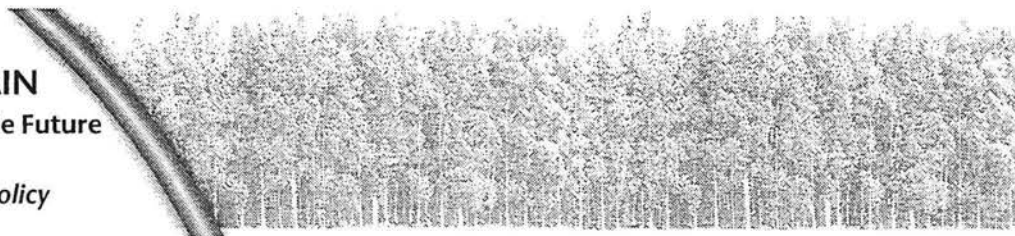
- While the land capability has been determined based upon summer cultivation, the horticultural industry is of the opinion that there are technical options that will allow it to operate all year.
- There is insufficient data to develop an accurate picture of the nutrient status of the water bodies in the region, however, it appears that there are already elevated levels of nutrients, particularly nitrogen, present.

- The SCP contains native vegetation that is poorly represented elsewhere and includes some rare and Priority Species. This is discussed in Section 8.
- There are opportunities for protecting and repairing native vegetation, e.g. along roads and streamlines, and thereby increasing the ecological value of the region.
- There are a range of land uses that can be used for economic production that also have an environmental repair function, e.g. growing plantation timbers adjacent to degraded stream lines.

2.4.3 Issues – Community

Key issues include:

- It is important that improvements to the ecological and social qualities of the region are not to the detriment of the economic activity in the region.
- The community feels threatened by the changes in rural activities that have occurred over recent years. The introduction of blue gum plantations has potential to result in people moving out of the region.
- With changing mining activity, the size and composition of the population living in the SCP will change with the ensuing changes in the community structure.
- There has been no review or assessment of changes in community structure as a result of changing land use.



3. RELEVANT STATE GOVERNMENT POLICY

This section describes selected State Government policy in relation to general natural resource management issues such as clearing, drainage and wetlands and describes landholder responsibilities under State Legislation and government policy.

3.1 Clearing of remnant vegetation

The protection of remnant vegetation on rural land in Western Australia is provided for by the Soil and Land Conservation Act 1945 and Regulations (1992) and managed according to the Memorandum of Understanding for the protection of remnant vegetation in Western Australia published in April 1997.

The Memorandum of Understanding between State agencies is aimed at ensuring that broader nature conservation and biodiversity values are not threatened by a proposal for clearing, as well as addressing land degradation issues. Where the Commissioner for Soil Conservation does not object to a proposal (or part thereof) on land degradation grounds, he will consider advice from other State agencies and may refer proposals on to those authorities for appropriate action under other legislation, e.g. the Commissioner may refer a proposal for clearing to the EPA if it is considered that the protection of biodiversity is an issue.

Under new procedures announced by the Minister for Primary Industry on 5 March 1999, landholders wishing to clear vegetation will have to prove that any proposed land clearing will not cause land degradation. The collection of detailed information to assist the assessment of clearing proposals will no longer be undertaken by AGWEST staff. The Commissioner will request landholders to document and present their case for assessment. The new arrangements ensure that further clearing does not add to the severity of land degradation that already affects significant areas of rural Western Australia.

Notification to the Commissioner is required for clearing that will result in a change in the use of that land and the area is greater than 1 hectare.

Other provisions exist in:

- a controlled catchment or water reserve proclaimed under the Country Area Water Supply Act (1947); or
- a special policy area such as the Peel-Harvey Catchment, or the Leeuwin-Naturaliste Ridge Statement of Planning Policy area.

The SCP lies within the Shires of Augusta-Margaret River and Nannup. Landholders wishing to clear remnant vegetation on their properties will need to address land degradation issues such as erosion and possibly eutrophication (or loss of nutrients) and ensure the nature conservation and biodiversity issues are addressed in their proposals.

More detailed information to assist with assessing the likely outcome of a clearing proposal and how to prepare a detailed proposal, is available from Agriculture Western Australia in the *Information Package for Land Clearing Proposals on Land Zoned Rural*, see Appendix 18. In addition, the Vegetation Strategy in Section 8 of this report, with additional details in Appendices 12 to 18, contains descriptions of vegetation complexes that are well represented and those poorly represented in the SCP area.

3.2 Drainage

The principal control mechanism related to drainage in Western Australia is the Soil and Land Conservation Act 1945 (SLC Act) and this is mainly for saline drainage. In addition, provisions exist within the Rights in Water and Irrigation Act 1914 (RIWI Act) and the Environmental Protection Act 1986 (EP Act) which have implications for drainage activities.

The RIWI Act provides protection for any watercourse, race or drain flowing through or over the land, however, these are mostly used in gazetted catchments for the management and allocation of surface water flows. The EP Act may be invoked where it can be demonstrated that there is potential for any drainage activities to result in environmental damage.

The SLC Act deals with all aspects of land related degradation including that which results from drainage works. This may include the adverse affects of erosion, flooding and eutrophication.

The Soil and Land Conservation Regulations are those most often applied to the management of degradation issues on private land. These regulations require that landholders intending to drain or pump saline groundwater, principally for the purpose of reducing land salinisation, notify the Commissioner of Soil and Land Conservation of their intentions. The aim of the notification is to ensure that neighbouring landholders are given an opportunity to comment on the proposal and for an assessment to be carried out. The assessment would include aspects relevant to the other Acts as well as the Soil and Land Conservation Act.

Drainage works on the SCP are undertaken principally for the management of fresh surface and shallow groundwater to reduce the impacts of waterlogging and inundation. Where they are not for the purpose of lowering saline groundwater or mitigating land salinisation, these works are considered to not require notification, by the proponent, under the Act.

Notwithstanding, the Commissioner for Soil and Land Conservation is charged with the responsibility of preventing land degradation. Therefore, there is a requirement to assess any proposal or existing activity brought to the Commissioner's attention, on the basis of potential land degradation. As an outcome of any such assessment, conditions may be imposed.

In order to reduce the potential for land degradation and community conflict, landholders are encouraged to work cooperatively in drainage activities. In support of this, the Commissioner may provide comment and assistance to landowners developing water management and drainage plans, if they are referred to AGWEST. In addition, a draft policy on drainage for the SCP has been endorsed by the Commissioner to advertise for public comment in this Strategy. See Section 7.11 on catchment planning and Appendix 5 for more information.

3.3 Declared plants and weed pests

AGWEST and the Agriculture Protection Board have recently announced a major initiative to control plant pests and weeds that threaten agricultural industry in the South West. Across the whole State and within each shire certain species of plants have been declared and landholders and occupiers will be required to carry out weed control works on their properties where the weeds occur. Details of the weeds requiring control and eradication works by landholders in the Shires of Nannup and Augusta–Margaret River are shown in Appendix 32.

3.4 Wetlands

Wetlands on the SCP have been classified by Semeniuk (1996) and published in the WRC report *Mapping and Classification of Wetlands from Augusta to Walpole in the South West of Western Australia* (1997).

In this report, wetlands are defined as '*areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries*'.

One of the implications for landholders is that areas of pasture considered by farmers to be of little or no environmental value can be included in the list of wetlands, or appear on

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Relevant State Government policy

wetland mapping for their area, simply because it is waterlogged or inundated at some time during the year. The values assigned to this sort of wetland are usually low, however, most biologists recognise that waterlogged and flooded pasture areas do present certain values for wildlife (grazing,

feeding on invertebrates and possibly nesting by some waterbirds).

A summary of selected formal controls and protection mechanisms such as Legislation, Regulations and Policies covering wetlands and how they apply to the Scott Coastal Plain are shown in Table 2.

Table 2. Summary of legislative and policy controls relating to wetlands

Legislation or Policy	Provisions for Wetlands	Applies to SCP
Rights in Water and Irrigation Act	Controls surface water diversions in gazetted catchments; licensing and control of groundwater abstraction in gazetted groundwater areas.	Yes Limited to groundwater licensing.
Country Areas Water Supply Act	Controls clearing in gazetted catchments.	No None in SCP.
Soil and Land Conservation Act	Controls clearing Statewide, applies to the SCP for clearing all vegetation for areas > 1 ha, including wetland vegetation. Controls drainage Statewide. Draft policy developed for SCP involves sub-catchment planning approach, however, no formal controls on drainage unless land degradation occurs.	Yes Yes See section 7.12 and Appendix 5.
The Environmental Protection Act 1986	Part 5 has the objective of the prevention, control and abatement of environmental pollution, for the conservation, preservation, protection, enhancement and management of the environment.	Yes
Water and Rivers Commission Act	The Commission has water resources conservation, protection and management functions vested in it by various written laws. This Act also gives the WRC functions which relate to the conservation, management and assessment of water resources and planning for their use (water resources is broadly defined to include wetlands).	Yes No clear provisions for protection of wetlands.
Waterways Conservation Act	Within certain gazetted management areas, a management authority will protect waterway systems. None occur in the SCP area.	No
Wildlife Conservation Act	Protection of Declared Rare Flora, declared threatened communities.	Yes Some occur in SCP area, landowners are notified. May involve wetlands.
South West Agricultural Zone Wetlands Policy (EPP)	Protection for nominated and registered wetlands Statewide. See detailed note below.	Yes None occur in the SCP yet.
Swan Coastal Plain Lakes Policy 1992 (EPP)	Protection for wetlands on the Swan Coastal Plain. Does not apply to the SCP.	No
State Wetlands Conservation Policy	Principles for identification and protection of wetlands in Western Australia.	Yes But at a high level, non-statutory.
International Treaty to which Australian and State Governments are responsible	Western Australian Ramsar wetlands, none occur in SCP.	No
Department of Environmental Protection – Guidelines for environment and planning	Non statutory guidelines, provides advice on wetlands generally as well as those that are important such as Ramsar, current legislation and policies, classification of wetlands, and guidelines on protection mechanisms including buffers.	Yes

Generally, most provisions within the above statutes and policies apply to areas outside the SCP. There are no Ramsar wetlands in the SCP and the provisions within the RIWI Act for surface water management generally are not applied in this area.

The State Wetlands Conservation Policy is a non-statutory policy of Government, aimed at identifying and protecting wetlands within Western Australia. The Policy outlines principles for protection of wetlands and identifies the need to protect wetlands. There are no specific provisions that impact on SCP landholders, however, most of the principles for protection of wetlands are incorporated into decision making by State agencies and local government.

The drainage regulations apply State-wide, however, are not applied to the SCP area, unless land degradation occurs, because drainage of saline groundwater is not an issue for this area. A draft policy for drainage management has been endorsed by the Commissioner to advertise for public comment as part of this Strategy. See Section 7.11 and Appendix 5 for more information on drainage approaches for the SCP.

3.4.1 South West Agricultural Zone Wetlands Policy

The Environmental Protection Authority and Department of Environmental Protection have recently prepared an Environmental Protection Policy (EPP), called the Environmental Protection (South West Agricultural Zone Wetlands) Policy.

This EPP creates a register of protected wetlands; sets up a program for protection of wetlands; and prescribes a number of controls on activities that might have a detrimental environmental impact on protected wetlands.

A wetland becomes protected when it is nominated to and entered on the Register of Wetlands, which requires the agreement of the landowner. The policy provides for

offences that result from damage or degradation of registered wetlands and the development of BMP between government and landowners to encourage voluntary adoption of environmentally sensitive practices.

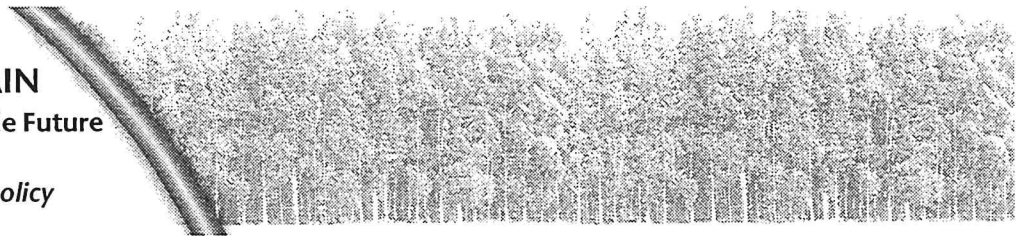
3.5 State Water Quality Management Strategy

A State Water Quality Management Strategy (SWQMS) has been developed containing a water quality management objective, principles, strategies, action plan and implementation framework. This Strategy recognises that water quality management is a responsibility shared by government (at all levels), industry and the community.

The State Government is signatory to National Agreements and Strategies which require government and agencies to apply certain principles and implement reforms and strategies related to natural resource management, water resources management and sustainable development. This includes a requirement to develop the SWQMS, in line with the principles and objectives of the National Water Quality Management Strategy.

The water quality management strategies (summarised) are to:

- use an integrated resource management approach;
- involve and inform community and key stakeholders;
- determine environmental values or beneficial uses;
- prepare water quality management guidelines;
- adopt a precautionary approach and encourage continuous improvement;
- use a mixture of regulatory and market measures;
- require the polluter to avoid pollution and pay for clean-up.



The implementation of the SWQMS involves a number of actions including the preparation of a State Water Quality Implementation Strategy and assessing existing plans, policies and guidelines and processes for consistency with the principles and strategies. In addition, interagency agreements, central compilation of policies and guidelines and coordination mechanisms are required to ensure effective integration of water quality management.

This SWQMS does not impact on landholders in the SCP area directly. The State Government has the prime responsibility for water quality management in Western Australia and the SWQMS is implemented through agencies in the first instance and through cooperative projects and committees and catchment management groups supported by agencies throughout the State.

3.6 Native Title and Aboriginal heritage

The Native Title Act (1993) was introduced by the Federal Government to give statutory effect to the principles handed down by the High Court Mabo Decision in June 1992. This Act is not directly related to heritage issues yet affects the ownership and management of land by determining whether Native Title exists over particular land.

The operation of Native Title legislation within Western Australia continues to be debated by sections within the community, including State Government. Due to the complicated nature of the situation and the intricacy of the legislation, the reader is

advised to seek any further advice from the Native Title Tribunal.

A number of Native Title claims have been lodged with the National Native Title Tribunal in relation to land covering parts or all of the study area. The applications do not include claims involving freehold land.

The Aboriginal Heritage Act (1972) establishes protection for areas of Aboriginal heritage, identifies the characteristics of Aboriginal heritage and provides for offences for actions which degrade or destroy values of Aboriginal sites. Not all sites of Aboriginal heritage are registered and landholders may be unaware that their property has sites possessing Aboriginal heritage values. The Department of Aboriginal Affairs recommend that landholders and developers consult with the Sites Register and with local Aboriginal groups to determine whether any heritage values exist on their property before commencing development.

3.6.1 Native Title and water allocation

The WRC has recently included the consideration of Native Title when assessing applications for surface water or groundwater use and allocation.

The impacts of Native Title on water allocation and statutory licensing under the RIWI Act are still being determined by the WRC. The reader is advised to seek further advice from the Commission on how an application for surface or groundwater would be processed.

Generally, most provisions within the above statutes and policies apply to areas outside the SCP. There are no Ramsar wetlands in the SCP and the provisions within the RIWI Act for surface water management generally are not applied in this area.

The State Wetlands Conservation Policy is a non-statutory policy of Government, aimed at identifying and protecting wetlands within Western Australia. The Policy outlines principles for protection of wetlands and identifies the need to protect wetlands. There are no specific provisions that impact on SCP landholders, however, most of the principles for protection of wetlands are incorporated into decision making by State agencies and local government.

The drainage regulations apply State-wide, however, are not applied to the SCP area, unless land degradation occurs, because drainage of saline groundwater is not an issue for this area. A draft policy for drainage management has been endorsed by the Commissioner to advertise for public comment as part of this Strategy. See Section 7.11 and Appendix 5 for more information on drainage approaches for the SCP.

3.4.1 South West Agricultural Zone Wetlands Policy

The Environmental Protection Authority and Department of Environmental Protection have recently prepared an Environmental Protection Policy (EPP), called the Environmental Protection (South West Agricultural Zone Wetlands) Policy.

This EPP creates a register of protected wetlands; sets up a program for protection of wetlands; and prescribes a number of controls on activities that might have a detrimental environmental impact on protected wetlands.

A wetland becomes protected when it is nominated to and entered on the Register of Wetlands, which requires the agreement of the landowner. The policy provides for

offences that result from damage or degradation of registered wetlands and the development of BMP between government and landowners to encourage voluntary adoption of environmentally sensitive practices.

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- use a mixture of regulatory and market measures;
- require the polluter to avoid pollution and pay for clean-up.

4. STATE OF WATER RESOURCES IN THE CATCHMENT

In order to discuss the health of the Hardy Inlet it is important to consider the health of the two rivers that flow into it first, the Scott River and the Blackwood River. Unfortunately, water quality data is limited and accessed from different sources, leaving questions regarding the quality of this differing information. However, a brief overview and a graphical presentation of the data is presented.

4.1 Scott River

The Scott River is much smaller than the Blackwood in respect to both catchment and flow. It is tidal for approximately 8 km upstream and upstream of this point is relatively fresh. In recent years, on numerous occasions, ammonia, total nitrogen and total phosphorus concentrations were above the maximum ANZECC guidelines for these parameters (Figure 3 and Figure 4).

The Scott River has a greater colour than the Blackwood, which gives the water a dark tea stained colour. This colour could be the reason why large algal blooms have not been regularly recorded. The darker water may inhibit algal growth by reducing light penetration or by reducing the availability of nutrients.

4.2 Blackwood River

The catchment of the Blackwood River covers a very large area of the southern wheatbelt and is impacted upon by agricultural and urban land uses. The salinity of the Blackwood River in the upper and middle reaches is brackish (200–1400 mg/L of Cl) becoming less saline in the lower reaches, before the influence of marine water. Elevated concentrations of nitrogen and phosphorus have also been recorded in recent years, exceeding the maximum ANZECC guidelines on numerous occasions.

Total nitrogen and total phosphorus concentrations from the Blackwood and Scott rivers are compared to the Serpentine River in Figure 3. From this comparison it is clear that nitrogen concentrations from the Scott River are similar to the Serpentine River. The Serpentine River experiences regular toxic algae blooms for most of the spring and summer. It is important that conditions in the Scott River do not deteriorate any further, allowing a similar problem to occur.

4.3 Hardy Inlet

The Hardy Inlet appears to be healthy when first observed. The fringing vegetation is in good condition and there are no obvious signs of eutrophication. However, on examination of the limited data that is available, nutrient concentrations are of concern. Elevated total nitrogen concentrations were recorded in August 1995 and in both June and July during 1999. Oxidised nitrogen concentrations were elevated in August 1995 and between June and September 1999. Filterable reactive phosphorus was slightly elevated at some sites within the Inlet during June 1999. In addition, elevated ammonia concentrations have been recorded on the majority of sampling occurrences throughout the estuary.

4.4 Possible consequences of elevated nutrient levels

There are two major consequences of elevated nutrient levels: the effect of nitrogen and phosphorus on algal growth and the toxic effect of ammonia.

High nitrogen and phosphorus concentrations can lead to an increase in growth in both macroscopic (large enough to view with the naked eye) and microscopic (smaller than can be seen with the naked eye) algae.

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

State of water resources in the catchment

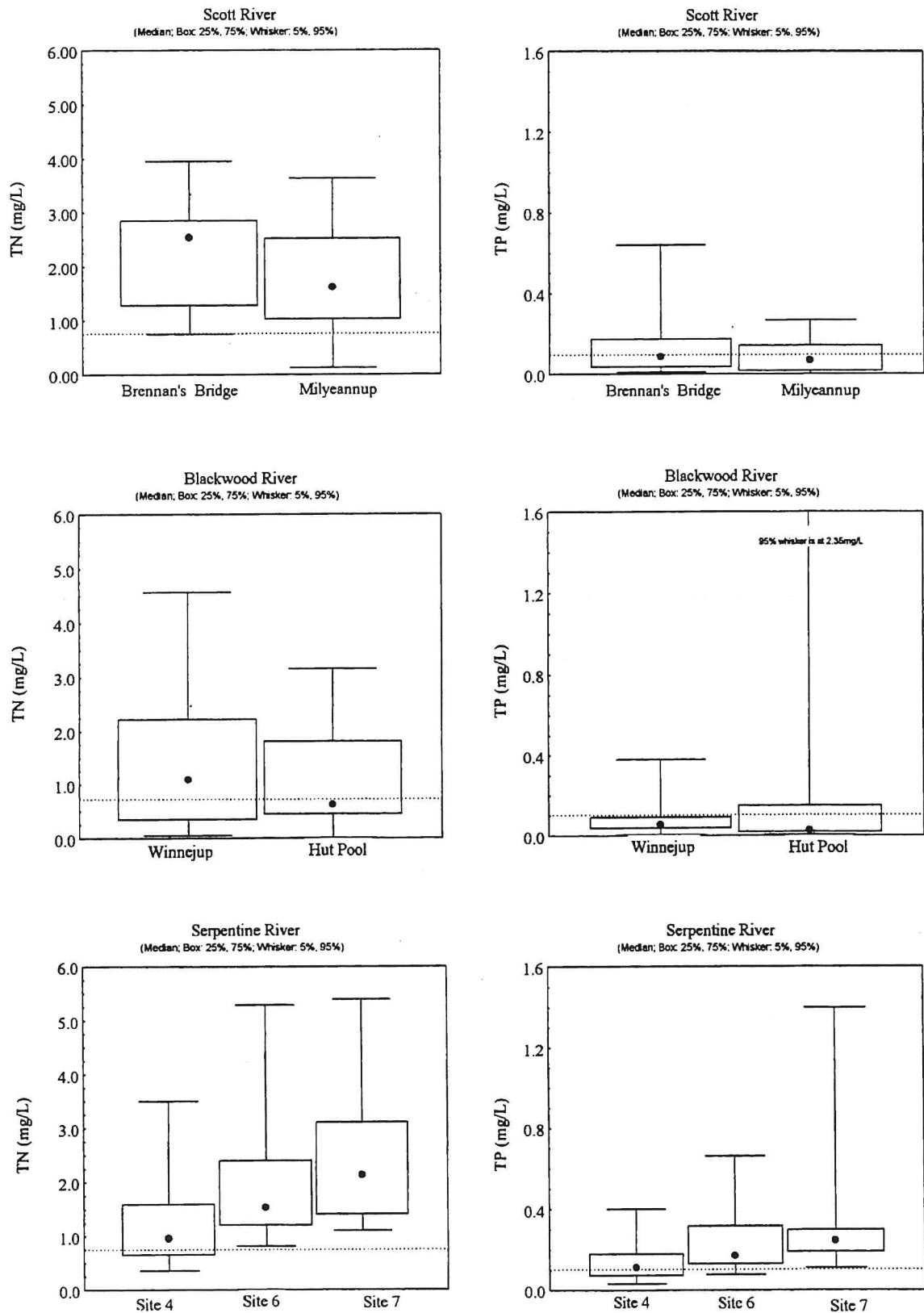


Figure 3. A comparison of total nitrogen and phosphorus concentrations in the Scott, Blackwood and Serpentine Rivers between July 1996 and October 1998. (The dotted line indicates ANZECC (1992) guideline values for fresh water.)

SCOTT COASTAL PLAIN – A Strategy for a Sustainable Future

State of water resources in the catchment

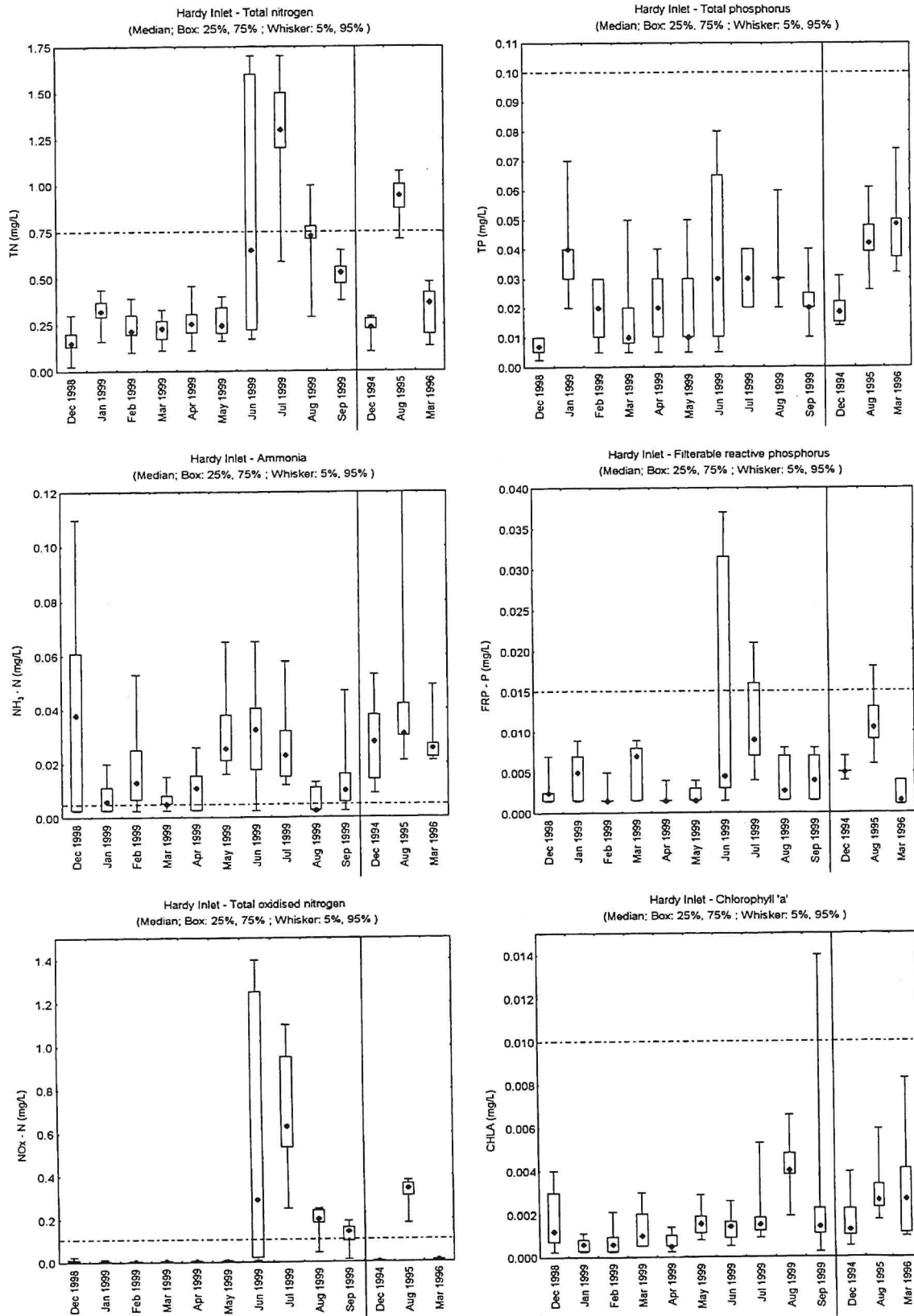


Figure 4. A record of nutrients and chlorophyll 'a' concentrations in Hardy Inlet collected between December 1998 and September 1999 with those collected historically. (The dotted line indicates ANZECC (1992) guideline values for estuarine and fresh water.)

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

State of water resources in the catchment

Problems that can result from large growths (blooms) of algae:

- *Habitat degradation* – Algae can smother existing habitats of fish and invertebrates.
- *Physical barrier* – Macroalgae blooms can form physical barriers to fish migration.
- *pH and oxygen changes* – Blooms can lead to local, but marked, diurnal (day/night) changes in both pH and oxygen. This can be deadly to sensitive species of aquatic plants and animals.
- *Odour and nuisance* – The decomposition of an algal bloom, can lead to major odour problems for local residents and users of the estuary. Algal blooms can often spoil beaches and shorelines and are an obvious nuisance to recreational users (e.g. swimmers, boating and fishing).
- *Bloom crash* – If a bloom crashes (often caused by seasonal changes in water conditions) its decomposition leads to a rapid drop in oxygen levels. A lack of dissolved oxygen within surrounding waters is deadly to other aquatic life.
- *Toxicity* – Some forms of algae, especially blue-green algae (Cynobacteria), can be toxic to both aquatic life, as well as humans.
- *Seagrass decline* – Microalgae, growing on the leaves, can eventually smother seagrass, causing the death of large meadows. Seagrass (which is not an algae, but an aquatic flowering plant) meadows are an important habitat, a major food source for aquatic animals and their roots stabilise the estuary floor.

High concentrations of ammonia are of concern as they can have acute toxicity to aquatic life. Elevated levels of ammonia can also have chronic effects including reduction in fish hatchings and growth rates.

4.5 Current and proposed research

The high level of agricultural and general development activity in the Blackwood and Scott catchment and the increased nutrient concentrations recorded have prompted the WRC to assess the health of the Hardy Inlet in more detail. Currently a fortnightly water quality program is being conducted to collect seasonal data, which will give a better indication of nutrient concentrations.

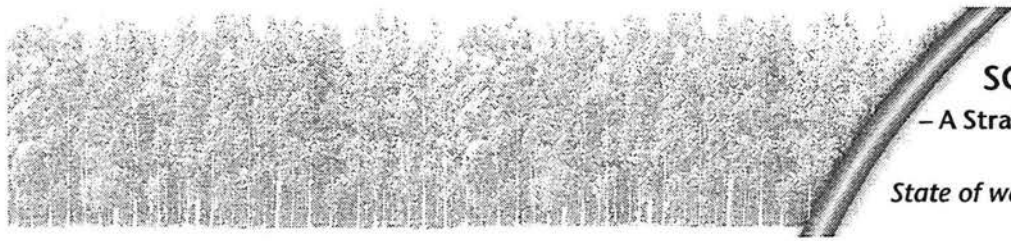
It is also envisaged that the following work will be conducted over the next two years:

- A hydrographic survey.
- A water circulation survey which includes the mapping of the Scott River/Hardy Inlet interface.
- A sediment survey to determine where sediment is settling in the Inlet.
- A macroalgae/sediment survey to determine where nutrients are accumulating and macroalgae growth is greatest.
- Fish and bird surveys.
- A shoreline vegetation survey.
- An invertebrate study.

The results from these studies will give a better indication of the health of the Hardy Inlet and problems that are likely to occur in the short to longer term. In the meantime it is strongly advised that nutrient input in to the Blackwood and Scott rivers should not be increased and that instead, effort is made to decrease the nutrients entering these rivers.

4.6 State of the wetlands

The SCP is comprised of predominantly undulating to near flat land. It is an area of deep sediments, with varied soils including coloured deep sands, some deep sandy duplex soils, sandy loams and loams. The SCP contains a large diversity of wetland types ranging both in size and condition.



A significant proportion of the SCP has been classified as being wetland. This includes extensive seasonally waterlogged or inundated areas such as swamps, damplands, palusplain and areas of permanent water such as lakes and rivers. A number of these wetlands have been recognised as having significant conservation values.

Wetlands found on the SCP are highly valued for the diversity of functions and values that they provide including the provision of habitat for flora and fauna, biofiltering of sediments and nutrients, flood mitigation, groundwater discharge and erosion control. Wetlands are diverse and productive areas that perform a range of ecological functions, in some cases supporting large faunal populations, functioning as sanctuaries for native species and forming corridors that link areas of native vegetation with conservation values.

Mapping, classification and evaluation of wetlands from Busselton to Walpole has been undertaken by the WRC (Semenuk Research Group 1997; Pen 1997). A condition assessment (the degree to which a wetland has departed from its natural state) was also completed at this time. There are two levels of wetland evaluation, first and second tier. First tier assessment is based on existing evaluations of important values at the local, regional, national and international level. Second tier evaluation is undertaken where there is limited comprehensive information available and evaluation of a large number of wetlands is proposed. This is discussed further in Appendix 11.

4.7 Wetlands of conservation significance

A number of the wetlands on the SCP have been identified as having significant conservation values and have been incorporated into national parks or nature reserves. Lake Jasper is the largest freshwater lake in the

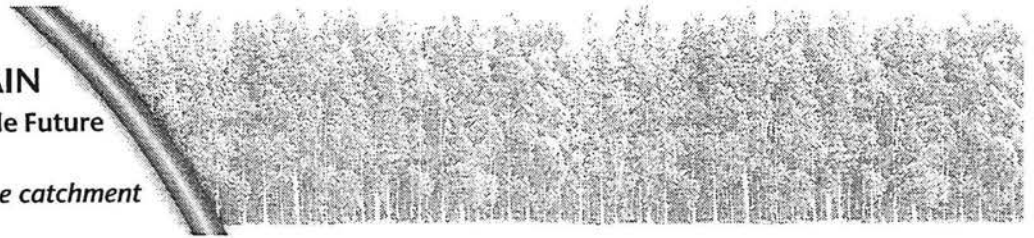
south-west of the State consisting of 440 ha of open water that is up to 10 m deep in places. Lake Jasper and the surrounding swampland represent some of the most pristine wetland habitat found in the South West. Lakes Jasper, Quitjup, Smith and Wilson are all found within the D'Entrecasteaux National Park.

Lake Jasper and Lake Quitjup have been identified as having significant floristic values both supporting extensive areas of very tall sedgeland. Water quality in each of the lakes is good with Lake Jasper in particular providing important habitat for freshwater fish, waterbirds, aquatic invertebrates and frogs.

Gingilup Nature Reserve includes a complex network of wetlands including Gingilup Swamp, which is a very large area of swampland of approximately 2000 ha. Native vegetation in the Nature Reserve is in excellent condition providing habitat for a diversity of fauna and supporting a number of species of Declared Rare Flora (DRF). Gingilup Swamp and Lake Jasper have been identified as nationally significant wetlands by the Australian Nature Conservation Agency and the Australian Heritage Commission.

Scott River National Park commences at the eastern boundary of the Blackwood River and includes both sides of the lower reaches of the Scott River. It includes a large number of Priority Species and DRF. A large proportion of the area is considered to be in pristine condition with little evidence of past disturbance.

The Hardy Inlet is the broad shallow estuarine component of the Blackwood and Scott River Systems. It is up to 2 km wide and has significant areas of reserves and national park adjacent to it. The estuary functions as a nursery for a number of fish species and provides habitat for a number of waterbirds including migratory species.



4.8 Threats to wetlands

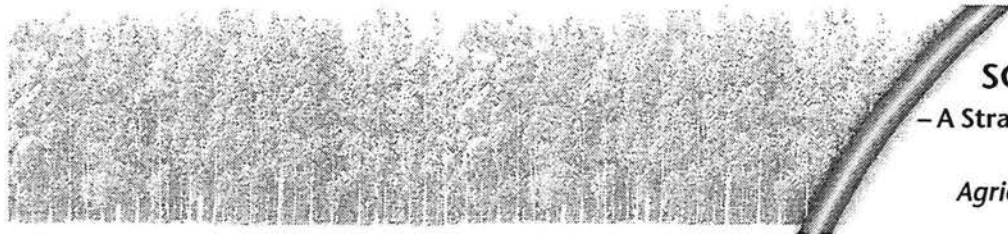
Given the generally sandy soils and high watertable within the catchment, careful land management practices are required to ensure that unacceptable environmental impacts do not occur. Threatening processes which may adversely impact upon wetlands on the SCP include:

- Increased nutrient loads from both surface and groundwater being discharged into wetlands and waterways resulting in a decline in water quality and potentially eutrophication, adversely impact upon wetland ecology. Best management practices in management of irrigation and fertiliser must be implemented to ensure the conservation values of downgradient wetlands are not compromised.
- Alteration to wetland water regimes through clearing, drainage of waterlogged areas and discharge of drainage water into

receiving waterbodies has the potential to adversely impact upon wetlands. These processes contribute to the loss of wetlands through either lowering the watertable or the alteration of wetland water regimes through flooding and increased waterlogging adversely impacting upon wetland ecology.

- Clearing of wetland buffer zones removes habitat for flora and fauna and diminishes the capacity of the buffer to reduce the export of sediment and nutrient into the wetland from surface run-off. Adequate buffers must be maintained to ensure wetland functions and values are protected.

The status of individual wetlands is discussed in Appendix 11.



5. AGRICULTURAL DEVELOPMENT POTENTIAL

5.1 Introduction

This section of the Strategy provides an assessment of the economic potential of agriculture on the Scott Coastal Plain. It estimates the potential for agricultural land use, production levels and presents a vision for the future for agriculture. Economic activity is only one component of land use on the SCP.

This study starts with identifying potential agricultural industries and the constraints on their development including infrastructure, environment and production requirements. The resulting estimate of the productive agricultural land available for each activity has then been adjusted downwards based on these constraints. There are still a number of uncertainties in these estimates. These include sufficient market demand for increased horticulture produce from Scott River and the ability of identified management strategies and best practice guidelines to achieve environmental sustainability targets. In addition, further work needs to be done to demonstrate that best practice and agronomic techniques will sustain viable levels of production for cropping in the SCP area, given the natural constraints, e.g. nature of the soils and waterlogging.

It is acknowledged that the figures estimated here may be amended over time and adapted, based on reviews of the overall Strategy and in light of more detailed knowledge of the impacts of land use and land management practices.

This report calculates gross margins for existing enterprises that operate in the SCP and potential enterprises that could operate in this area. These gross margins are then used as the basis for calculating the existing and potential gross value of agriculture able to be generated from the SCP. The existing and potential gross value of agriculture figures are then used in conjunction with total

value adding ratios to calculate the existing and potential total value added by agriculture in the SCP.

The Land Use Strategy in Section 9 relies on these figures in estimating the growth in development and identifying potential infrastructure needs.

5.2 Vision for the future of agriculture

The vision for the future of agriculture in the SCP area is one of profitable and diversified agricultural land use, in balance with the environmental and social values of the region. The figures presented in this report show that diversified production combining tree plantation and/or irrigated cropping with grazing enterprises provides for potential increases in gross margins and buffers against movements on commodity prices in any one industry.

The vision for agriculture is also one of a long-term investment. The high cost of equipment and land management infrastructure (drainage and nutrient stripping systems) and rising values of land, combined with the long-term returns on tree plantations, mean that landholders need to plan and manage their business enterprise on a long-term basis.

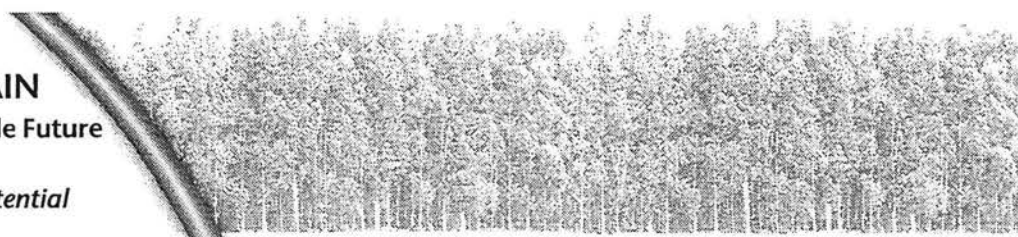
5.3 Available land for agricultural production

The total area of the SCP study area is 107,000 ha. Within this study area 57,384 ha is State forests, national parks, nature reserves and other reserves. Private farmland in the study area has been calculated using GIS data developed by CALM when assessing vegetation systems on the Scott Coastal Plain. The area of private farmland is estimated to be 49,616 ha, of which 18,060 ha is remnant vegetation. This leaves 31,556 ha of cleared land that is suitable to be developed for agriculture (CALM 1999 *pers. comm.*).

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Agricultural development potential



Agriculture Western Australia has prepared mapping of land capability assessments for the SCP. Maps have been prepared showing the distribution of land with very high to high capability (rating classes 1 and 2) for summer vegetable cropping, the distribution of land with very high to fair capability (rating classes 1, 2 and 3) for summer vegetable cropping (Tille 1999).

Using GIS data, the total area that has Class 1, 2 and 3 capability is estimated to be 23,713 ha. Land that has a land use capability of 1, 2 and 3 is considered to be capable for summer horticulture with appropriate management practices.

It includes extensive areas of the catchment that have been assigned a capability rating of Class 3 due to drainage requirements. Though capable of producing reasonable crops most years, the land can be expected to experience waterlogging problems in some seasons and major crop losses could be expected once in every four years or five years (Tille 1999).

Approximately 36 per cent of the Class 1, 2 and 3 area would have remnant vegetation on it, resulting in 15,082 ha cleared land that is capable of being developed for summer horticulture. It is estimated by the Scott Coastal Plain Steering Committee that within

the next 10–15 years up to 5000 ha of horticulture could potentially be developed. This smaller figure estimate is due to:

- environmental constraints;
- uncertainty about market development;
- site and infrastructure constraints;
- potential available water use constraints;
- some rotational cropping with fallow years.

It is likely that the area suitable for summer horticulture will be revised, as more information becomes available on suitable crops, market development, environmental impacts buffer and setback distances, approvals for clearing remnant vegetation and the development of sub-catchment plans.

5.4 Current agricultural development

Traditional beef grazing enterprises dominate current land use in the SCP area. But in addition to beef production approximately 450 ha of horticulture have been developed, 1,750 ha of the cleared land is devoted to dairy enterprises and approximately 5,000 ha has been planted to farm forestry (B. Dunnet 1999 *pers. comm.*).

Table 3. Current area, potential area, total value adding ratio, assumed gross value and assumed gross margins of enterprises operating in the Scott Coastal Plain study area

Enterprise	Current area (ha)	Potential area (ha)	Total value adding ratio	Gross value of agriculture enterprise (\$/ha)	Gross margin of enterprise (\$/ha)
Beef grazing	21,920 ⁽¹⁾	31,556	1.47	269	142
Wool sheep grazing	1,218 ⁽²⁾	31,556	1.41	252	90
Sheep meat grazing	1,218 ⁽³⁾	31,556	2.14	340	147
Dairy	1,750	Subject to market development	1.78	1,452	769
Horticulture	450	5,000	1.11 ⁽⁵⁾	12,510 ⁽⁴⁾	3,348 ⁽⁴⁾
Forestry	5,000	9,500	Not available	901	147

⁽¹⁾ 90% of general grazing area (Cleared land – (area devoted to dairy enterprise + horticulture + farm forestry) = 24,356 ha).

⁽²⁾ 5% of general grazing area (Cleared land – (area devoted to dairy enterprise + horticulture + farm forestry) = 24,356 ha).

⁽³⁾ 5% of general grazing area (Cleared land – (area devoted to dairy enterprise + horticulture + farm forestry) = 24,356 ha).

⁽⁴⁾ Average of potatoes, carrots, onions, sweetcorn enterprises.

⁽⁵⁾ Assumes Total Value added of onions and sweetcorn is the same as carrots. Average of the four crops value added contribution.

The total value-adding ratio is a ratio that relates the gross value of agricultural production to the total value added by that industry to the economy. The total value added to the economy is the sum of profits created in each sector of the economy including the farming sector.

5.5 Short-term agricultural development potential

The table below shows the current and potential value of agriculture that can be produced from the SCP area, given different areas of land devoted to different enterprises. Scenarios 1, 2 and 3 represent possible enterprise mixes that could operate in the study area.

Table 4 clearly shows that potentially the SCP can become a significant producer of agricultural products. The total value added figures represent the potential contribution that the SCP can have on the Western Australian economy given the different enterprise mixes. The gross values and gross margins used in the calculations of the total value added represent the best bet assumptions about the income and input costs likely

to be incurred in this area. In reality, individual gross margins are likely to vary considerably from season to season and between individual farmers.

The three scenarios also demonstrate that a diversified agricultural enterprise, with possibly a mix of grazing, irrigation and tree plantations, will provide most landholders with better overall returns in the long term, although the potential for diversification will vary from property to property.

5.6 Constraints to agricultural development

The constraints upon agricultural development can be grouped into three areas: structural, agronomic and environmental. These are listed below.

5.6.1 Structural constraints

- Growers' access to three-phase power supply.
- Poor condition of road network.
- Prescribed assessment and approval processes established through the *Strategy for a Sustainable Future*.

Table 4. Gross value of current agricultural industries and total value added contribution of agriculture for the area under different land use scenarios

Enterprise	Cleared land available for development (%)	Current area (ha)	Scenario 1 (ha)	Scenario 2 (ha)	Scenario 3 (ha)
Beef grazing	100	21,920	11,100	10,500	7,600
Wool sheep grazing	100	1,218	1,262	631	0
Sheep meat grazing	100	1,218	10,300	7,900	6,300
Dairy	10 ⁽¹⁾	1,750	1,893	2,524	3,156
Horticulture	16	450	1,000	3,000	5,000
Forestry	30 ⁽²⁾	5,000	6,000	7,000	9,500
Total gross value of agriculture		\$19.2 million	\$27.5 million	\$53.1 million	\$80 million
Total value added		\$28 million ⁽³⁾	\$44 million ⁽³⁾	\$81 million ⁽³⁾	\$115 million ⁽³⁾

⁽¹⁾ Currently dairy enterprises occupy 6% of cleared land, this assumes it is possible to increase this area to 10% given suitable market conditions.

⁽²⁾ Estimate of potential area, assume 25% overlap with the area suitable for horticulture.

⁽³⁾ Assumption that the total value added ratio is 1 for farm forestry.

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Agricultural development potential

- Lack of suitable workforce means focus will be on crops and other agricultural activity with high mechanisation requirement.

5.6.2 Agronomic constraints

- Lack of experience in growing horticultural crops other than potatoes.
- Necessary to test the practical suitability of other horticultural crops.
- Waterlogging is a significant constraint in some parts of the SCP. Use of large centre pivot irrigation systems may not enable suitable siting to avoid waterlogged areas. Growers could consider semi-permanent irrigation systems sited on soils that are not affected by high watertables.
- Crops and varieties with shorter growing seasons may provide better returns from irrigation sites.
- Necessary to overcome weed, disease and pest issues as they arise on individual properties and in the region.
- Necessary to manage for price and marketing variances.

5.6.3 Environmental constraints

- Necessary to adopt best practice techniques to minimise the off-site effects of horticulture.
- The location of larger streamlines (4th and 5th order streams) which cannot practically be re-directed due to their flow volumes may constrain siting and design of irrigation areas.
- Use of buffers setbacks around streams and setbacks from other environmental features to prevent nutrients leaching into waterways.
- Protection of remnant vegetation.
- Availability of land with suitable soils and depth to summer watertable.

To address these issues the Steering Committee considers that emphasis is needed in two specific areas, these are described below in the following recommendations.

Recommendation 1

It is recommended that additional investigation and research on agricultural production and farming systems development for irrigation on the Scott Coastal Plain be carried out jointly by AGWEST and local grower groups.

Recommendation 2

It is recommended that an economic development and marketing plan for agricultural production of the Scott Coastal Plain be prepared identifying production and marketing opportunities and to include alternatives for funding, horticulture research and marketing.

5.7 Flow-on effects

Multipliers are used to give an indication of the flow-on effects of an expansion in any sector of the economy. Multipliers give an insight into the importance of each sector to the economy by giving an indication of the flow-on effects of a change in either output, income or employment of one particular sector of the economy. The potential effects of these multipliers on the State economy and employment are discussed in Appendix 20.

References

Tille, P.J. (1999). Land Capability Assessments for Horticulture in the Scott River Catchment. Agriculture Western Australia, (unpublished).

FOCUS TOPIC

— CHANGES TO FRENCH FRY PROCESSING INDUSTRY

BACKGROUND

On 31 August 1999, Simplot Australia closed the French fry processing factory at Manjimup. The closure of the factory presents the local vegetable industry and the community with a challenge. Substantial debts are held by growers and contractors that relate to potato production for the Simplot factory. Potatoes are also an important rotational option contributing to the economic viability of enterprises producing other crops, such as export cauliflower.

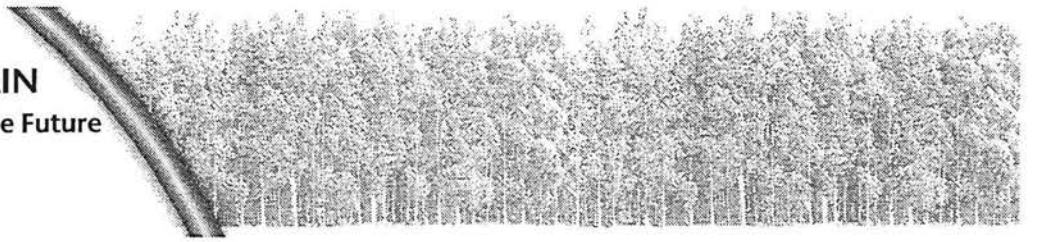
ISSUES AND ACTIONS

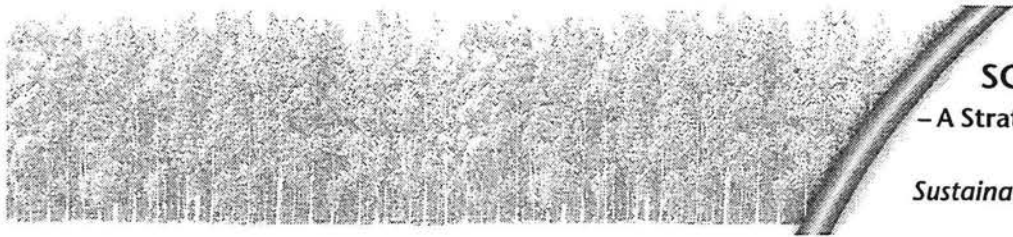
New horticultural opportunities have been identified for development in the Manjimup and Scott River areas, which may progress to commercial scale over the next two to five years. Export opportunities exist for ware, crisp and seed potatoes in SE Asia. Work to realise these opportunities is a high priority for the Agriculture Western Australia potato project, and \$180,000 has been allocated to a new activity to promote an export potato industry for Western Australia. This work aims to assist with the development of new potato varieties suitable for export markets in SE Asia, to provide agronomic advice to growers and to assist with export market analysis, and development of the potato market in SE Asia. In addition a submission has been submitted to the Horticultural Research and Development Corporation (HRDC) to develop agronomy profiles for new potato varieties for export markets. A further HRDC funding submission is being developed to assist with the long-term development of an export seed tuber trade.

Other opportunities being considered include; expanding markets for cauliflower, sweet corn and other export vegetables by innovations in post-harvest to extend sea freight life, locally based value adding for vegetable products and the examination of new crops for the area.

A group has been formed to investigate opportunities for growers in the Manjimup and Scott River areas. The Manjimup Horticultural Industry Advisory Group, was elected at a meeting in Manjimup called by the Potato Growers Association to discuss the Simplot closure. This group includes potato growers (Mr G. Ipsen, Mr E. Rose, Mr T. Fox), a vegetable exporter (Mr D. Geare), and Officers from Agriculture Western Australia (Mr M. Heap) and South West Development Commission (Mr J. Threlfall). The group has set its terms of reference as 'to examine horticultural industries with potential for the region and undertake the necessary activities, including accessing funds, to develop those industries with potential'.

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– A Strategy for a Sustainable Future





6. SUSTAINABLE DEVELOPMENT – FRAMEWORKS

6.1 Vision for the future

The Strategy for a Sustainable Future is based in a vision for the future of the Scott Coastal Plain that was worked out by the community in consultation with the State agencies and local government. The Executive Committee has developed this vision into a Vision Statement for this Strategy.

Vision Statement

A vital sustainable agricultural community living in balance with economic development and the unique environmental values of waterway and vegetation systems of the region.

To achieve the vision, the overall objectives of the Strategy for a Sustainable Future are to:

Objective 1 – Involve all the stakeholders

To encourage all stakeholders to work together to develop a sustainable future for land use and the environment.

Objective 2 – Produce a framework for sustainable land use

To develop a framework for sustainable land use which protects and maintains the natural environment.

Objective 3 – Preserving ecological integrity

To identify and protect the ecological values of bushland, waterways and wetland systems, report on their state of health.

Objective 4 – Produce sustainable agriculture

To identify sustainable agricultural development opportunities and develop processes for the future management of the region.

Objective 5 – Proper management of change

To develop formal planning and coordination processes to manage development and changes in land use in the region.

Objective 6 – Monitor performance

To develop a process for monitoring and reporting on catchment performance, including sustainability of land use and land and water management.

Objective 7 – Promote the region

To promote the value of agricultural enterprise in the region to the community of Western Australia.

6.2 Key directions of the project

With advice from scientists and State agencies, the Steering Committee decided that the Scott River and Hardy Inlet were in reasonable ecological condition and that the community had stated its intent and commitment to proper environmental management. Based on this the Steering Committee favoured a management approach that used a regional or catchment area framework to identify appropriate areas for future development, sought to monitor catchment-wide ecological changes around established benchmarks and used an adaptive approach to land use by encouraging use of BMP and local monitoring.

With this in mind the Committee recommends the following approaches:

- An integrated approach to planning at the catchment level but emphasise local management using best practice guidelines at the farm, industry and local level.
- Recognise that it is possible to develop a catchment/study area Land Use Strategy,

however, localised differences in production and landscape mean that local planning and management cannot be done in a prescriptive manner. It requires a farm by farm and industry by industry approach, within appropriate guidelines.

- Minimise the regulatory approach by focussing on outcomes.
- Take a management approach that uses feedback from monitoring to determine how to adapt land use strategies and land management practices. Where better information shows that improvement is needed, the Strategy will be updated or amended.
- There is a need for a feedback mechanism (or report card) that will indicate how well the use and management of land and water is meeting the ideal of being sustainable.

Some assumptions that have been made about the process and for the future:

- An integrated plan will produce a balance between land use and environmental maintenance and protection.
- Stakeholder participation will provide ownership of outcomes and strategies, resolve conflicts and ensure commitment.
- The resources required to monitor the sustainability criteria and to provide feedback to stakeholders, will be available.
- An integrated plan can provide the environmental foundation on which social and economic development can occur.
- Local government will support the Strategy and recognise it is a valid and useful mechanism for resolving land use issues for the SCP area.
- The formal requirements for changes in land use can be streamlined by implementing the Strategy through the Town Planning Schemes of local government.
- The integrity of the Strategy will be maintained with future changes in man-

agement structures at local authority and State agency levels.

- The Strategy and guidelines will be understood, accepted and honoured by decision-making authorities and future influential stakeholders.
- Decisions on land use and land and water management will be consistent through the hierarchy of decision-making authorities.

6.3 Guiding principles

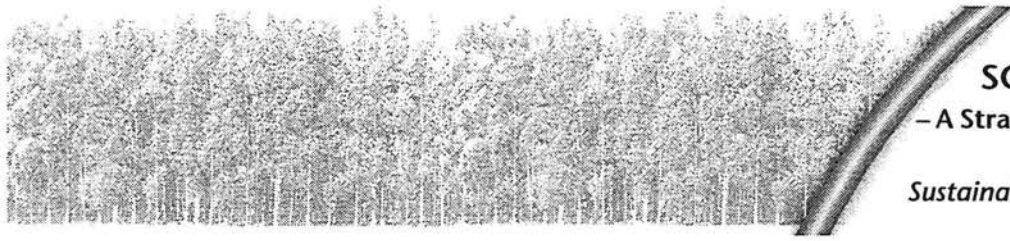
Guiding principles are used to direct Strategy development to ensure the objectives are met and achieve the vision and aims of the project. The guiding principles also help achieve consistent management strategies across a number of different subject areas.

The following guiding principles have been used to guide preparation of the draft Strategy:

- Compliance with existing legislation, regulations and government policy.
- Multi objective criteria for sustainability – economic, social and environmental.
- Recognising existing land uses.
- Adheres to precautionary principle.
- Open decision making.
- Involvement.
- Evaluation.
- Presentation and understanding.
- Flexibility.
- Regional dimension.
- Infrastructure requirements.

6.3.1 Compliance with existing legislation, regulations and government policy

The Strategy should recognise existing State Government policy, legislation and regulations for the environment, natural resource management and land use planning. It is possible that through discussion of issues



specific to the SCP, that recommendations could be formulated to enhance, add to or amend existing policy and regulations. These recommendations will need to be taken to government, however, it must be recognised that recommendations take time to work through government and may or may not be acceptable to government.

6.3.2 Multi objective criteria for sustainability – economic, social and environmental

A combination of economic, social and environmental criteria are needed to enable the sustainability of land and water use to be measured and reported to the community and government.

Social sustainability underlies the community's vision for the future of the SCP area, ensuring that land use and development protects and enhances the social structure and quality of life for all residents.

Environmental sustainability is important because it underpins the objective of a sustainable agricultural industry with a long-term future in the SCP. Unsustainable land uses which result in significant impacts will lead to increased government regulation and restrictions on agricultural practice. The Scott River and Hardy Inlet are both receiving waters for nutrients from the catchment and all land uses and land users should recognise that water quality in these systems needs to be maintained at a level which ensures the long-term viability of ecological systems and processes.

While this Strategy was developed in response to the moves to increase horticulture on the Scott Coastal Plain it must be recognised that there are many land uses developing in the catchment. Each of these presents its own particular environmental issues. The Strategy has been written with the idea that all land users should all be treated as being equally responsible for their contribution to maintaining ecological quality for the catchment.

6.3.3 Recognising existing land uses

Any retrospective changes to policy on land use should include appropriate compensation mechanisms to ensure fairness and equity to those affected. The strategies for land use should address equity issues in relation to management of individual properties, water allocation and licensing and identifying appropriate levels of development that provide a future for agriculture in the area.

6.3.4 Adheres to precautionary principle

The strategies for land use should recognise the limitations of current understanding of environmental and social impacts and plan accordingly to minimise risk in the face of scientific uncertainty.

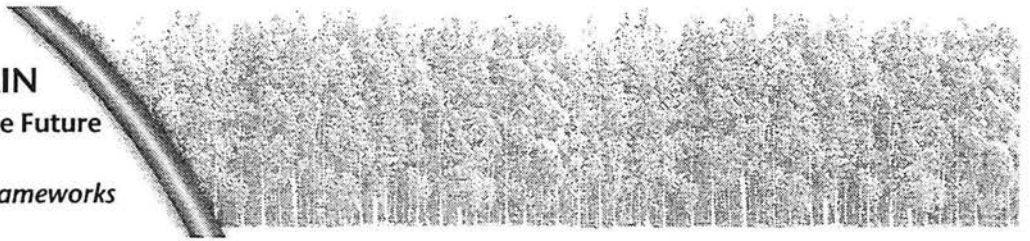
6.3.5 Open decision making

Decision making for policy, regulations and strategic and land use planning should be an open process, transparent and in partnership with community and government and should make use of the best available information. Decisions by agencies and shires should be communicated to the general community.

6.3.6 Involvement

The policy on agricultural land use should include significant community consultation and participation and involve all stakeholders. The development of policy, BMP, plans and strategies should be an efficient and transparent process with community participation at its core. The Strategy should recognise opportunities for resolving issues which develop over conflicts between public good and private rights.

At the end of the consultation process the community should feel that their issues have been addressed and the policies are accepted and 'owned' by all the stakeholders involved in the process.



6.3.7 Evaluation

The management Strategy should be structured in a way that it can be evaluated against performance and adoption criteria and should include a framework for evaluation.

6.3.8 Presentation and understanding

The Strategy should be presented in a simple and logical manner that is intelligible to all potential users.

6.3.9 Flexibility

The strategies for land use need to be flexible and dynamic and be able to respond to new information and scientific data as it becomes available. There is a significant gap in scientific knowledge about the impacts of nutrients on Hardy Inlet and Scott River and current and ongoing studies will attempt to fill this gap over the next few years.

6.3.10 Regional dimension

Developing sustainable land uses on the SCP should recognise the regional catchment of Hardy Inlet. While higher than expected levels of nutrients have been measured from the Scott River catchment, it is only a proportion of that sourced from the Blackwood catchment. Recognising the regional dimension means understanding that there are other impacts on Hardy Inlet from the catchment of the Blackwood River and the catchment area surrounding the Inlet including Augusta townsite.

In addition, Hardy Inlet also experiences tidal flushing from Flinders Bay and the Southern Ocean. Understanding the nutrient and sediment dynamics of Hardy Inlet is important to understanding the impacts of changes in land use within the Scott River catchment.

6.3.11 Infrastructure requirements

Any proposed increase in development in the SCP area will require consideration of infrastructure for servicing the development.

Roads are provided by the Shires of Nannup and Augusta–Margaret River for access to properties, whereas increased plantation development, irrigated agriculture or mining will require road upgrading works in order to support the trucking programs usually associated with these industries to transport logs, produce and minerals to markets or ports. The Strategy should recognise the needs and requirements of local government in planning for infrastructure to support increased development.

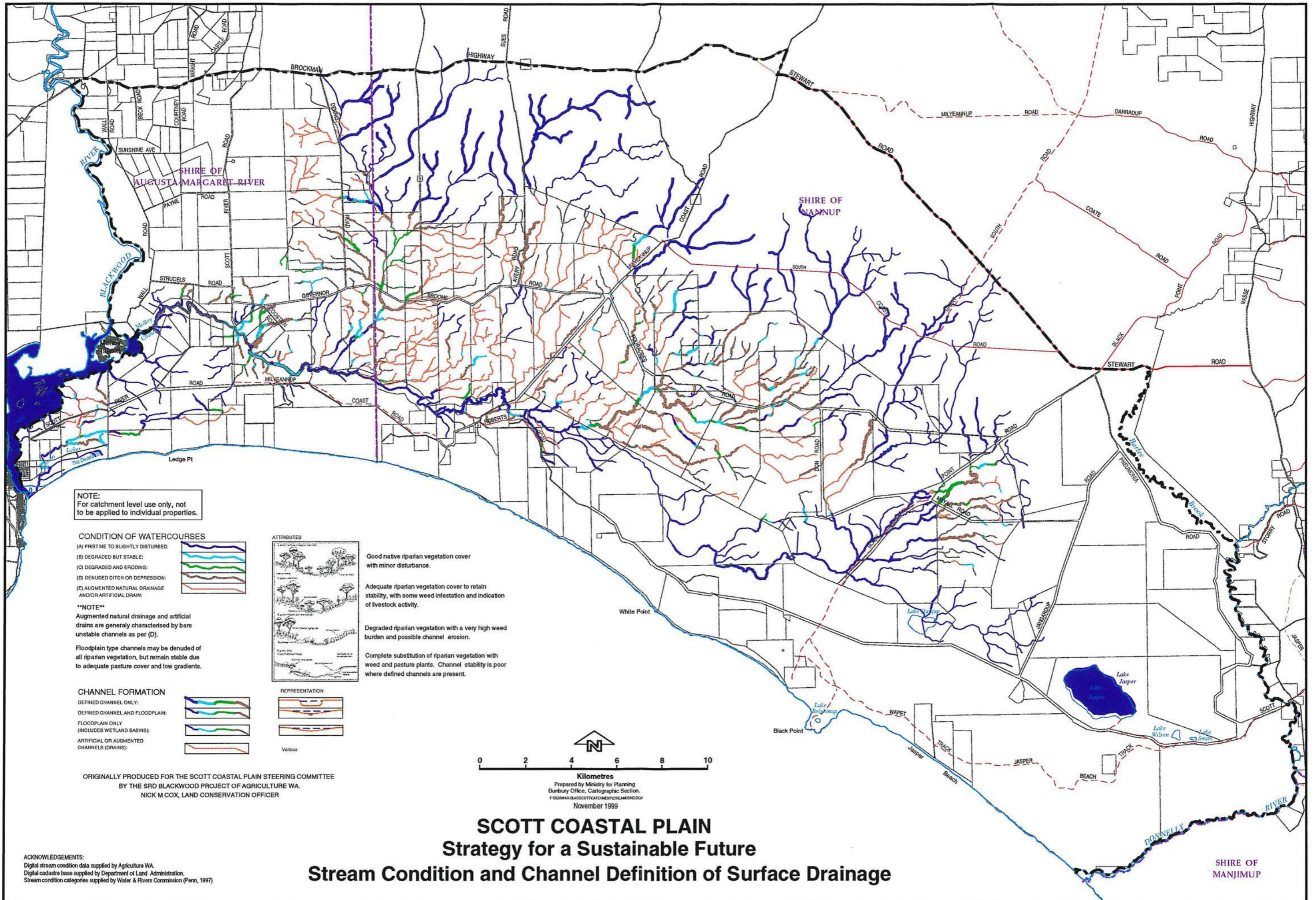
6.4 Local and catchment area approaches

This Strategy has developed an approach that recognises that the landscape, economic activity and communities cross the sectors that government agencies manage. Similarly it recognises that there are different managers and legal implications for different geographic scales in the landscape.

The development of a Strategy for sustainability of a catchment area will inevitably have to work within the sectors of government agencies. For example water issues tend to be managed by the WRC, land planning and allocation by the Ministry for Planning and local government.

Similarly the agency or individual that manages the landscape is determined by the size of area being considered. For example the Ministry for Planning and the Shires are concerned with the regional allocation of land to different uses and the preparation and administration of town planning schemes and region plans. The individual landowners are responsible for the management of their properties and farms. In contrast to this the WRC are the managers of water resources within the catchment but also have legislative powers to license bore use at the farm level.

These ideas are discussed further in the implementation section.



NOTE:
For catchment level use only, not to be applied to individual properties.

CONDITION OF WATERCOURSES

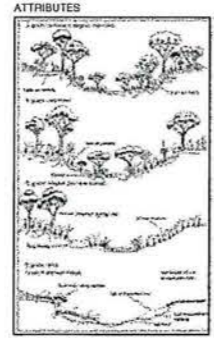
- (A) PRISTINE TO SLIGHTLY DISTURBED:
- (B) DEGRADED BUT STABLE:
- (C) DEGRADED AND ERODING:
- (D) DENUDED DITCH OR DEPRESSION:
- (E) AUGMENTED NATURAL DRAINAGE AND/OR ARTIFICIAL DRAIN:

****NOTE****
Augmented natural drainage and artificial drains are generally characterised by bare unstable channels as per (D).

Floodplain type channels may be denuded of all riparian vegetation, but remain stable due to adequate pasture cover and low gradients.

CHANNEL FORMATION

- DEFINED CHANNEL ONLY:
- DEFINED CHANNEL AND FLOODPLAIN:
- FLOODPLAIN ONLY (INCLUDES WETLAND BASINS):
- ARTIFICIAL OR AUGMENTED CHANNELS (DRAINS):

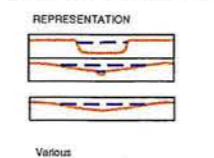


Good native riparian vegetation cover with minor disturbance.

Adequate riparian vegetation cover to retain stability, with some weed infestation and indication of livestock activity.

Degraded riparian vegetation with a very high weed burden and possible channel erosion.

Complete substitution of riparian vegetation with weed and pasture plants. Channel stability is poor where defined channels are present.



ORIGINALLY PRODUCED FOR THE SCOTT COASTAL PLAIN STEERING COMMITTEE
BY THE SRD BLACKWOOD PROJECT OF AGRICULTURE WA.
NICK M COX, LAND CONSERVATION OFFICER



Kilometres
Prepared by Ministry for Planning
Bunbury Office, Cartographic Section.
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November 1999

**SCOTT COASTAL PLAIN
Strategy for a Sustainable Future
Stream Condition and Channel Definition of Surface Drainage**

ACKNOWLEDGEMENTS:
Digital stream condition data supplied by Agriculture WA.
Digital cadastre base supplied by Department of Land Administration.
Stream condition categories supplied by Water & Rivers Commission (Penn, 1997)

SHIRE OF
MANJIMUP

7. WATER MANAGEMENT STRATEGY

7.1 Introduction

The Water Management Strategy (WMS)¹ aims to assist land managers to manage the water resources of the Scott Coastal Plain. Guidelines aim to minimise the off-site effects to agreed environmentally acceptable levels whilst allowing for diversified sustainable land use. The WMS is focused at an 'on-farm' scale of water management.

The following land uses have had individual WMSs described:

- Irrigated agriculture
- Timber plantations
- Grazing/dairy
- Roads
- Conservation
- Mining

The above land uses have been identified through public consultation as relevant to the SCP. The strategies for water management have been partly based on accepted BMP and the remainder have been developed by the Steering Committee as draft guidelines for managing water flows, water quality and impacts from land uses.

Limited data is available for the Hardy Inlet, but what is available indicates that nutrient concentrations are of concern. Elevated total nitrogen, nitrate/nitrite and filterable reactive phosphate concentrations were recorded in August 1995. In addition, consistently elevated ammonium concentrations have been recorded on five separate occasions between December 1994 and December 1998 throughout the estuary. There are a number of sources of nutrients into the Hardy Inlet

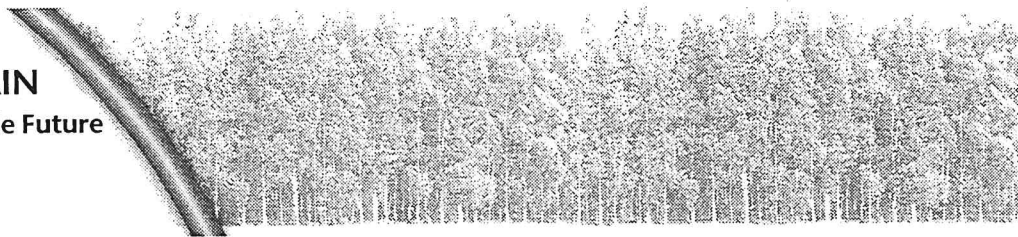
(the townsite of Augusta, the Scott River, the Blackwood River and Molloy Island). Monitoring has given us comparisons of inputs from the two main tributaries but has not conclusively identified the proportion and origin of nutrient inputs.

The Scott River is tidal for approximately 8 km upstream and above this point is classified as fresh. In recent years WRC monitoring has, on numerous occasions, found nitrogen and phosphorus concentrations to be above ANZECC National Water Quality Guidelines.

Sediment build-up in creeks and streams of the Scott River presents an important issue. Once sediment is in drains and creeks there is a great risk of movement into the Scott River and further down into the Hardy Inlet. Sedimentation of the Scott would have an effect on the biodiversity of the system as it would cover natural riverbed habitats, remove pools from the system and may have high nutrient levels associated with it.

A key issue relevant to the Scott River is the level of tannins in the water, which appears as brown staining. The colour of the Scott River water is thought to play a key role in preventing algal blooms by limiting light penetration and binding phosphorus. Tannins originate from native vegetation and as such the protection of native vegetation is a key issue for this Water Management Strategy. Cleared sub-catchments have continued to have high levels of tannins. This is probably due to detritus build-up in soil. Initial monitoring by the WRC has identified a link between tannins and total phosphorus in the Scott River and further investigation into the source and the interaction of the colour in Scott River water will be necessary.

¹ The majority of this Strategy has been prepared by the Water and Rivers Commission except for the discussion of drainage which was prepared by Agriculture Western Australia.



7.2 Statement of intent for water management on the Scott Coastal Plain

To ensure that all land use on the Scott Coastal Plain is conducted to minimise the off-site impacts while allowing for an economically competitive product.

Aims of water management:

- Protect water quality (physical, chemical or biological).
- Maintenance of water levels to protect wetland systems.
- Protect and enhance soil stability to minimise soil erosion.
- Protect the biodiversity of significant wetlands and waterways including the Scott River and Hardy Inlet.
- Protect native vegetation to maintain the colour of Scott River water.

Development in the SCP may introduce new land use with specific water management considerations that have not been covered here. The general principles of water management for the SCP (Section 7.3) should be considered for all further development or intensification of land use.

7.3 General water management principles for all land use

- Limit the risk of pollution by applying fertilisers, herbicides, pesticides and irrigation according to best practice guidelines.
- Limit off-site impacts by maintaining run-off on-site to allow for short-term storage and/or treatment of pollutants.

- Maintain native vegetation so as to maintain the colour of the Scott River to reduce the risk of algal blooms in both Scott River and Hardy Inlet.
- Maintain the sub-catchment water balance with particular emphasis on the effects of changes in water levels and flow regimes to conservation areas (wetlands).
- To develop water quality targets by land use. These targets need to be developed as interim targets initially and reviewed regularly in the light of new monitoring data for each sub-catchment. The continued improvement of BMP within any land use will be tied to meeting these targets.
- Address community concerns about a given land use.

7.4 Irrigated agriculture

7.4.1 Strategy rationale for irrigated agriculture

The Guidelines for Groundwater Well Licences, being prepared by the WRC, will work in conjunction with and consider the guidelines for water management outlined in this Strategy. The draft BMP guidelines for irrigated agriculture have been prepared by the Scott River Horticultural Growers Group and AGWEST (Appendix 28).

Proposed water management practices will need to be monitored and evaluated to ensure they are effective in protecting environmental values. Water management practices may prove effective in minimising any adverse effects of irrigated agriculture.

Issues have been identified for soils with low phosphate retention index (PRI) which are irrigated in summer and have high water-tables within a flat landscape. This does not represent the whole of the SCP, merely the highest risk situation that is encountered there. These issues include the potential for surface run-off of nutrients and chemicals and from possible leaching once the pollutants are in contact with the groundwater. Risks of nutrient impact off-site are influenced by soil

type, separation distance from environmental features and surface water flow management. Management therefore needs to minimise the use of nutrients and chemicals and minimise the opportunities for export of these nutrients and chemicals off-site.

7.4.2 Water management guidelines for irrigated agriculture

- All new proposals for irrigated agriculture and proposals to increase area for existing operators, will be assessed by the joint agency working group using the draft Assessment and Approval Process for New Irrigated Agriculture Proposals Scott Coastal Plain (Appendix 24). The assessment criteria for assessing the risk of phosphorus export from irrigation proposals include risk assessment based on soil type, depth to groundwater, on-site management practices and separation distance from environmental features such as rivers, wetlands and nature reserves.
- Site selection and layout of irrigation areas is critical to minimising the potential for nutrients to move off-site and land managers should discuss options for siting and design with both professional consultants and agency staff before commencing site establishment work (WRC, AGWEST).
- Irrigation sites should be established with an appropriate separation distance from features such as rivers, wetlands and conservation areas. The following table, taken from the guidelines for assessing the environmental risk of irrigated agriculture (Appendix 25), is the recommended guide to separation distances.
- Irrigation areas should be established on sites where surface water streams and drains do not flow across the site during winter. Minor streams and drains may be diverted where flow volumes during winter are low, it is not recommended that larger volume streams and drains be diverted due to high risk of erosion, and high cost of earthworks and rehabilitation/stabilisation works. Diversions should not be at a greater slope than the original stream or drain and professional advice is recommended for planning and constructing drainage works.
- Sub-surface drainage should not be installed without notification of intentions to AGWEST (refer Appendix 24), conformance with these guidelines for water management and inclusion of nutrient stripping systems for drainage discharge water. It is recommended that professional advice is obtained for planning and constructing sub-surface drainage systems to include nutrient stripping functions.
- It is recommended that consideration is given to relocating established pivot sites where a stream flows across pivot site during winter and the stream is difficult or costly to divert.
- Whole of property and whole of catchment nutrient generation should be considered when assessing proposals for irrigated agriculture.
- Land managers, using data they have collected locally, will develop water quality targets. Targets will consider the environment of individual sub-catchments and will be adapted with the goal of continuous improvement.
- Irrigation sites should operate in accordance with the BMP for the SCP and as such should direct run-off from irrigation areas through nutrient and sediment stripping systems and should maintain soil moisture to the root zone but not flush beneath the irrigation area during a cropping season.

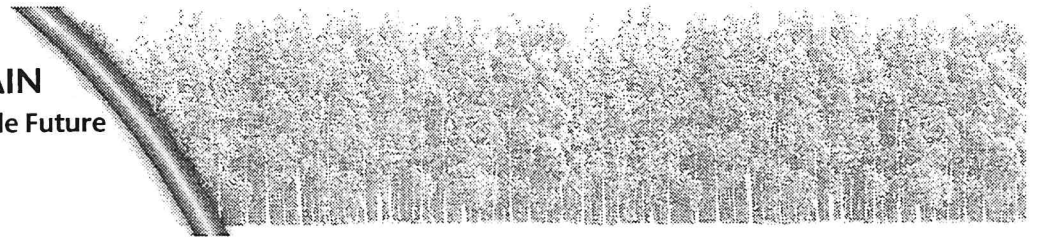
Table 5. Separation distance from irrigation sites: Guidelines

Feature	m
Conservation area (national parks and nature reserves)	200
Inlet or river (the Scott and the Hardy)	100
Wetland (as defined earlier in the document)	50
Creek or stream (fourth order and above only)	30
Bushland down slope	30

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Water Management Strategy



- During the summer cropping season, any sub-surface drainage of irrigation plots should be collected and, where practical, reused on the site during a crop season. Winter run-off from irrigation sites should be directed into detention systems, vegetated streamlines or wetlands on the property which will perform nutrient and sediment stripping functions, before leaving the property to enter identified **Key Streams** (refer to Appendix 4 on Surface Water Management).
- Fertiliser regimes should follow BMP for fertiliser application and soil amendment. Timing and placement of fertilisers should be such as to maximise the return from investment and minimise off-site effects. Fertiliser application strategies should not exceed crop requirements and should be determined by soil and plant tissue testing.
- Pest and weed eradication chemical applications should be operated in accordance with BMP.
- Works to retain and treat all pollutants on the property during the cropping season should be employed on all irrigation sites and may be required as a condition of approval for groundwater well licences issued through WRC.
- Cover crops should be established on irrigation sites immediately following harvesting of horticultural crops, to prevent erosion and use residual nutrients. Stock should be excluded from the sites until the cover crop has established and hardened off.
- Monitoring of groundwater or surface water adjacent to or downstream from irrigation sites may be required as a condition of approval for groundwater well licences issued through WRC. This monitoring will help to determine off-site environmental effects and to set water quality targets.
- Remaining native vegetation should be protected with fencing from stock. Commercial eucalypts or native vegetation should be used in buffers and windbreaks

to help reduce nutrient losses from the site and to help maintain tannin levels on the Scott. It is thought that the brown colour of the tannins inhibits algae growth in the Scott River.

7.5 Grazing and dairy

7.5.1 Strategy rationale for grazing/dairying

Water and nutrient management are issues because the land cleared for pasture has been shown to have higher run-off of water and nutrients and the increased nutrient loads pose a eutrophication risk to downstream water bodies. Constructed drainage has in some cases caused erosion and increased nutrient export during winter.

Grazing conducted in rotation with horticulture presents another issue as the surface water management for horticulture may require compromise with the requirements for grazing. The main sources of nutrient run-off from sheep and cattle production are fertilisers, dung and nitrate nitrogen produced by leguminous pastures, mainly clover. A portion (less than 10 per cent) of phosphorus fertiliser applied to pastures is leached from the soil into streams, mainly within several weeks of application. Sources of nutrients from grazing land include manure and fertiliser deposited directly into streams.

To minimise pollution of streams, paddock management practice is the first line of defence. The type, application rate and time of application of fertilisers should be determined by soil testing. For dairying, the same paddock drainage management guidelines should apply as for grazing. If pasture is to be irrigated in summer, the guidelines for irrigated agriculture should be applied.

With dairying there is the additional risk of stream and groundwater pollution from dairy shed, yard and laneway effluent. The risk from dairy effluent to the Scott River can be minimised if the *Dairy Effluent Management Guidelines* (see Appendix 30) are followed.

7.5.2 Water management guidelines for grazing/dairying

- Timing and placement of fertilisers should be such as to maximise the return from investment in fertilisers and minimise off-site effect. Fertiliser regimes should be operated in accordance with BMP and application rates should be guided by soil testing.
 - Wherever possible, timing of fertiliser application should aim to avoid periods and areas of intense run-off. Fertiliser regimes should avoid application in waterways, drains or inundated areas.
 - Initial planning should incorporate appropriate separation distances from waterways and wetlands.
 - Measures should be taken to decrease the risk of nutrient pollution of waterways. Any stock access to streams should be managed and this may include managing stock access to streams, or possible stock exclusion. 'Stream lining', fencing and revegetation of major streams is effective and is recommended for the larger 'key streams' (Appendix 4). Community funding assistance may be necessary for this to happen. Stream lining also reduces the risk of pollution from chemicals that may be applied to pastures.
 - Where streams and drains are to be fenced, stock crossings and water access points should be sited and constructed to ensure the efficient management of stock and the protection of stream and drain banks from disturbance and subsequent erosion.
 - Dairies should follow the *Dairy Effluent Management Guidelines* for the management of dairy effluent. Particular care should be taken to site dairy sheds and effluent ponds on higher ground away from streams. Effluent ponds should be excavated into clay subsoils, as trials have shown that groundwater pollution occurs near ponds excavated into sandy soils. The treated liquid effluent should be irrigated or spread onto pastures on higher ground that is not inundated in winter.
- If drainage is to be constructed in the paddock, it should be properly designed and surveyed according to drainage best practice, i.e. be broad, shallow, vegetated and of very low gradient. Construction of drains on higher order streamlines with large catchments should not be attempted (see Section 7.11).

7.6 Timber

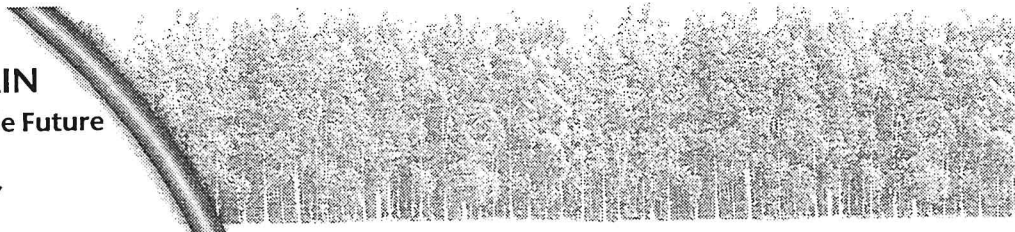
7.6.1 Strategy rationale for the timber plantations

The timber plantations have adopted a comprehensive code of practice that presents guidelines for many of the industry's issues. The *Draft Code of Practice for Timber Plantations in Western Australia* (Appendix 31) will be used as the source document for the recommendations in this Water Management Strategy.

The issues for surface water management that arise from the timber plantations centre around the risks of erosion and run-off of fertilisers and pest and weed control chemicals. Establishment and harvest are seen to be high-risk times, as vegetation cover does not protect the soil during these times. Previous to mound ploughing the area is heavily treated with herbicides.

Farm forestry has potential for improved economic returns over grazing and also has landcare benefits. Plantations can be used as windbreaks, can lower the superficial watertable, can provide nutrient stripping and soil stabilisation. Community consultation has also highlighted possible negative and social effects of increased timber production.

There are mixed community reactions to the possibility of increased timber production, leading to a decrease in the groundwater level in the area. It is felt that a decrease in the watertable may result in community change in the remaining native vegetation of the SCP. Others see the possible decrease in the watertable as a means to alleviate seasonal inundation of land.



Community concerns relating to plantation timber production include the impacts of fertilisers and biocides, water use and potential for impact on wetlands. Monitoring will need to be carried out to determine the validity of some of the concerns. Retention basins will be the main tool used to control all water on individual properties. These systems will allow a degree of nutrient stripping and trapping of other chemicals that may run off.

Roads and firebreaks that service plantations also raise water management issues as they can generate large amounts of run-off.

7.6.2 Water management guidelines for plantations

- Plantation design and operation will be guided by the established *Draft Code of Practice for Timber Plantations in Western Australia* and by this Strategy for management of drainage in establishment of tree plantations.
- The relevant agencies (primarily CALM and AGWEST) and industry bodies support the formation of a 'Timber Plantations – Code of Practice Advisory Committee'.
- Nutrient stripping basins and retention basins will be used to control run-off from plantations during high risk times for erosion and pollution. Specifically nutrient stripping and retention basin should be designed to manage run-off during the first two years of plantation establishment. An attempt should be made to make such structures multiple use water points, as required under the plantation *Fire Protection Guidelines 1991*.
- Every effort should be made to maintain vegetation between rows of planted trees for soil stabilisation purposes.
- Monitoring programs for surface water should be implemented to determine the effectiveness of the site works in controlling pollutant run-off.

- A quadrant of piezometers should be established in and around plantations to determine the draw down effect on groundwater over the life of the plantation. Careful attention should be given to minimise localised draw down effects on groundwater levels around wetlands of conservation value.
- Chemical spraying and drainage works, for timber plantations, need to take account of potential for impacts on adjacent landowners, streams and wetlands.
- Surface water management needs to be incorporated into the plantation design and designed to minimise erosion and sedimentation.

Recommendation 3

It is recommended that investigation and research be conducted by CALM and AGWEST into minimising use of fertilisers and biocides in plantations and improved methods for control of the run-off of fertilisers and biocides during the establishment and ongoing maintenance of plantations.

7.7 Mining

7.7.1 Strategy rationale for mining

Mining operations are often established under State Agreements, thereby limiting the application of this type of regional document for guiding land management. Water management concerns have been raised by the community with regards to the use of groundwater, environmental disturbance and chemicals emitted due to the exposure of acid sulfate soils.

With the closing of the Beenup mine site community concerns have been raised as to the clean-up of the site. Proposals by BHP for the site clean-up are currently being considered by EPA and have been open for public comment this year.

Guidelines adopted here are intended to guide agencies and mining companies.

7.7.2 Water management guidelines for mining

- The availability of natural resources, such as groundwater, lime and gravel, to traditional users should be considered by mining companies and decision-making authorities when additional mining or exploration activities are developed.
- Local community concerns should be considered when formulating water management options for the decommissioning of the Beenup mine site.
- Mining activities not covered under the mining or Environmental Protection Acts (e.g. gravel and lime extraction) should adopt BMP to minimise soil erosion.

7.8 Conservation

7.8.1 Strategy rationale for conservation

Issues have arisen from the community with regards to drainage of conservation areas. These issues are site specific and have arisen due to inconsistent drainage approaches within sub-catchments. While conservation areas are managed to preserve biodiversity other aspects of their management related to water such as the water balance, soil stabilisation and tannins need to be looked at.

The level of tannins in the water of the Scott River is seen as being a key buffer in preventing the high nutrient levels resulting in algal blooms. Tannins originate from plant material, specifically native vegetation, they colour the water limiting light penetration and also bind phosphorus allowing it to be flushed from the system and decreasing nutrient availability.

The need for preservation of biodiversity is widely accepted as being the guiding principle for the management of conservation areas.

The value of conservation areas does extend beyond biodiversity, especially on the SCP.

7.8.2 Water management guidelines for conservation

- It is recommended that consideration be given to the effects, on a sub-catchment level, of vegetation change with respect to tannin input to the Scott River, erosion risk and the water balance of the sub-catchment.

Recommendation 4

It is recommended that the Water and Rivers Commission initiate a research project to determine the sources of the colour in the Scott River and their contribution to the river's quality and ecology.

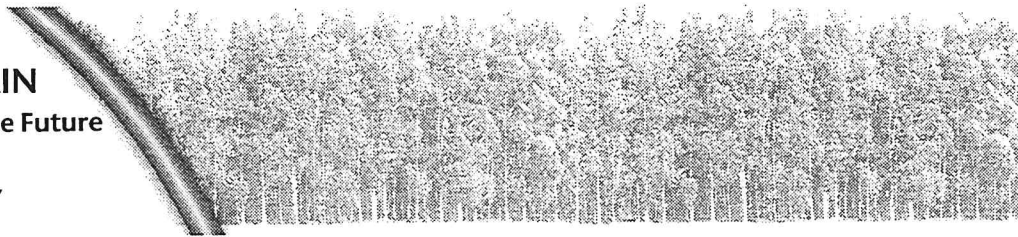
Recommendation 5

It is recommended that CALM participate as a stakeholder in all sub-catchment planning for the Scott Coastal Plain. This process negotiates drainage options and is outlined in Section 7.11.

7.9 Roads

7.9.1 Strategy rationale for roads

The principle of limiting off-site impacts should also be applied to road construction. The community has highlighted flooding and drainage problems that drainage with present roads is causing. The small rate base in the SCP limits council's ability to upgrade roads. Purpose built roads are being constructed for the mining industry and timber plantations – and are consequently affecting tourism and agriculture.



Poor sand sub-grades combined with minimal gravel depth result in the roads not being able to sustain heavy haulage traffic. Ongoing developments including mining, intensive agriculture and plantation timbers will result in increased use, particularly heavy vehicular traffic.

Many sections of road are too low and are subject to frequent flooding. Some sections have no drainage culverts at all which results in localised flooding. Increased peak run-off from upstream clearing and site drainage works also puts increased pressure on the road drainage system. Some of the downstream drains and creeks have become overgrown and silted up, further restricting drainage.

7.9.2 Water management guidelines for roads

- Upgrade and maintain all-weather road access for all existing and future road usage.
- Reduce the sections of road subject to localised flooding.
- Pursue funding options to assist in the upgrade of the road network.
- In conjunction with upstream and downstream land users, develop road drainage design parameters that complement whole of catchment drainage plans.
- Determine road width and construction standards for the anticipated road usage.
- Maintain roadside vegetation.
- Adopt BMP for erosion control during construction and maintenance of roadways.
- To develop water quality targets for roads. These targets need to be developed as interim targets initially and reviewed regularly in the light of new monitoring data for each sub-catchment. The continued improvement of BMP for roads will be linked to meeting these targets.

Recommendation 6

It is recommended that the Shires in association with Main Roads Western Australia and local landholders investigate how their road building activities can be incorporated into sub-catchment drainage planning (Section 7.11). This investigation should particularly address improving road planning and construction so that the impacts of road construction and maintenance on the regional and local drainage regimes are minimised.

7.10 Water quality targets: our first attempt

7.10.1 Overview

Environmental water quality targets for general water quality in Hardy Inlet and Scott River will be set to provide a guideline for future monitoring and management.

General water quality standards such as ANZECC National Water Quality Guidelines have set a national 'number' on parameters to determine how good your water is. However, a slightly different approach will be taken for setting the adaptive water quality targets for Scott River and Hardy Inlet.

There are two principles that need to be followed in order to have confidence in any targets that are set:

1. The targets should be based on an agreed standard or measure of quality.
2. Clearly identifying a pass or fail to meet the targets.

The Steering Committee has decided that both the River and the Inlet are generally in reasonable health (after comparing them to other rivers and estuaries and National Standards).

The Steering Committee has resolved to make the water quality targets equal to the current water quality in Scott River and Hardy Inlet, except where they might be above National Standards.

If the water quality drops below these targets, or fail to meet the targets and the targets are still valid, then there is a problem that needs attention.

Passing and failing targets

A random sampling system for water sampling is being used in monitoring programs, because sampling of waterways cannot be done on a continuous (24 hours around the clock) basis. Because it is random, there is a degree of 'natural' variability in the samples that are collected, i.e. there are natural high and low points. However, when a decision is made on passing or failing the set targets, the occasional high sample should not automatically lead to failure. It is a better approach to decide on how many samples will be allowed to be higher than the target before it is deemed to have failed.

Once targets are set, if a sample is above the target the sample won't necessarily fail the target. A method called compliance monitoring is used here. It is generally accepted that if more than half (> 50 per cent) of the entire samples in a given sample period (usually a year) are higher than the target then there is confidence that the system being sampled has failed. Less than half (< 50 per cent) and the system being sampled will have passed. It is important to remember to review the overall data for several years, to ensure the targets are not set too high or low.

This 50 per cent compliance rule is applicable to Scott River and it is the one that has been used to determine the initial targets (see Table 7). However, because the Hardy Inlet is a much more complex system (due to the influence of the Blackwood River and marine flushing) it is harder to know if the random samples really reflect the true water quality situation. To reflect this uncertainty the ANZECC guidelines suggest that a 20 per cent rule is used instead, i.e. if one-fifth of

the samples are higher than the target then there is confidence that the system being sampled has failed. This is the compliance rule that has been used for the Hardy Inlet (Table 6).

7.10.2 Water quality targets for the Hardy Inlet

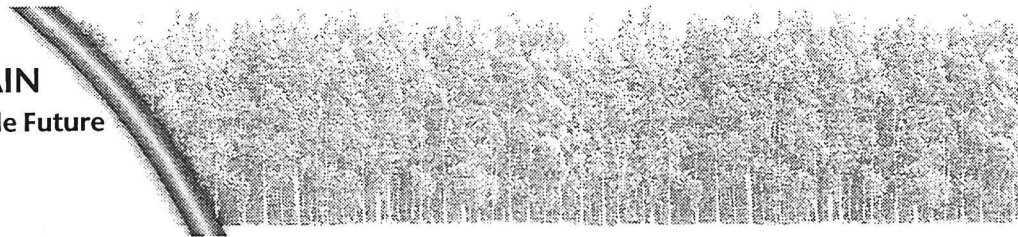
This is an example of how targets are set.

The inputs are:

- All existing historical data from the Hardy. The sampling program has been running for a year so targets will be based on this data. It is usual to base targets on three years of data. This means that the targets will need to be updated when three years worth of 'start up' data has been collected.
- Data from similar environments. None was used in the first attempt but since it has been suggested that data from the Wilson Inlet be examined.
- Established water quality guidelines. The ANZECC National Water Quality Guidelines. Hardy Inlet has been shown to frequently exceed the ANZECC National Water Quality Guidelines targets for nutrients, yet the Inlet has not experienced severe algal blooms. The guidelines may not be relevant for this environment.
- The perception of the status or health of the Hardy Inlet. This is a value judgement and is perhaps the most important factor in setting the targets. The general perception has been that Hardy Inlet is healthy, despite some 'high' nutrient levels.

The decisions made were:

- Hardy Inlet appears healthy so targets are set at present levels with the 'fail' or compliance component designed to report on a significant change from the present status.
- There are 12 sites in the Hardy Inlet sampling program; they measure different areas of the Inlet. The strength of the target setting comes from data relevant to the specific environment, that is, the input



from existing data. With limited 'start up' data, targets will not be established for the different areas of Hardy Inlet. One target will be set for the Inlet as a whole. As the three years start up data is collected, targets for the different areas of the Inlet can be set.

Compliance with targets is tested by analysing the compliance data set to determine if more than 20 per cent of the data points are greater than the target. Such a small sample makes it hard to say with certainty that there are more than 20 per cent of the data points over the target. So in this example, with once-monthly sampling for 12 sites, 39 (26 per cent) of the 144 samples need to be above the target before the system being sampled will fail.

The following parameters have been chosen to have targets set for them:

1. FRP – filterable reactive phosphate. This is a measure of the phosphorus that is readily available for plant uptake and the potential for algal growth.
2. DIN – dissolved inorganic nitrogen. This is a measure of the nitrogen that is readily available for plant uptake and the potential for algal growth.
3. Chla – chlorophyll A. This is a measure of the amount of one of the photosynthesising pigments in all plant life. This measurement tells us how much algal growth is actually occurring.
4. NH₃ – ammonia. Ammonia is one of the parts of DIN, but it is also important because high levels are toxic and this target measures the risk of toxicity to both plants and animals from ammonia.
5. DO – dissolved oxygen. It is essential to have oxygen dissolved in the water for fish to live. This target measures the risk of fish being killed through low oxygen levels. (Note the compliance rate is set at 15 per cent, based on 10 per cent figure plus 5 per cent uncertainty, because it is the occasional dramatic drop in DO that can cause problems, not the average levels).

Table 6. The water quality target levels for Hardy Inlet

Parameters	Target	Units	Excursion rate	No. of samples	≥ No. of samples fail
NH ₃	≤ 0.023	mg/L	0.20	144	38
DIN	≤ 0.043	mg/L	0.20	144	38
FRP	≤ 0.007	mg/L	0.20	144	38
Chla	≤ 0.002	mg/L	0.20	144	38
DO	≥ 87.3	% Sat	0.10	144	22

7.10.3 Environmental water quality targets for the Scott River

The process for setting targets, described above, was also used for the Scott River.

The decisions made were:

- The Scott River appears healthy, with the exception in point 3 below, so targets are set at present levels with the 'fail' or compliance component designed to identify a significant change from the present status.
- There are three sites currently used to gather data from the Scott River. Due to the small data set available, there is considerable uncertainty regarding the existing water quality. Thus the proposed targets presented here are intended as interim values only. They should be revised in several years' time when more information is available.
- The exception is that, based on ANZECC guidelines, the observed levels of dissolved inorganic nitrogen (DIN) are considered to be too high. An incremental target was therefore set. This is a target, which under current conditions will fail. However, this provides a target, literally, to aim for.

Compliance with targets is tested by analysing the compliance data set to determine if more than 50 per cent of the data points are greater than the target. A small sample makes it hard to say with certainty that there are more than 50 per cent of the data points over the target. So in this example, 26 (65 per cent) of the 40 samples need to be above the target before the system being sampled will fail.

The following parameters have been chosen to have targets set for them:

1. FRP – filterable reactive phosphate. (See Section 7.10.2 for description.)
2. NH₃ – ammonia. (See Section 7.10.2 for description.)
3. DIN – dissolved inorganic nitrogen. (See Section 7.10.2 for description.)
4. Turb – turbidity. Is a measure of how clear the water is (i.e. light penetration). It is affected by the amount of solids suspended in the water and has a major effect on the growth of algae and aquatic grasses.
5. Col – colour. Is another measure of light penetration. However, unlike turbidity, colour is a measure of the amount of fine solids (colloids) that are in suspension. This indicates the amount of tannins or iron oxides in the water.

Table 7. Proposed water quality targets for Scott River

Parameters	Target	Units
FRP	≤ 0.059	mg/L
NH ₃	≤ 0.037	mg/L
DIN	≤ 0.6	mg/L
Turb	≤ 8.1	NTU
Col	≥ 220	Gilvin 440

7.10.4 Reporting on targets

It is important that the community is kept informed of how it is performing in relation to these targets.

Recommendation 7

It is recommended that the Water and Rivers Commission coordinates the water monitoring programs as detailed in Appendices 7 and 8 and collates and reports on the data as required by the report card described in Section 11.

7.11 Sub-catchment planning and drainage management Strategy

7.11.1 Introduction

This Strategy presents a summary of the discussion paper *Surface Water Management within the Scott River Catchment*. See Appendix 4 for a full discussion of changes to the landscape through clearing and drainage work and additional technical information on causes of erosion and drainage design.

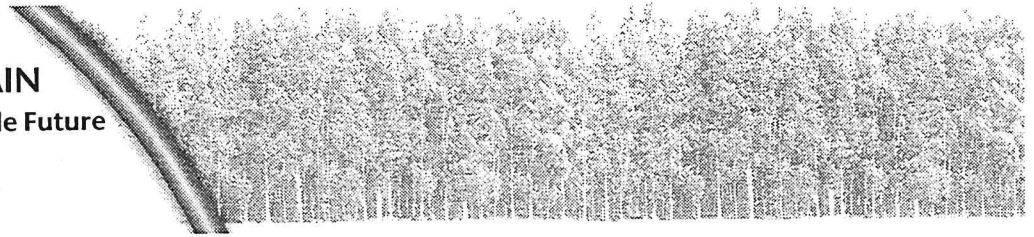
This section sets out a Strategy for managing surface water movement at sub-catchment level, involving all landholders, to maximise the interests of landholders and benefits to the environmental values of streams and receiving water bodies. It closes with discussion in regards to some potential options that may be implemented, or at least may change the way we think about managing catchment run-off.

7.11.2 Summary of the current situation

The action of clearing the native vegetation from, and draining extensive areas of the Scott River catchment and particularly the coastal plain, has had a significant impact on how surface water moves through the landscape.

The majority of cleared drains and watercourses within the catchment are subject to bank and channel erosion. Watercourses that have been identified on private land and left in a vegetated condition may also be subject to erosion and siltation, under increased pressure from livestock grazing and rising levels of, and intensity of, run-off. Drainage in the landscape is shown in Map 2.

The most common form of channel erosion found in naturally formed channels within the Scott catchment, is that caused by water flowing into the channel and/or undercutting of the bank. This results in the formation of gullies, away from the watercourse and the collapse of the banks. This is less serious than



scour erosion, which is influenced by the velocity and direction of flow, channel dimensions and soil texture. Poor alignment and the presence of obstructions increase meandering and cause erosion along the channel (Schwab 1981). This form of erosion is common in artificial drainage on private land.

The augmentation of surface drainage has occurred in an uncoordinated fashion, with the outlet point usually consisting of the nearest down slope watercourse, ditch or property boundary. The objective appears to have been to achieve the most rapid rate of surface drainage in order to reduce water-logging. This may not be in the best interests of downstream land users, who may be on the receiving end of increasing volumes of sediment laden drainage water. Further to this, the deposition of sediment within the natural drainage system of the downstream conservation areas will only serve to worsen the poor drainage situation within the catchment.

7.11.3 Principles for catchment planning

Catchment planning should aim to integrate as many aspects of land management as possible, including:

1. Drainage and earthworks, revegetation, remnant protection (including stream-lining), BMP, monitoring and evaluation.
2. It should be led by the local community, e.g. the LCDC, with technical support from State agencies such as AGWEST, Water and Rivers Commission and the Department of Conservation and Land Management.
3. Catchment planning should be collaborative and should aim to involve all stakeholders within a given catchment.
4. Catchment planning should be complemented by farm planning and individual business planning.
5. For catchment planning to be successful it must lead to action on the ground. Therefore a catchment Strategy should outline priorities and a timetable for action. This should not be seen as a contractual obligation for individual landowners, but instead as a fair and realistic way to move forward.
6. It requires acceptance at the land user level, that surface water management is a land use in its own right. This may require that areas of land need to be set aside solely for this purpose.
7. To maximise the effectiveness of any sub-catchment Strategy in a catchment with a high rainfall and diversity of land uses, surface water management requires coordination between all land users at the catchment scale and landowners at the property scale.

7.11.4 Integrated drainage

The first stage of development of the surface Water Management Strategy is to determine **key watercourses** within the catchment. This would involve an assessment of the drainage system at the catchment scale, involving factors such as catchment area and flow volumes, channel dimensions, current condition and usage. The network of **key watercourses** within sub-catchments provides for an integrated regional drainage approach.

Before conducting any on farm drainage works, planning should be done to ensure discharge water can be disposed of safely, without causing detriment to downstream land users or the environment. A **key watercourse** that is recognised by other landowners serves this purpose.

7.11.5 Channel stabilisation

The key element of the regional drainage network is stability. The purpose of the designated watercourses (whether they be streams, drains, banks or waterways) is to convey run-off water from high, to a lower level in the landscape, without resulting in

damage to the land surface. The process of improving the stability of watercourses is often referred to as streamlining (Heady 1994) and may involve:

Physical modifications (Schwab 1981 et al.) such as:

- the use of drop structures to reduce the gradient of the channel floor to result in the reduced velocity of flow within the channel;
- battering of vertical sides to allow for revegetation, hence preventing undercutting and bank collapse;
- the provision of rock rip-rap to the channel, to roughen the surface, therefore reducing the velocity of flow and to protect the surface;
- construction of poundage and detention areas along the watercourse;
- the provision of levee banks to confine extreme flow events to within the riparian area.

Vegetation cover:

The benefits of the presence of vegetation cover, including grasses, sedges and shrubs, in terms of safe carrying capacity, has been discussed above. The requirement is for the protection of the immediate soil surface so that particles cannot be washed away. In ephemeral watercourses, a dense cover of grasses and sedges is usually sufficient. Whilst large and/or perennial watercourses may require the presence of vegetation with a more significant root system, in conjunction with the surface vegetation, to impart greater stability.

Livestock management or exclusion:

The exclusion (or site specific management) of livestock from at least **key watercourses** is essential in maintaining a vegetative cover of any description on streamlines. The action of livestock trample stream and drain banks (Heady 1994) and detach soil particles within the channel, greatly increasing the potential for channel erosion.

7.11.6 Detention and safe disposal

It is not practical to discuss all available alternative surface water management practices potentially available at the property level, due the wide variety of land uses in the catchment. However, detention is one common theme that should be relevant to all new proposed sub-catchment and drainage plans. The detention of soil and the temporary detention of water.

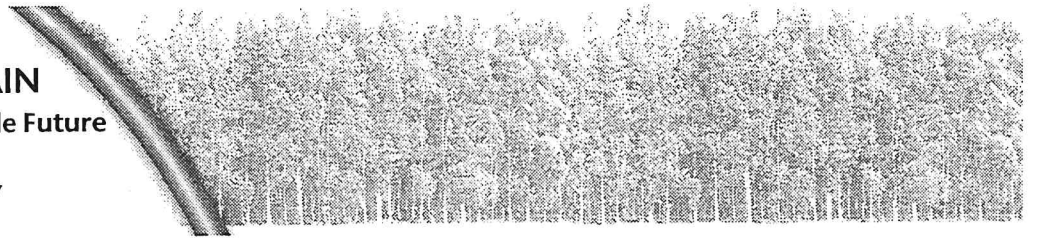
Channel erosion can be seen as a symptom that the dendritic tributary drainage network is unsuitable for use on cleared land, in an unprotected condition. The gradients of the channels are too steep for the regularly occurring peak run-off events. There is no ability to regulate the depth and velocity of flow within the channels. Hence, the result of drain failure (a term used to describe when a run-off event exceeds the design carrying capacity of earthworks) is channel erosion.

The orientation of a drain straight down the slope is also not seen to be the most conducive to water collection. In a relatively flat landscape, there may be no incentive (the force of gravity) for run-off to flow towards and into a drain. In many instances, run-off may proceed to flow parallel to the drain, or else may pond alongside. This necessitates the construction of additional feeder drains, extending out from the main channel.

With **key watercourses** designated within the catchment, landowners would have access to safe discharge areas that would extend high in the landscape. With the need for localised drainage to be used on the property, to convey water from high in the landscape, to the lowest point, negated, this provides for other water management options.

7.11.7 Contour drainage

The use of diversion banks to redirect stream flow around intensive horticulture areas, is already becoming an accepted practice within the catchment. These types of structures have the capacity to detain and divert large volumes of water, particularly when constructed on relatively flat ground.



A contour diversion bank or grade bank is essentially a drain that is constructed across the slope, perpendicular to the path of natural run-off. The spoil is placed on the down slope side of the open channel, to form a bank. These are surveyed at a controlled gradient, that is pre-determined by the anticipated amount of run-off, size of the structure and likely condition of the channel surface during a run-off event (i.e. well grassed or bare and sandy).

The structures are constructed such that they intercept water flowing across the landscape and divert it to a safe discharge area. In this instance, this may consist of a **key watercourse** or other form of stabilised watercourse or detention basin. The dimensions, length and number of structures required, depends on the situation and landowner's objectives.

This type of water control structure offers many advantages over conventionally orientated open drains. These include some of the following:

- reduced erosion potential;
- increased peak run-off detention period;
- reduces peak run-off events;
- improved drainage efficiency;
- improved trafficability;
- flexibility of use.

When used as water control structures on cleared land, diversion banks may provide the added benefit of increasing the summer green grazing area. Conversely, deepening of the channel may provide for groundwater relief, when used as a cut-off/interceptor drain around an area of intensive land use.

7.11.8 Strategy rationale for integrating drainage

The use of open drains, diversion banks, raised beds and sub-surface drainage is seen as ways to improve plant growth by reducing inundation and waterlogging. However, it is important to ensure that excess water is

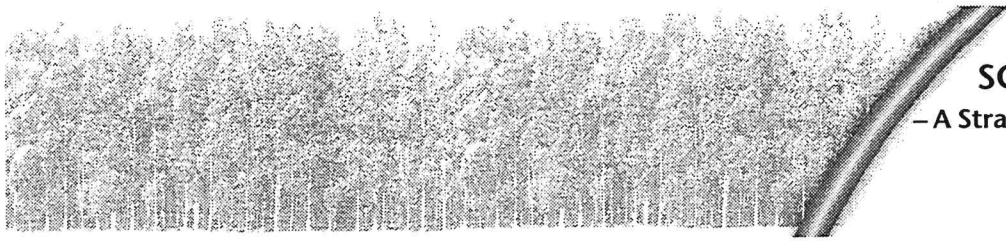
disposed of appropriately. Water management schemes should be undertaken in such a way as to ensure there are no adverse impacts on the downstream environment, including neighbouring properties.

This WMS can only make broad recommendations with regards to surface water management and drainage, as issues will be site-specific and will require a coordinated approach from all local stakeholders. Individual drainage proposals are best considered within the context of an overall catchment plan, agreed to by affected landowners and relevant statutory authorities.

Drainage is an important catchment issue. Inappropriate drainage can have a detrimental effect on infrastructure (roads), areas of environmental significance and downstream properties. However, a properly planned and implemented proposal has the potential to minimise the impacts on these assets as well as increasing the productivity of the land.

7.11.9 Water management guidelines for integrating drainage

- Drainage management proposals are best conducted on a sub-catchment basis, with the involvement of other landholders, where they may derive benefit or suffer impacts from the proposal.
- Sub-catchment groups involving all landholders should prepare a sub-catchment Strategy for drainage management and identify a **key watercourse** or stream to provide a safe area for disposal of drainage and discharge water.
- Drainage is only one component of an overall plan to better manage the affected land and reduce the potential for land degradation.
- Streamlining is recommended as the principal means of providing stability to drains and streams, in combination with re-vegetation, physical works and livestock management.



- The process of preparing sub-catchment plans and managing the involvement of each landholder and the work they want to do, is recommended to be carried out by the Lower Blackwood LCDC, with technical assistance from State agencies.

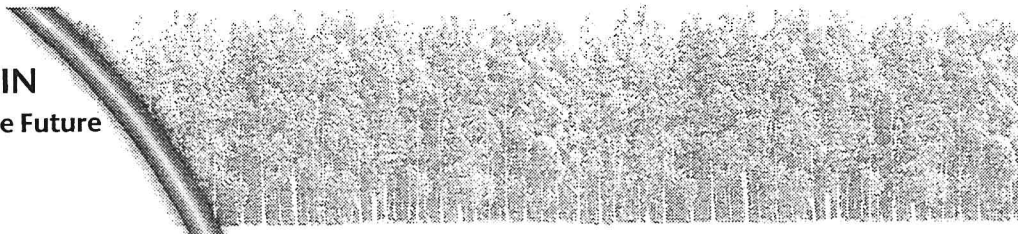
More specific options for integrating drainage within a catchment and a detailed process for sub-catchment planning are outlined in Appendix 4.

Recommendation 8

It is recommended that the Lower Blackwood LCDC coordinate the sub-catchment planning for drainage management in the Scott Coastal Plain area with technical assistance from Water and Rivers Commission and AGWEST.

References

- Heady, G. and Guise, N. (1994). Streamlining, an Environmentally Sustainable Drainage Network for the Swan Coastal Plain. Agdex 557, Department of Agriculture, Western Australia.
- Schwab, G.O., Frevert, R.K., Edminster, T.W. and Barnes, K.K. (1981). Soil and Water Conservation Engineering (third edition). John Wiley and Sons, United States of America.



FOCUS TOPIC

— FARM PLANNING FOR SURFACE WATER MANAGEMENT

INTRODUCTION

A beef grazing and irrigation property on Jangardup Road was selected as a case study and demonstration for a whole farm surface water management plan. The Management Plan shows where and how to improve the removal of surplus surface water from the landscape, whilst improving the stability and performance of the existing drainage network. It also highlights opportunities to decrease export of particulate matter in run-off from the property. The complete management plan is included in Appendix 12 and summarised in Figure 5.

The drainage works, which are incorporated into the natural drainage network, aim to:

- use and improve the existing natural drainage system as far as is practical;
- protect irrigation sites from flooding from upstream catchment areas; and
- improve the performance of each irrigation site and reduce the impact of high groundwater levels and waterlogging. This has been achieved for this site without the use of sub-surface drainage.

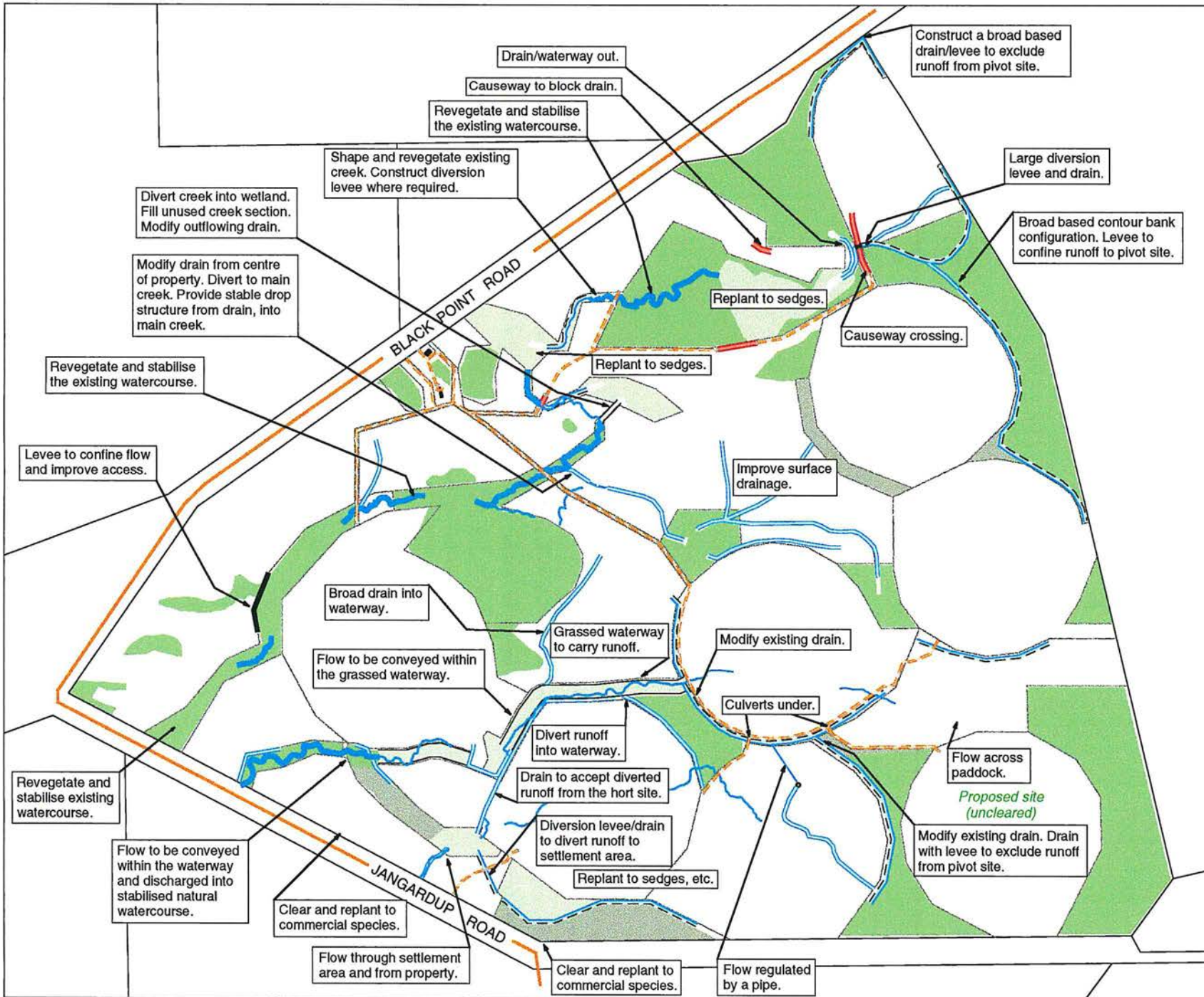
DESIGN CONSIDERATIONS

Critical factors to consider when starting out on a farm surface water management plan include catchment run-off, slope, watertable depth and potential water detention areas. These attributes are used to determine the dimensions, layout and specifications of proposed works, such as drains, levees and settlement areas.

The approach recommended in the Scott Coastal Plain is to:

- determine your run-off management goals and objectives, based on the desired land use;
- identify catchment areas and estimate anticipated run-off, based on calculations and experience;
- using mapping and field survey techniques (such as measuring levels) identify opportunities and constraints for improved run-off management on your property. These may include diversion of run-off away from cropping/grazing areas; the increased use of natural drainage and detention areas and the ability to safely drain waterlogged areas without off-site affects;

(continued next page)



LEGEND

EARTHWORKS

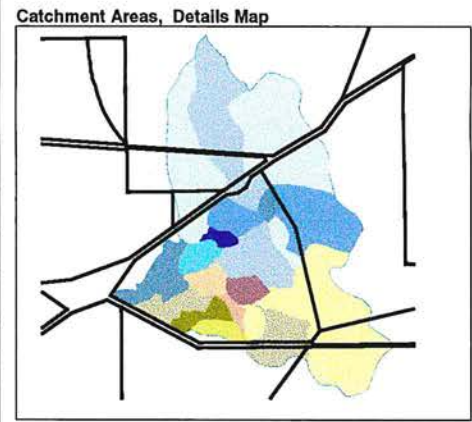
- Waterway
- Drain with spoil placed one side, to form levee
- Drain with spoil spread or removed
- Built up causeway crossing
- Levee bank
- Stabilised watercourse

INFRASTRUCTURE & LAYOUT

- Remnant vegetation area
- Reeds and sedges
- Tree lots - hardwood
- Roads - sealed/unsealed
- Fences - boundary/internal
- Watercourse

DETAILED WATER MANAGEMENT WORKS LEGEND

All works illustrated are as per the maximum dimensions required, i.e. drain widths are the maximum expected to be required along their lengths.



North arrow pointing up.

Scale bar: 0, 100, 200, 300, 400, 500 METRES

SCALE 1:20 000

November 1999

Simplified version of plan prepared by Agriculture WA (June 1999)

DEMONSTRATION: NELSON LOCATION 12894

Property Water Management Plan

Figure 5

(continued from previous page)

- determine the dimensions of the required works. Aim to construct earthworks in a stable manner using broad gentle batters in favour of vertical sides. Avoid over excavation and creating deep narrow channels that will erode. The use of levee banks in lieu of drains, to control flooding, is usually more cost effective and poses less risk of failure. Maximise the incorporation of existing watercourse and waterbodies on the property as they can reduce the overall cost of implementation and provide opportunities to detain and filter sediments and nutrients. Encourage growth of vegetation (may be pasture, reeds and/or shrubs) within and adjacent to earthworks and natural water features. This will reduce the potential for erosion and provide additional opportunities to trap suspended sediments;
- seek assistance from drainage consultants to design and construct surface water management works. It is essential to consider factors such as slopes on batters, in relation to soil types, to ensure the construction of a stable drain. Avoid the desire to over drain;
- monitor water entering and exiting the property to assess potential contributions of particulate matter and nutrients. This should be commenced prior to commencing the plan in order to ascertain the impact of surface water management works carried out.

RECOMMENDED WORKS

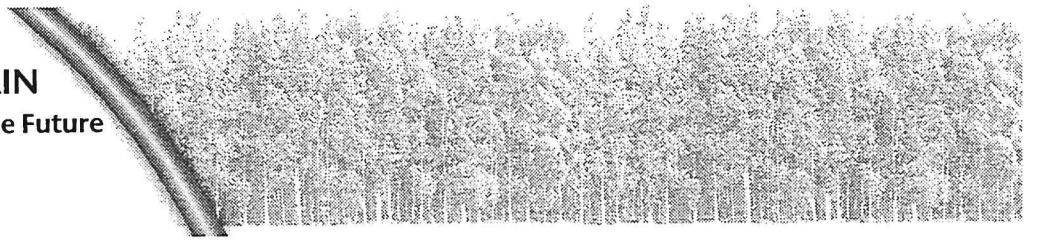
The works recommended for Nelson Location 12894 are a comprehensive mix of broad based levee banks, diversion drains, wide 'v' drains, detention areas, grassed waterways, fencing and revegetation.

The recommended works for each catchment area are annotated on Figure 5. The works program involves earthworks and other development on nearly every part of the farm. Some drains have already been constructed and require modification and vegetating. These works will be done by the landowner a little at a time as resources permit, with work on streamlining and fencing in Catchment 1 already underway.

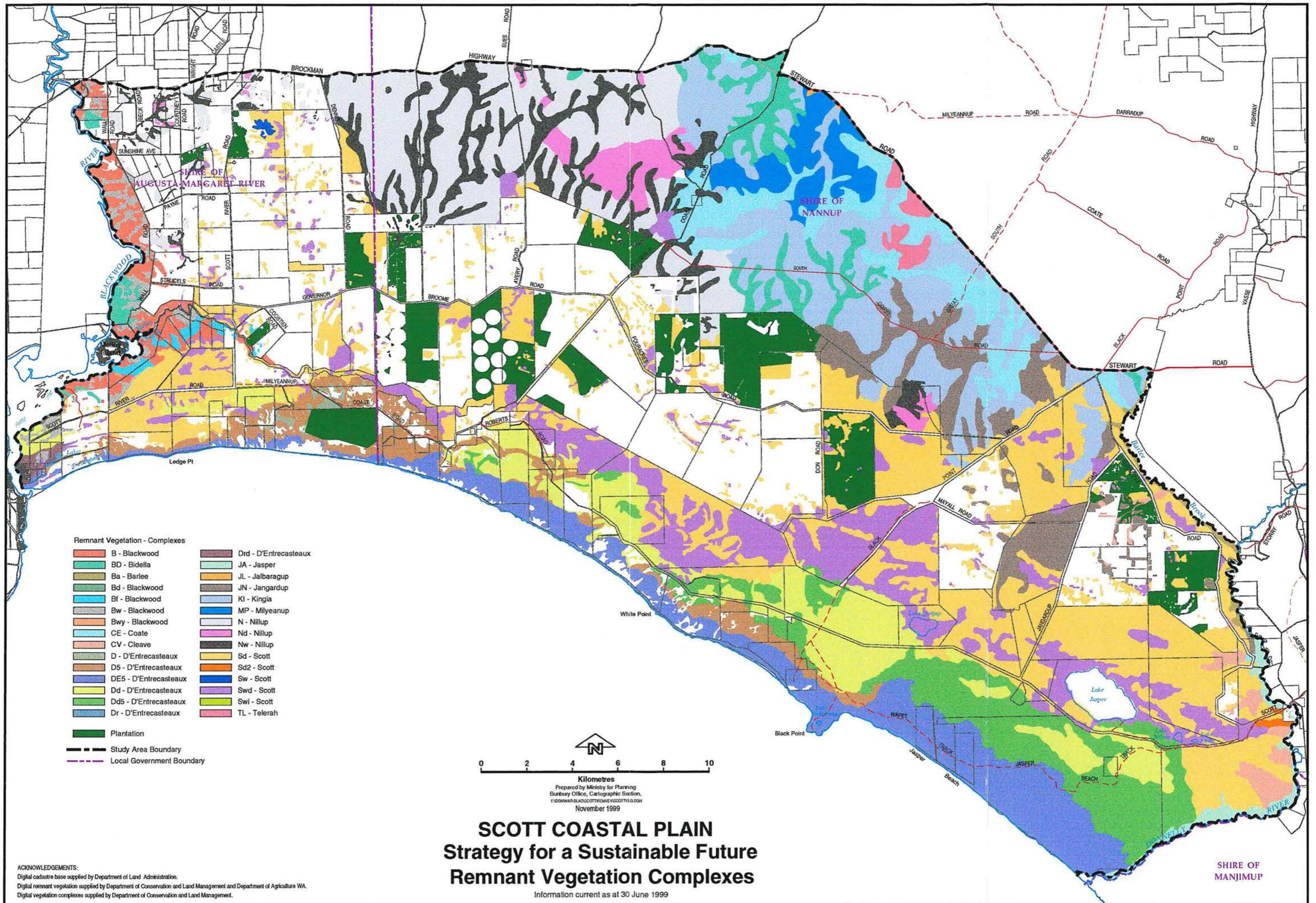
MONITORING

The run-off from this property has been monitored for several winters by WRC and the property owner. It is expected that reductions in nutrients and sediments will be evident with more of the works being completed. The results of water quality monitoring will be reported in the report card on sustainability for the Scott Coastal Plain.

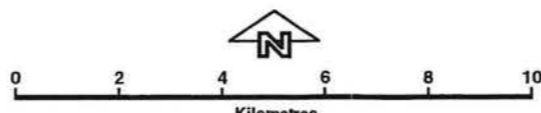
SCOTT COASTAL PLAIN
– A Strategy for a Sustainable Future



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- Remnant Vegetation - Complexes
- | | |
|--|---|
| B - Blackwood | Drd - D'Entrecasteaux |
| BD - Bidella | JA - Jasper |
| Ba - Barlee | JL - Jalbaragup |
| Bd - Blackwood | JN - Jangardup |
| Bf - Blackwood | KI - Kingia |
| Bw - Blackwood | MP - Milyeannup |
| Bwy - Blackwood | N - Nillup |
| CE - Coate | Nd - Nillup |
| CV - Cleave | Nw - Nillup |
| D - D'Entrecasteaux | Sd - Scott |
| D5 - D'Entrecasteaux | Sd2 - Scott |
| DE5 - D'Entrecasteaux | Sw - Scott |
| Dd - D'Entrecasteaux | Swd - Scott |
| Dd5 - D'Entrecasteaux | Swi - Scott |
| Dr - D'Entrecasteaux | TL - Telerah |
- Plantation
- Study Area Boundary
- Local Government Boundary



Kilometres
 Prepared by Ministry for Planning
 Burbury Office, Cartographic Section.
 E:\GDM\WAR\BLACKCOTT\REMVE\SCOTT\VI\G.DGM
 November 1999

SCOTT COASTAL PLAIN Strategy for a Sustainable Future Remnant Vegetation Complexes

Information current as at 30 June 1999

ACKNOWLEDGEMENTS:
 Digital cadastre base supplied by Department of Land Administration.
 Digital remnant vegetation supplied by Department of Conservation and Land Management and Department of Agriculture WA.
 Digital vegetation complexes supplied by Department of Conservation and Land Management.

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8. VEGETATION MANAGEMENT STRATEGY

8.1 Background

The vegetation² of the Scott Coastal Plain is characterised by a rich mosaic of wetland and dunal vegetation associations combined with areas of forest and woodlands which vary from small pockets to broad zones. The complexity of vegetation is derived from a combination of unique hydrology of the area and the diversity of soils. Many of the vegetation associations contain DRF or Priority Species.

Within the study area 32 vegetation complexes have been identified. Of these 10 have been found to be either poorly represented within secure land tenures or are so small in area both within and outside of the study area to be classed as vulnerable. A further two complexes can be added to this list when the known occurrence of rare or Priority Species populations is considered. There is currently 235 known populations of rare or Priority Species within the study area. These popula-

tions occur across 18 of the vegetation complexes represented within the study area. Data analysis has identified 10 vegetation complexes that could sustain a level of disturbance given their level of representation in secure tenures and subject to current approval procedures.

Protection of native vegetation on private property in Western Australia is essential in stopping and reversing land degradation and loss of biodiversity (AGWEST 1997). Any proposal to clear more than 1 hectare of remnant vegetation in Western Australia must have approval from the Commissioner for Soil and Land Conservation. There are four levels of assessment under the Memorandum of Understanding between government agencies for assessing clearing proposals, for further information see Appendix 27. The vegetation Strategy for the SCP will give government agencies a tool to assist them in the assessment process for clearing land parcels within the study area.

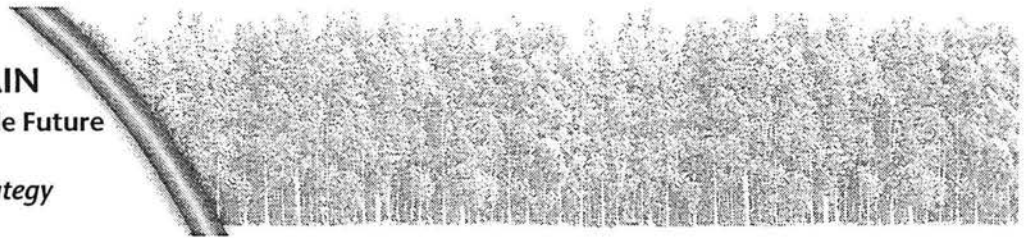
8.2 Statement of intent

Vision for future	Justification	Issues to be addressed
<p>8.2.1 Threatened flora</p> <p>Protection of DRF and Priority Species as listed by CALM.</p>	<p>Native vegetation which contains or is likely to contain threatened species or species of special interest should be a high priority for protection.</p>	<p>Information known from previous studies. Certain vegetation types are hotspots for threatened flora. Ongoing DRF surveying.</p>
<p>8.2.2 Threatened ecological communities</p> <p>Protection of TECs as described by CALM.</p>	<p>TECs have the same importance as threatened flora. CALM has worked to identify and define TECs which need protection. There is one TEC located at 43 sites within the study area.</p>	<p>Information known from previous studies.</p>
<p>8.2.3 Vegetation representation</p> <p>Protection of vegetation communities with no or poor representation on CALM land as listed in the Strategy.</p>	<p>As part of the Regional Forest Agreement, vegetation communities have been identified across the forest areas of the state. There are vegetation communities present on remnants within the study area that have little or no representation on protected CALM estate.</p>	<p>Information determined from remnant vegetation and RFA vegetation community GIS databases. Ongoing assessment will be required as database information improves and changes.</p>

² This section was prepared by CALM.

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 – A Strategy for a Sustainable Future

Vegetation Management Strategy



Vision for future	Justification	Issues to be addressed
8.2.4 Corridors		
Protection of corridors or stepping stones between areas of conservation (CALM) land.	Corridors of remnant vegetation connecting areas of conservation estate are important for the natural movement of wildlife.	Determined from existing remnant vegetation information. As remnants are cleared these corridors will become more important.
8.2.5 Other vegetation of importance		
Vegetation with aesthetic values or particular significance for nature conservation must be protected from clearing.	The familiar rural landscape of farmland fringed and dotted with trees and patches of bush can only be maintained with positive action. Retain vegetation with high scenic quality, strongly defined vegetation patterns, unique specimen stands. Vegetation types that influence the tannin component of the Scott River.	These areas are identified in the Strategy.
8.2.6 Well represented vegetation		
Potential disturbance opportunities that will not impact significantly on vegetation previously identified as being important will be highlighted.	This will give farmers in the study area a degree of certainty in the future potential of their lands.	These areas are identified in the Strategy, however there is ongoing assessment required as more vegetation is cleared.

8.3 Strategy statements and recommendations

8.3.1 Threatened flora

The presence of DRF or Priority Species on remnant vegetation will have a direct impact on the future management of those vegetated land parcels within the Scott Coastal Plain study area. Under the *Wildlife Conservation Act 1950* (Section 23 F (2)), the Minister for the Environment may declare any Western Australian native flora to be 'rare flora' (DRF) if he/she is of the opinion that it is likely to become extinct or is rare or otherwise in need of special protection. This may be as a consequence of its rarity, or the prevalence of a threat from which the flora needs special protection.

Special protection is afforded DRF under the act, with the written consent of the Minister being required before such flora can be taken. The term 'take' refers to either direct means, such as taking a scientific sample, collecting seed, clearing an area; or through indirect means, such as burning, grazing, introduction of pathogens, or the alteration of the water-table.

Complementary to the schedule of the DRF notice, CALM maintains a supplementary listing referred to as the Priority Species List. This lists those flora which may be rare or threatened but for which there is insufficient survey data available to accurately determine their true status (poorly known) and those taxa which have been determined as being rare, but are currently not threatened. Priority Species does not have the same level of legislative protection as DRF, in that Ministerial permission is not required to take them. Priority Species are, however, often known from fewer plants or populations than the DRF and hence should be managed in a similar manner to DRF until their status has been confirmed as being not rare or threatened. Environmental assessments take into account the occurrence of Priority Species and CALM encourages land managers to conserve Priority Species.

DRF and Priority Species are more likely to occur within certain vegetation types such as wetland, sedgeland and iron stone communities. An examination of DRF and Priority Species within the study area has highlighted those vegetation complexes that warrant a higher degree of protection due to their limited occurrence.

Map 4 shows the locations of DRF within the study area. The study has shown that there are three main vegetation communities that are 'hot spots' for threatened flora. These complexes are Scott complexes Swd, Sd and Swi. It must be remembered that flora surveys have not been undertaken across the whole study area, thus DRF surveys will always be an essential part of any major clearing proposal. As more DRF surveying works are undertaken other vegetation types may become increasingly important for protection.

Recommendation 9

It is recommended that remnant vegetation that has DRF or Priority Species present must be protected and clearing applications which contain any of the three complexes listed above require intensive flora survey during both spring and autumn to identify the occurrence of DRF or Priority Species.

8.3.2 Poorly represented (vulnerable) vegetation

Work carried out by CALM has identified one Threatened Ecological Community (TEC) which occurs at 43 sites within the study area. Like Priority Species CALM encourages the protection of TECs even though this protection does not currently exist within legislation. These TECs are illustrated in Map 4. They all occur within Scott Ironstone communities highlighted previously (Swd, Sd and Swi). This further enhances the requirement for protecting any area containing these vegetation types regardless of land tenure.

Recommendation 10

It is recommended that no disturbance at all occur on any area containing Threatened Ecological Communities.

There are a number of vegetation types other than the TECs that are either poorly represented in the conservation estate or so small in area that they are considered vulnerable. Vulnerable vegetation types are listed below in Table 8 and illustrated in Map 4. The total area of these types occurring on insecure tenures is 7469 hectares.

Recommendation 11

It is recommended a high degree of protection and management be given to the areas listed in Table 8 regardless of the presence of DRF or Priority Species (refer to the four steps outlined in the following vegetation management section of the Strategy).

Recommendation 12

It is recommended that the feasibility of acquiring remnants for conservation reserves within vulnerable or poorly represented vegetation complexes through appropriate land exchanges be examined. Any formal proposal to acquire land for conservation estate should be extensively examined in the field. CALM should liaise with Ministry for Planning and Department of Land Administration to identify appropriate locations and determine an approach to be taken for implementing this initiative.

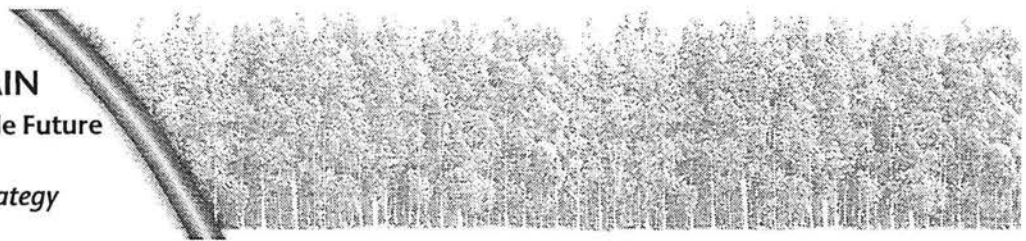


Table 8. Summary of vulnerable vegetation complexes

Vegetation complex	Area of veg. cleared	Area of existing veg.	Area of veg. secure	Area of veg. insecure	Area of veg. outside study
Blackwood (Bd)	32.37	246.03	174.63	71.40	78.29
Blackwood (Bwy)	0.56	24.63	13.47	11.16	39.82
D'Entrecasteaux (D)	328.81	217.93	0	217.93	15.64
D'Entrecasteaux (D5)	311.37	2,523.61	272.40	2,251.20	0
D'Entrecasteaux (DE5)	461.31	5,280.21	817.63	4,462.58	1,723.05
Darradup (DP)	0	5.18	5.18	0	4,083.19
D'Entrecasteaux (Dr)	22.99	21.80	0	21.80	0.01
D'Entrecasteaux (Drd)	6.75	141.65	0	141.65	0
Scott (Sw)	4.22	39.67	0	39.67	0
Scott (Swi)	1,394.16	251.57	0.28	251.29	0

Areas shown are in hectares.

8.3.3 Corridors

Remnant vegetation close to other remnants and with good connecting corridors are important for the health of fauna in that area (Safstrom 1996). Certain corridors will be viable for some species but not for others, but it can be assumed that wide (500 m plus), continuous linkages with core areas of undisturbed vegetation would be best for most fauna (Safstrom 1996). The Scott Coastal Plain study area does not contain any viable, continuous linkages on private property.

Recommendation 13

It is recommended that as more consistent data relating to the viability of certain corridors for specific species becomes available, vegetation corridor assessment must be undertaken.

vegetation types that influence the colour of the Scott River are all habitats that require special consideration for protection.

'Wetlands play a key role in supporting the diversity and abundance of species within surrounding terrestrial ecosystems' (CALM 1992). Wetlands also add landscape diversity and aesthetic appeal to the rural landscape. There may be added pressure to clear wetlands in the study area to enable good summer grazing or crop production. The Water and Rivers Commission through the State of the Catchment document has highlighted the value of wetlands in the study area.

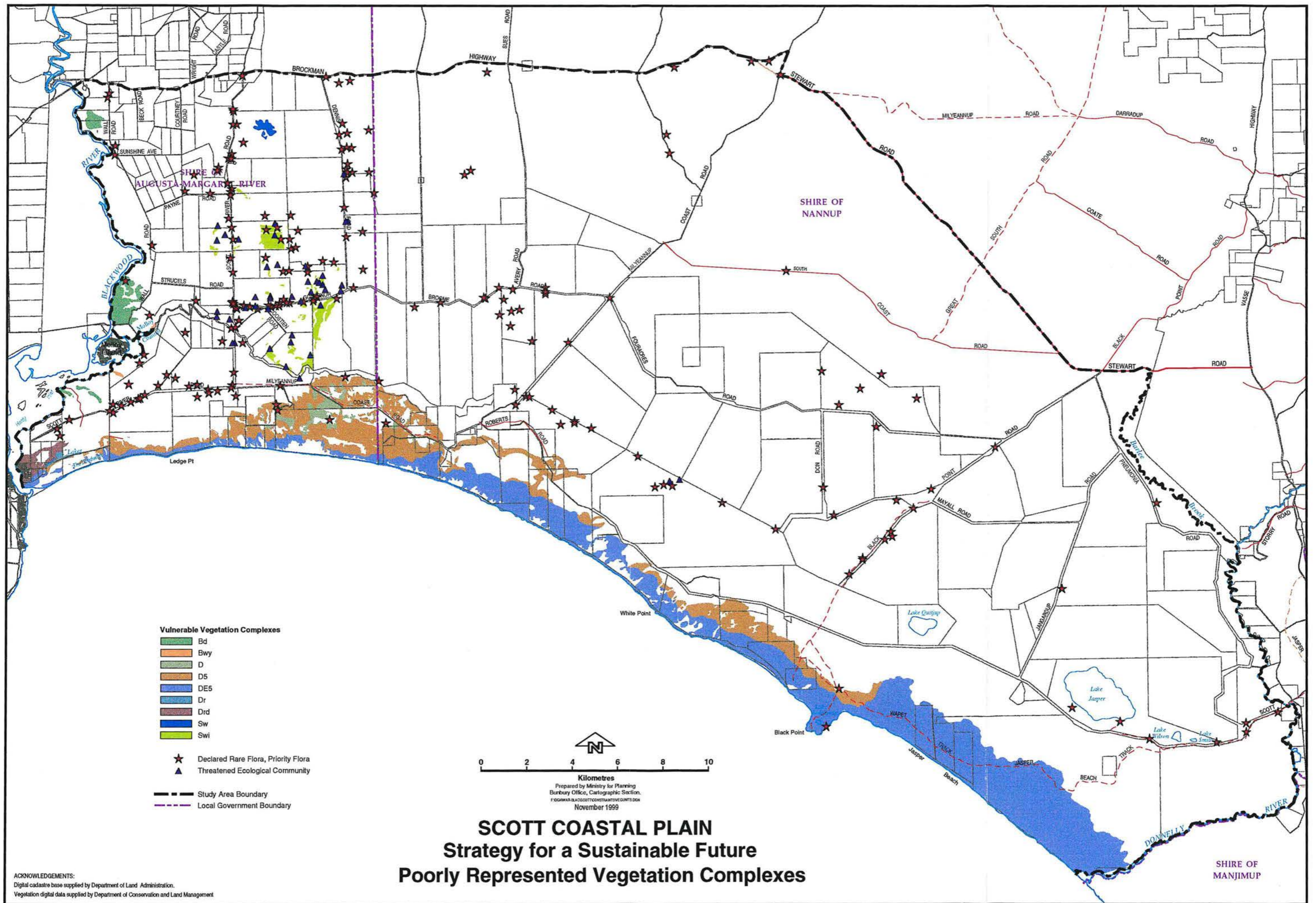
Recommendation 14

It is recommended that the pressure to clear the remaining wetlands in the study area be resisted.

8.3.4 Other vegetation of importance

Within the Scott Coastal Plain study area there are many specific habitats which have particular significance for nature conservation and aesthetics. These areas need to be protected from clearing and other forms of degradation. Wetlands, unique coastal habitat, vegetation with high scenic quality,

Coastal habitat within the study area has special conservation significance. These areas have appeal to visitors and are often habitat to unique biota. Coastal areas (within 500 m of the coast) are often not suitable for grazing or cropping. Further discussion on issues associated within the coastal zone of the study area will be addressed in the Land Use Strategy.



Vulnerable Vegetation Complexes

- Bd
- Bwy
- D
- D5
- DE5
- Dr
- Drd
- Sw
- Swi

- Declared Rare Flora, Priority Flora
- Threatened Ecological Community

- Study Area Boundary
- Local Government Boundary



Kilometres
 Prepared by Ministry for Planning
 Bunbury Office, Cartographic Section.
 F:\OGN\WAR\BLACK\SCOTT\COAST\VEG\GANTS.DGN
 November 1999

SCOTT COASTAL PLAIN
Strategy for a Sustainable Future
Poorly Represented Vegetation Complexes

ACKNOWLEDGEMENTS:
 Digital cadastre base supplied by Department of Land Administration.
 Vegetation digital data supplied by Department of Conservation and Land Management

Recommendation 15

It is recommended that a high degree of protection be given to these areas. In addition a separate management Strategy for the coastal zone should be developed to address the unique issues associated with the area.

Recommendation 16

It is recommended that any potential future development be examined in the appropriate manner outlined in the Memorandum of Understanding (AGWEST 1997).

8.3.5 Well represented vegetation

Vegetation complexes that have the capacity to handle some level of disturbance within the study area due to their overall representation in areas of secure tenure both within and outside of the study area have been identified.

Any potential disturbance within these complexes must still be examined in the appropriate manner outlined in the Memorandum of Understanding governing the protection of remnant vegetation on private land within the agriculture region of Western Australia.

These complexes are listed in Table 9 and illustrated in Map 3. Any future clearing within these areas will require a re-analysis of the data contained in this table.

8.4 Vegetation management

The management of vegetation is dependent on many factors, such as the size and shape of the vegetation, the nature of the adjoining land use, the type of vegetation in the area and the quality of the vegetation. While it is not possible to define specific vegetation management practices in a Strategy document, the following points provide a guide to the issues that need to be addressed in considering appropriate vegetation management for a specific area. To develop a specific vegetation management plan, specialist advice might be required, or refer to such reference material as the book *Managing Your Bushland* by B.M.J. Hussey and K.J. Wallace (available through CALM).

Table 9. Summary of well represented vegetation complexes

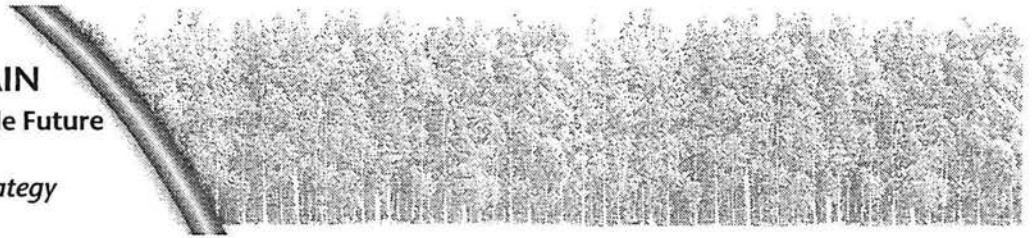
Vegetation complex	Area of veg. cleared	Area of existing veg.	Area of veg. secure	Area of veg. insecure	Area of veg. outside study
Coate (CE)	17.34	3,096.33	3,078.94	17.39	21,181.59
Cleave (CV)	166.98	612.56	542.91	69.66	1,258.28
D'Entrecasteaux (Dd)	350.93	4,999.19	2,978.76	2,020.43	1,232.41
D'Entrecasteaux(Dd5)	54.91	4,463.01	2,264.78	2,198.23	3,695.78
Jasper (JA)	22.77	532.67	445.26	87.42	972.24
Jangardup (JN)	923.39	3,212.51	2,566.01	646.49	556.1
Kingia (KI)	241.73	6,880.34	6,712.92	167.42	95,117.78
Nillup (N) *	2,352.31	7,070.67	6,263.27	807.40	8,376.8
Nillup (Nd)	100.28	1,126.07	939.14	186.93	1,152.17
Nillup (Nw)	1,153.64	3,513.4	2,956.27	557.13	3,917.38

* High occurrence of DRF and Priority Species.
All areas shown are in hectares.

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Vegetation Management Strategy



The stages in vegetation management are:

- Regional or property vegetation management planning. This will assist the manager to determine which areas of vegetation have greater value for protection in the landscape for initial actions and where strategic revegetation may be required to re-establish functionality in the landscape. This vegetation Strategy primarily deals with this area of regional remnant vegetation management.
- Vegetation protection. Where the adjacent land use is stock grazing, the vegetation will need to be fenced and the stock excluded. This will enable regeneration to occur, will reduce soil compaction and will reduce weed invasion caused by soil disturbance and nutrient/seed inputs through dung. Vegetation should also be protected from detrimental invasions, such as from dieback disease, weeds, fertiliser, fire and feral animals.
- Vegetation management. Once isolated as a remnant, the vegetation will not persist without some form of management, such as the control of pests and diseases (such as small outbreaks of dieback, weeds and feral animals).
- Vegetation enhancement. The existing vegetation may be small, isolated or degraded. In such situations, vegetation enhancement may be necessary to ensure its longer-term survival. Enhancement

may be by the establishment of a buffer of vegetation around the area to protect it (may be commercial Plantings), the establishment of a corridor of vegetation to link it to another area, or the regeneration or replanting of vegetation in disturbed areas within the site.

References

- Agriculture Western Australia (1997). The protection of Remnant Vegetation on Private Land in the Agriculture Region of Western Australia. Memorandum of Understanding. AGWEST publication.
- Department of Conservation and Land Management (1992). A Nature Conservation Strategy for Western Australia.
- Hussey, B.M.J. and Wallace, K.J. (1998). Managing Your Bushland. Department of Conservation and Land Management.
- Monaghan, J. and Associates (1997). Scott Coastal Plain – Background and Issues Paper for Land Use Development and Environment.
- Safstrom, Rod (1996). Environmental Evaluation of Native Vegetation in the Wheatbelt of Western Australia (principles and criteria used to appraise land clearing proposals). Paper prepared for Western Australian Department of Environmental Protection.

9. LAND USE STRATEGY

There has been an overwhelming statement of appreciation for and identity with the area, its environment, landscape and lifestyle arising out of the community consultation for this project. The community wants to ensure this is protected to guarantee a viable future for themselves and an opportunity for their children. There also appeared to be a clear commitment to responsible development and conservation and a willingness to highlight and address the constraints to those objectives.

The Warren–Blackwood Regional Planning Strategy (WBRPS), which covers the Shires of Nannup, Manjimup, Bridgetown–Greenbushes and Boyup Brook, acknowledged the issues and concerns associated with the SCP and the study being undertaken by the Steering Committee. The WBRPS deferred detailed assessment and proposals for the SCP pending the outcome of this study and proposed to adopt the findings and recommendations of this study into that Strategy.

9.1 Agricultural development potential, workforce and accommodation

The agricultural development potential of the SCP has been assessed by AGWEST and the vision and projections for agricultural land use includes three scenarios for various levels of agricultural diversification. From those projections various assumptions have been made to allow estimation of the likely employment generation, resultant population increases, accommodation requirements and demands for additional infrastructure and community services and facilities.

Of the various agricultural uses listed in the three land use scenarios, there is likely to be little additional employment generated, other than for the landowner and immediate family, for beef grazing, wool sheep grazing and sheep meat grazing. Farm forestry is unlikely to result in any significant additional on-site

employment, as this industry tends to employ a number of specialists whose work demands range across the whole region.

On-site employment demands for horticulture vary significantly from one area to another and between one crop and another and are also influenced by whether the growing period is seasonal or continuous. With widespread winter waterlogging, a large proportion of the horticultural developments will be summer cropping, with a resultant seasonal peak in employment demand.

Table 10 has been prepared on the basis of the AGWEST projections and employment demand experience of local producers. It is intended to give an indication of the likely employment demands emanating from that scale of future development. To this should be added employment accommodation needs related to existing and future mining activity and future tourist and recreational demands.

Currently, the only accommodation available in the study area is on privately owned rural zoned lots, with the exception of the small scale development at East Augusta. Each landowner has the opportunity under local zoning provisions to erect an additional dwelling for the accommodation of a farm worker, but seasonal workers are not adequately catered for and mine workers need to find their own accommodation, generally in towns outside the study area. There is no provision for tourist accommodation at this stage.

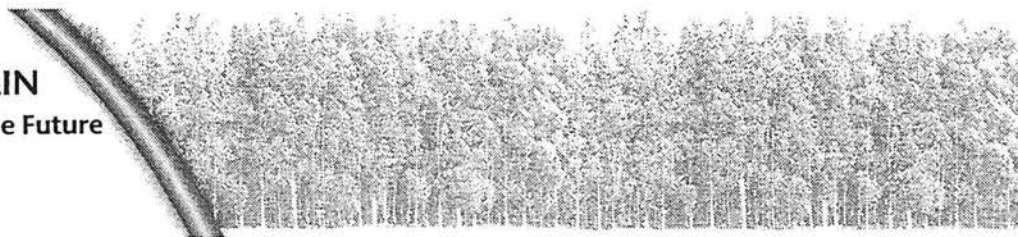
9.2 Land tenure

Of the total 107,000 ha of the study area, State forests, national parks, nature reserves and other reserves account for about 57,400 ha, with the remaining 49,600 ha being private farmland. Most of the private land holdings on the SCP are much larger in area than those in other parts of the South West. North of the Scott River and east of Scott River Road most of the lots are between 600 ha and 1200 ha in area, but with some down to 150 ha. The vast

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majority of the holdings are family owned, some with two or more lots forming the total farming enterprise.

The large lot sizes, relatively low land values and minimal land speculation pressures in this area have provided a favourable basis for developing large scale agricultural enterprises. These factors have offered greater flexibility for the placement of 40 ha centre pivot irrigation systems, through reduced restriction by lot boundaries, streamlines, remnant vegetation, poorer soils or other constraints.

To the west of Scott River Road the lot sizes are generally in the range of 40 ha to 200 ha, but with a few lots of much smaller size. South of the Scott River the lot areas are much more variable, ranging generally from 100 ha to 500 ha. Several land holdings consist of a

number of much smaller lots. In the area known as East Augusta, on the eastern bank of the Hardy Inlet and at the end of Scott River Road, there is a precinct of about 50 lots around 4000 m² to 8000 m² in area.

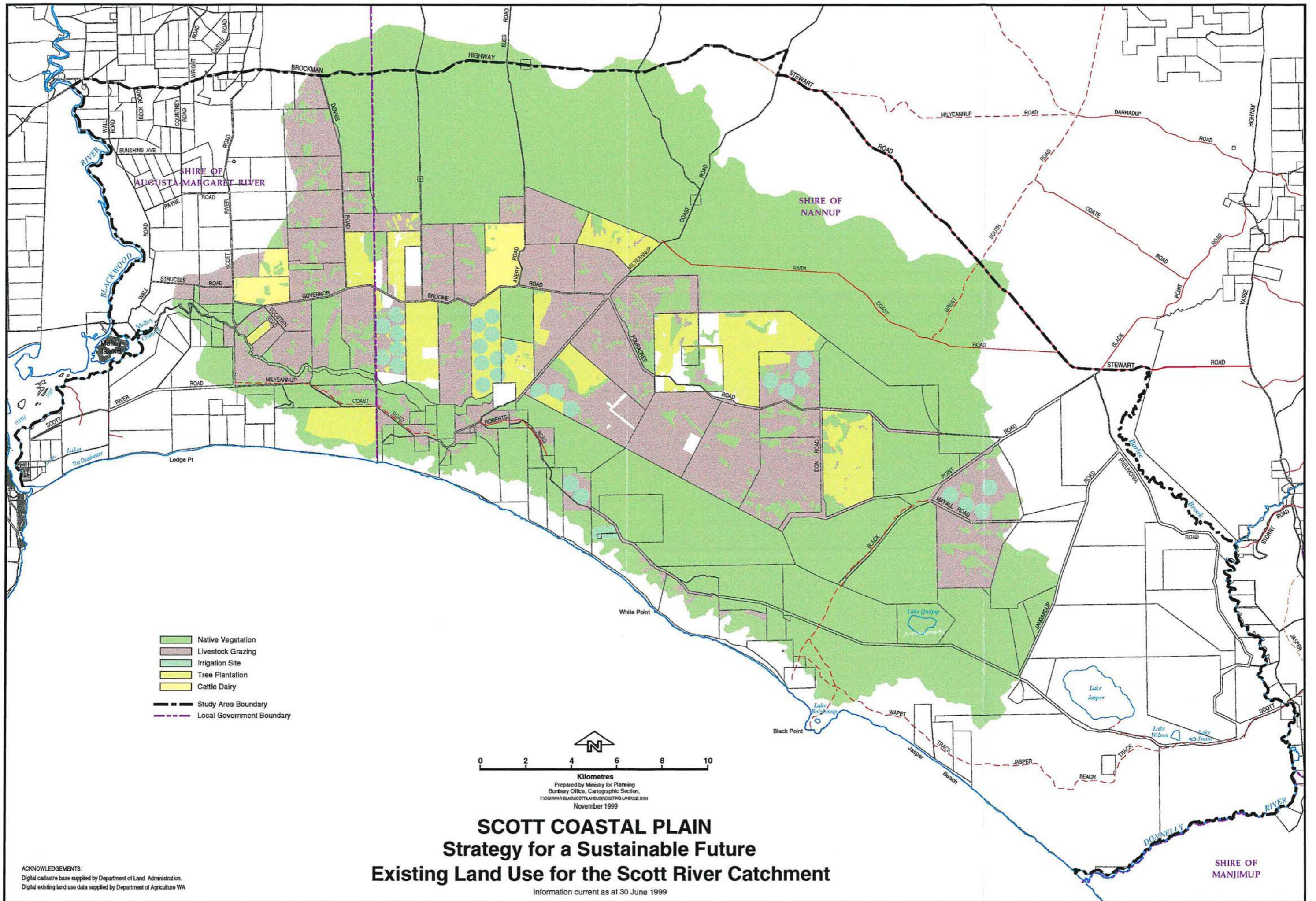
The SCP has been identified by the State Planning Strategy as being an agricultural area of State/regional significance. As such, its productive agricultural capacity should be protected against inappropriate subdivision or development, or land degradation. Further breakdown of agricultural lot sizes may impinge on the productive capacity of the land by restricting operational flexibility and by reducing the scale and viability of the farming enterprise. It may also lead to speculative pressures and increased land values. In turn these effects may limit the financial capacity of landowners to carry out the appropriate land management procedures.

Table 10. Indicative workforce accommodation implications within the study area (based on three potential development scenarios outlined in Chamarette, 1999)

Agricultural activity	Employment per 100 ha ⁽¹⁾	Current		Scenario 1		Scenario 2		Scenario 3	
		Area (ha)	Employment	Area (ha)	Employment	Area (ha)	Employment	Area (ha)	Employment
Dairying ⁽²⁾	2	1,750	35	1,893	38	2,524	50	3,156	63
Horticulture ⁽³⁾	50	450	225	1,000	500	3,000	1,500	5,000	2,500
Other ^{(4), (2)}	-	-	30	-	31	-	27	-	22
Workforce	-	-	-	-	-	-	-	-	-
Year round ⁽⁵⁾			110		169		377		585
Seasonal ⁽⁶⁾			180		400		1,200		2,000
Total			290		569		1,577		2,585
Additional accommodation requirement									
Permanent ⁽⁷⁾			37		56		126		195
Seasonal ⁽⁸⁾			90		200		600		1,000
Total			127		256		726		1,195

Notes and assumptions:

- ⁽¹⁾ The figures used in this column are based on local landowner advice and experience.
- ⁽²⁾ Year-round workforce.
- ⁽³⁾ Largely seasonal workforce, peaking around harvest time (March to May).
- ⁽⁴⁾ Includes beef grazing, wool sheep grazing, sheep meat grazing and farm forestry.
- ⁽⁵⁾ Includes 20% of the horticultural workforce and all the workforce of the other agricultural uses.
- ⁽⁶⁾ Includes 80% of the horticultural workforce.
- ⁽⁷⁾ Assumes that 1/3 of the workforce is accommodated at the workplace, 1/3 finds accommodation outside the study area and 1/3 will require an accommodation opportunity within the study area.
- ⁽⁸⁾ Assumes that 1/4 of the workforce is accommodated at the workplace, 1/4 finds accommodation outside the study area and 1/2 will require an accommodation opportunity within the study area.



SCOTT COASTAL PLAIN
Strategy for a Sustainable Future
Existing Land Use for the Scott River Catchment
 Information current as at 30 June 1999

ACKNOWLEDGEMENTS:
 Digital cadastral base supplied by Department of Land Administration.
 Digital existing land use data supplied by Department of Agriculture WA

9.3 Land capability

Large reserves of high quality groundwater are available to the majority of the properties within the study area. The main concerns which had been expressed by various government agency reports in respect of the more intensive agricultural land uses related to the suitability of the soils and the ability to control off-site nutrient impacts. Tille and Lantzke (1990) reported a generally low capability for horticulture across the study area, due mainly to poorly drained soils to the north of Scott River and to wind exposure and erosion risk to the south of the river.

This assessment was subsequently confirmed by Van Gool and Runge, indicating waterlogging as the main constraint. However, when summer cropping only was considered by Van Gool and Runge, most of the area north of the river and parts of the southern area were shown to have a fair capability, with some land having a high capability. However, this was qualified by the comment that occasional early breaks to the winter season may cause waterlogging, which may affect crop yields and can impede harvesting of the summer crop. On the agricultural land north of Scott River and the suitable areas abutting the coastal dunes to the south, the principal concern is nutrient leaching/run-off.

9.4 Environmental constraints

Agriculture Western Australia through Cox (1999) has classified the waterways network of the Scott River catchment, into first to sixth orders of drainage and also according to channel formation. Most of the streams outside of the CALM estate have been modified or impacted upon to varying degrees and few retain their original vegetation and bank structure. The importance of retaining riverine vegetation and protecting the stability of stream banks is fully recognised. In some cases this may require additional treatments, such as reservation, fencing, revegetating or stock control. However, there may be opportunities to

redirect lower order streams to facilitate placement of irrigation systems or other intensive agricultural developments, provided suitable management measures are taken.

The wetland distribution within the study area has been identified by WRC to indicate such features as lakes, sumpland, dampland, floodplain and palusplain. Most of the wetland features outside of the CALM estate have either been cleared of natural vegetation or have otherwise been significantly impacted upon. Where these features do remain in their natural state or close thereto, their value for retention will need to be evaluated, especially where they are associated with poorly represented vegetation complexes.

Retention of existing remnant vegetation also has other potential benefits, such as reducing wind erosion, enhancing the visual landscape, reducing waterlogging, providing biological filters for nutrients, protecting rare and endangered species, maintaining wildlife corridors, providing areas for wildlife refuge and protecting adjoining reserves. In particular, remnant vegetation within existing road reserves can play an important role. New irrigated horticultural proposals will be evaluated against various additional assessment criteria, as described in Appendix 23, and include nutrient management issues. The risk of nutrient losses from irrigation areas needs to be managed (Section 7.4) to maintain water quality in Scott River and Hardy Inlet to agreed levels (Section 7.10).

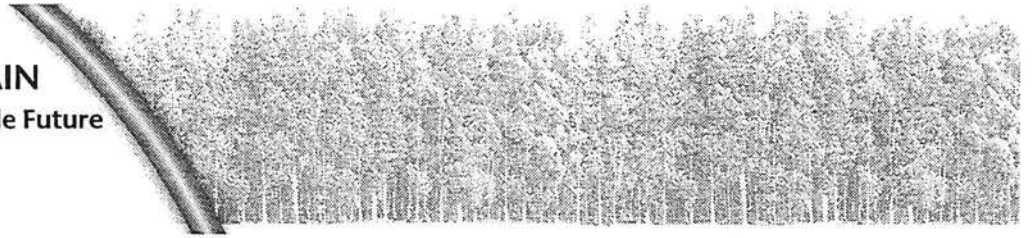
9.5 Minerals and mining

The Beenup titanium minerals mine has been closed recently because it is not economically feasible to handle the large proportion of slimes within the ore. Attendant problems such as the presence of pyrite and of strongly cemented sideritic horizons in the ore, added to the difficulties of balancing costs and sales revenue. A considerable mass of mineralised sediments remains in situ and the possibility of reopening the mine must be considered if there are further breakthroughs in technology.

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The Jangardup mine and the nearby Jangardup South proposed mine are well-defined and no land use changes that could compete with the mining should occur. Although the western portion of the study area is underlain by the Sue Coal Measures, there are shallower and therefore more financially attractive seams occurring to the north and therefore any extraction of coal on the SCP is most unlikely to be contemplated in the foreseeable future.

Ferricrete gravels are an attractive base construction material for roads and other uses. Significant quantities can be extracted from the ferricrete cap-rock of the laterite profiles, common in the South West of Western Australia. However, these areas are not suitable for agricultural pursuits and tend to occur within areas still forested to the north of the agricultural lands. Some ferricrete related to shallow groundwater levels may occur in the SCP, although their location is less predictable than the laterite and they are not used greatly.

Construction sand is widely available from the surficial units (Safety Bay Sand, Guildford Formation). The resource is believed to have a relatively low demand and with the widespread nature is not seen to be an issue for land use planning.

The Tamala Limestone contains extensive deposits of both cemented limestone and lime sand. The former is used for road-base and for construction blocks and the latter, along with crushed limestone, for agricultural soil pH modification. The Tamala Limestone occurs widely in the coastal dunes. However, most of these areas are held within the conservation estate and mining is not judged acceptable to significant parts of the community. Areas of private land near the coast that are underlain by limestone or lime sand should be viewed as containing a resource that will probably become more valuable with time, and land use planning to allow for future access could be appropriate for such areas.

Peat occurs in low-lying areas subject to near continuous inundation. This is an attractive consumer product for plant growing, but in uncleared wetlands its extraction can produce undesirable environmental impacts.

9.6 Coastal constraints

The vast majority of the ocean frontage, extending from Hardy Inlet to Donnelly River, is a sandy coastline, with the main feature of variation being the large basalt outcrop at Black Point. The dunal areas are low in elevation in the western sector, grading to high in the east, particularly just to the west of Black Point and Donnelly River. There is a lack of information on coastal processes and stability, but the whole area is exposed to westerly to southerly winter storms and south-easterly to south-westerly sea-breezes in summer and that exposure can be described as extreme. There are large areas of dunal blowouts, stressing the importance of protecting the vegetation cover.

Although relatively remote from major population centres and local towns, there is growing pressure on this coastal area from tourism, recreation and fishing enthusiasts. That pressure extends into the D'Entrecasteaux National Park, which covers the eastern part of the study area coastal strip. A new management plan for the D'Entrecasteaux National Park is currently in preparation. It is understood there are concerns within CALM that there is limited visitor capacity around Black Point, one of the most popular spots within the park, to handle the degree of camping and vehicle pressures that are coming onto that area. The new management plan will endeavour to address that issue, but there are opportunities for this Land Use Strategy to assist in resolving some of that pressure. At this stage the only formal road access to the coast along the entire 70 km ocean frontage is at Black Point, and that is by way of an unmaintained four wheel drive sand track. Some landowners allow restricted public access through their properties.

Of the 70 km ocean frontage, D'Entrecasteaux National Park covers about 9 km and almost the entire remainder is vacant Crown land, being that strip of land along the water frontage of private landholdings between Black Point and Hardy Inlet. Full responsibility for implementation of the national park management plan rests with CALM. Currently, there is no vesting for the Crown land coastal strip, there is no management concept in place and so far no agency has been prepared to accept any management responsibility.

There are clearly significant opportunities for tourist, recreation and lifestyle development in this area as well as intensive agricultural use in some sections. However, there are also major issues to address, including vesting of the vacant Crown land, coastal management, foreshore access, road construction and services and infrastructure provision.

9.7 Roads and transport

Consistent with the remote nature of the study area, only Brockman Highway was constructed to a sealed standard until recent times and even that was of a rather poor standard. The development of two mineral sand mines has resulted in the reconstruction of parts of Brockman Highway, Black Point Road and Scott River Road and also the construction of Sues Road to the north. Apart from a short section of Milyeannup Coast Road, all other roads in the study area are either graded earth roads or unconstructed dirt tracks. One of the major constraints to road construction and upgrading in this area is the lack of roadbase materials within a reasonable haulage distance, as most of the materials reserves are located within the CALM estate and are generally not available for local government road purposes. A more detailed outline of the background information is set out in the *Part 1 – Background and Issues* report.

Current developments in the area have placed considerable strain on a number of the existing local roads. As indicated in the *Part 1 – Background and Issues* report, each centre pivot site producing potatoes generates about

53 return truck movements (38 tonnes) at the time of harvest, with a further five return truck movements carrying in lime, gypsum and fertiliser at other times of the year. It could be assumed that there would be similar truck movements associated with other horticultural production, but their seasons of cartage may be different or may be more evenly spread throughout the year. Each dairy will involve the calling of a milk tanker each day of the year.

It should be noted that the upgrading of Sues Road has considerably improved the accessibility to the processing plants in the Busselton/Bunbury area for milk tankers and other products and has also facilitated the transport of farming requirements and equipment into the study area. Another route that has been used extensively outside the study area has been via Stewart Road, Coronation Road and Graphite Road to deliver potatoes from the study area to the processing plant in Manjimup. With that processing plant having recently closed down, the future demands on this route are uncertain, but Manjimup may remain a centre for sorting and/or processing of potatoes and other horticultural crops, given its current importance in horticultural production.

Harvested logs from the existing hardwood plantations may be destined for a woodchip mill that is likely to be built in the vicinity of Donnybrook or Bunbury. Indications at this stage are that Sues Road and Bussell Highway will be used as the truck transport route. However, further changes to the Regional Forest Agreement may result in using the existing Diamond Chip Mill for chipping some plantation timbers from the Manjimup/Pemberton/Scott River area. In that case both Stewart Road and Coronation Road could be used to gain access to the existing log haul route along Palings Road to the chip mill.

Future development potential will have considerable implications for the road network. Table 11 sets out the indicative volume of loaded heavy truck movements likely to be generated each year for the three development scenarios outlined in Chamarette (1999).

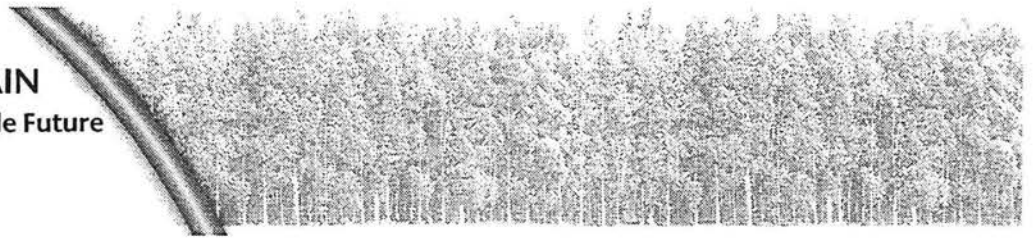


Table 11. Indicative truck generation implications

Agricultural activity	Current ⁽¹⁾			Scenario 1			Scenario 2			Scenario 3		
	Ha	Tonnes	Trucks	Ha	Tonnes	Trucks	Ha	Tonnes	Trucks	Ha	Tonnes	Trucks
Dairying	1,750	-	680	1,893	-	735	2,524	-	981	3,156	-	1,226
Support ⁽²⁾	-	1,225	33	-	1,325	35	-	1,767	47	-	2,209	58
Horticulture ⁽²⁾	450	22,500	592	1,000	50,000	1,315	3,000	150,000	3,945	5,000	250,000	6,579
Support ⁽²⁾	-	2,250	59	-	5,000	131	-	15,000	394	-	25,000	658
Farm forestry ^{(3), (4)}	5,000	125,000	2,083	6,000	150,000	2,500	7,000	175,000	2,916	9,500	237,500	3,958
Support	-	-	-	-	-	-	-	-	-	-	-	-
Sheep/cattle grazing ^{(5), (6)}	24,356	9,744	213	23,662	9,466	207	19,031	7,613	166	11,900	4,760	104
Support ⁽²⁾	-	16,685	438	-	16,209	426	-	13,038	343	-	8,153	215
Total ⁽⁷⁾	31,556	167,404	4,098	32,555	232,000	5,344	31,555	362,418	8,792	29,556	527,622	12,798

Notes and assumptions:

- ⁽¹⁾ Tonnages and truck movements for horticulture and sheep/cattle grazing based on road count figures taken by the Shire of Nannup in late 1997/early 1998; for dairying based on discussions with Bill Russell from Agriculture Western Australia; for farm forestry based on discussions with John Sanders from Bunnings Tree Farms.
- ⁽²⁾ Based on 38 tonne trucks.
- ⁽³⁾ Based on 60 tonne trucks.
- ⁽⁴⁾ The truck movements related to harvesting plantations occur 10 years after planting; that is, uptakes to these levels will be progressive.
- ⁽⁵⁾ Based partially on 60 tonne trucks and partially on 40 tonne trucks.
- ⁽⁶⁾ The overall figures for tonnage and truck movements were taken from the Shire of Nannup road count figures and proportionately expanded to include also the Shire of Augusta-Margaret River.
- ⁽⁷⁾ All truck numbers shown relate only to loaded large trucks; actual truck movement numbers will be double to account for empty return journeys.

9.8 Power and telecommunications

Agricultural properties are currently limited to single phase (240 volts) power supplies, which is sufficient to operate an irrigator, but a bore pump requires three-phase (415 volts). There is a considerable cost saving in using reticulated electricity supplies, rather than diesel fuel, to power the plant associated with irrigated horticultural production.

Many landowners in the study area have expressed a strong desire to connect to three-phase power supplies. This could be achieved by extending a 22 kv line from the Beenup substation, which is served by a 132 kv line. Previously, this would have necessitated the installation of filter banks to reduce the level of harmonics generated by mining equipment, but with the Beenup mine now being closed indefinitely, this is no longer required.

There have also been suggestions of extending the power grid to supply the Jangardup Mine. This could open up other possibilities for landowners. A preliminary estimate by Western Power to extend a suitable transmission line from the Beenup substation to the eastern sector of the study area suggests that it may cost in the order of \$1–2 million.

Currently, most of the properties in the central and western sections of the study area are connected to the Telstra cable phone system, but those in the east mostly rely on radio or satellite connections. Mobile telephone coverage is very limited. The local community has expressed a strong desire for an improved telecommunications service.

9.9 Other community services

There is no established townsite in the study area and no urban commercial services. Currently local landowners and residents use

the commercial and civic facilities in the surrounding towns. From a common point at the junction of Milyeannup Coast Road, Fouracres Road and Governor Broome Road, it is a distance of 47 km to Nannup, 60 km to Augusta, 68 km to Margaret River, 81 km to Pemberton and 84 km to Manjimup.

A small roadside shop exists on the north side of Brockman Highway, near the junction of Scott River Road. For the usual commercial and civic facilities, residents in the central and eastern sections generally use Nannup and those in the western end tend to prefer Augusta or Margaret River. Manjimup is the regional level focus for most of the local community and is the processing and servicing centre for the horticultural and timber industries.

Many of the local residents have expressed concern at the remoteness and lack of services and facilities. They have cited a general store, tavern/bottle shop, sporting facility (golf), community hall/social meeting area, rural supplies and product handling/storage unit as their main interests in that regard. Provision of these facilities is generally based on both need and commercial viability, with the implication that an increasing local population and greater economic activity may be the catalysts to achieving them.

9.10 Current zonings and land uses

In both the Shire of Augusta–Margaret River Town Planning Scheme No. 11 and the Shire of Nannup Town Planning Scheme No. 1, the privately owned land within the study area is currently zoned 'Rural'. These schemes allow for a wide range of uses to be permitted at the discretion of the Council, some requiring prior public advertising. A narrow strip of land on the eastern shore of Hardy Inlet is included within the Shire of Augusta–Margaret River Town Planning Scheme No. 19 and is zoned 'Special Residential', allowing for the creation of about 50 lots.

9.11 Reserved and Crown lands

Existing areas of State forest, national park, nature reserves and other reserves are vested in CALM or other relevant agencies. Nothing in this Land Use Strategy will affect the continued management of those lands by those agencies, but the Strategy will endeavour to reduce adverse impacts on those lands by appropriate management practices associated with agricultural and other land uses.

There are several relatively large parcels of vacant Crown land remaining within the study area which should be investigated further as potential land swap options in conjunction with the recommendations of the Vegetation Management and Water Management strategies. The vesting of the existing strip of vacant Crown land along the foreshore of the south coast needs to be resolved to facilitate appropriate planning and management of the coastal area.

Additional conservation protection on private land may be achieved by means other than acquisition. Various options, such as conservation covenants and incentives for voluntary protection, should also be considered.

9.12 General Strategy details

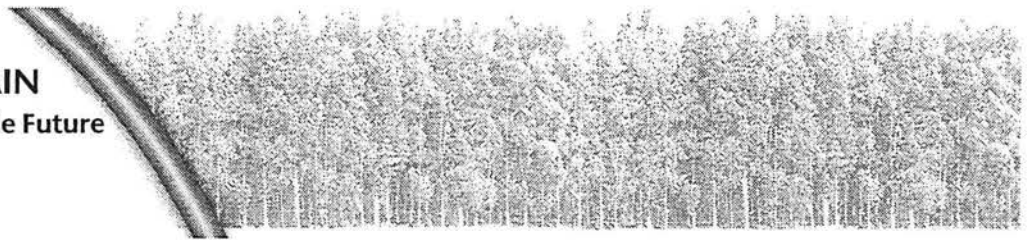
This Land Use Strategy recognises existing land uses and the need to consider a more diversified approach to agriculture in the catchment.

The land capability assessment carried out by Van Gool and Runge for summer horticulture indicated that the vast majority of the private land outside of the coastal dune area had a fair to high capability, subject to several cautionary notes. This suggested that, subject to appropriate land management practices being undertaken, seasonal irrigated horticulture and other intensive agricultural activities could be undertaken in some areas, depending on soil types, depth to watertable and other factors, including location of watercourses. The key factors for sustain-

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ability are implementation of BMP and ongoing monitoring.

As a result, the broad land use concept for the study area is for continued and enhanced agricultural uses on private land to the north of the Scott River and for a range of rural-type land uses on the private lands to the south.

9.12.1 Rural agriculture zone

In recognition of the availability of large volumes of high quality water and the large lot sizes unconstrained by incompatible adjoining uses, the Strategy proposes that all the freehold land within the study area to the north of the Scott River and the CALM estate to the east be zoned 'Rural Agriculture'. This will enable the continued development of a

wide range of intensive and extensive agricultural land uses in conjunction with appropriate land management practices.

The principal objective of the Rural Agriculture zone is to provide for the sustainable use of land for crop growing (including horticulture and timber production) and extensive animal husbandry (including dairying and grazing) and to protect the long-term productive capacity of agricultural land from incompatible land uses (including subdivision).

Within the Rural Agriculture zone, proposed land uses and developments should be assessed in accordance with the following chart (note that where the use is listed as 'permitted', a formal planning application to the council may still be required).

Table 12. Land Use Strategy – Rural agriculture zone provisions

Use type	Permissibility of use	Comments and guidelines for assessment
Irrigated horticulture	Permitted	<ul style="list-style-type: none"> • Groundwater well licence required from WRC. • Full compliance with well licence conditions. • All proposals for irrigated agriculture (or expansion) should show they have been considered by the multi-agency approval and assessment process, (see 'Application and Approval Process for New Irrigated Agriculture on the Scott Coastal Plain' and 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'). • May require EPA approval – subject to assessment of risk of nutrient losses from the site. • Full compliance with EPA approval conditions. • Clearing permits required from AGWEST where clearing is proposed. • Full compliance with clearing permit conditions. • Observe the Best Management Guidelines for Horticulture. • Setbacks from environmental features shall generally be in accordance with the Buffer Distance Guidelines set out in Table 5 of the 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'.
Tree plantations	Permitted	<ul style="list-style-type: none"> • Clearing permits required from AGWEST where clearing is proposed. • Full compliance with clearing permit conditions. • Observe the Best Management Practice Guidelines for tree plantations. • Observe the Timber Industry Code of Practice for timber plantations in Western Australia. • Compliance with any district road transport Strategy or fire management Strategy.
Dairying	Permitted	<ul style="list-style-type: none"> • May require EPA approval. • Full compliance with EPA approval conditions. • Effluent disposal to be located so as to comply with the environmental objectives.

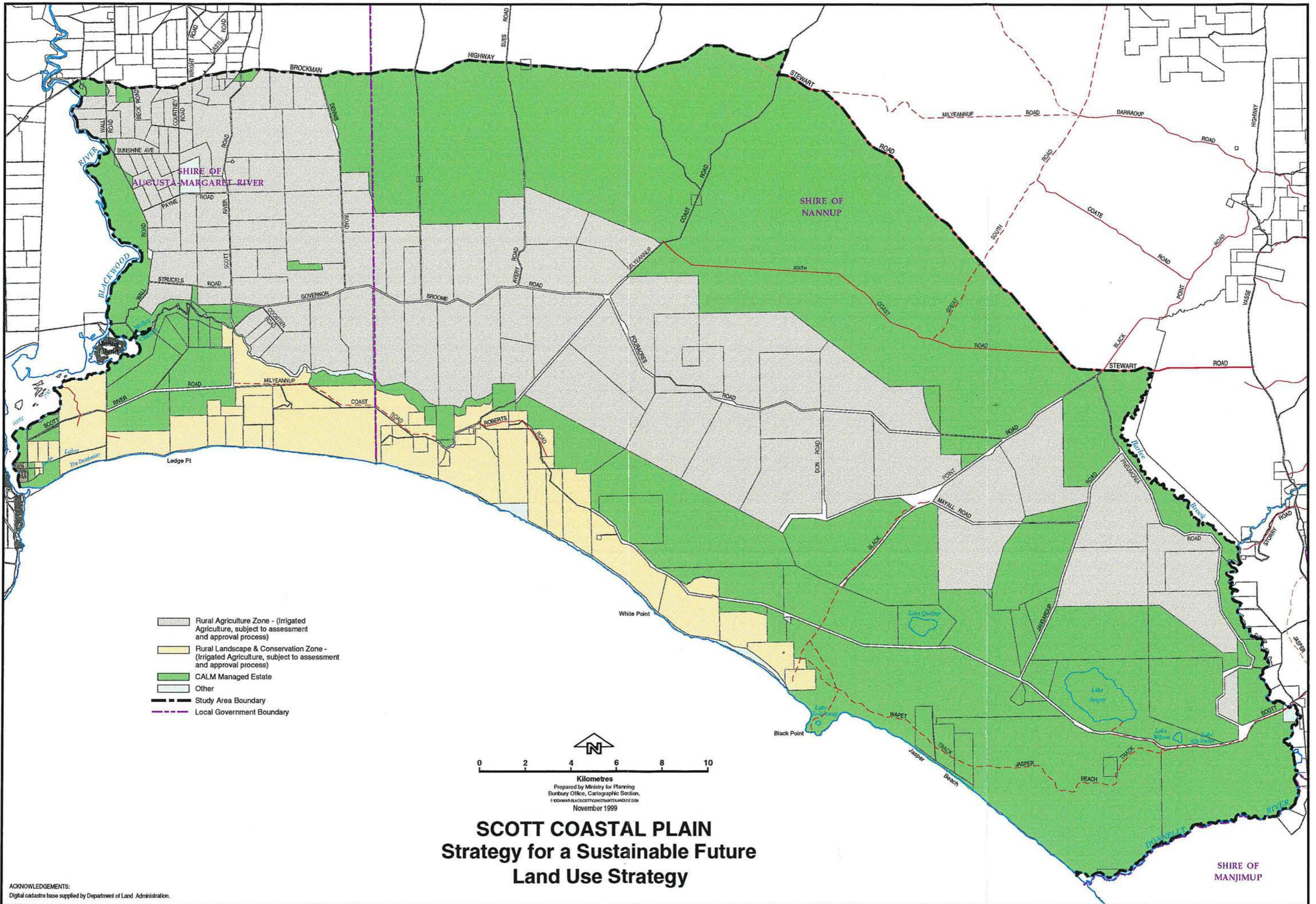


Table 12. Land Use Strategy – Rural agriculture zone provisions (continued)

Use type	Permissibility of use	Comments and guidelines for assessment
Animal husbandry	Discretionary	<ul style="list-style-type: none"> • EPA approval required. • Full compliance with EPA approval conditions. • Effluent disposal to be located so as to comply with the environmental objectives.
Grazing	Permitted	<ul style="list-style-type: none"> • Observe the Best Management Guidelines for grazing.
House	Permitted	<ul style="list-style-type: none"> • Effluent disposal to be located so as to comply with the environmental objectives.
Additional accommodation	Discretionary	<ul style="list-style-type: none"> • May be permitted only for accommodation of permanent or seasonal workforce on land under the same ownership. • To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.
Tourist accommodation	Discretionary	<ul style="list-style-type: none"> • To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.

In planning for new land uses and developments or extending existing ones, every effort should be made to avoid conflicting with existing waterways, areas of remnant vegetation and other areas of high conservation value. Irrigated horticulture developments should be positioned to ensure that natural watercourses do not enter or cross the site, and consider other location factors related to risk of nutrient losses such as soils, depth to watertable. First, second or third order streams or artificial drainage lines may be diverted as set out in the Water Management Strategy, but watercourses of fourth order or higher should be avoided. In addition, setbacks from environmental features should generally be in accordance with the Buffer Distance Guidelines set out in Table 5 and the *Preliminary Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain* Appendix 25.

The majority of the study area is underlain by the Yarragadee Aquifer, which can provide large quantities of high quality water for irrigation purposes. The aquifer extends well to the east of the study area, but its western limit approximates to the local government boundary between the Nannup and

Augusta–Margaret River shires. To the west of the Yarragadee Aquifer lies the Lesueur Formation, a shallower aquifer with variable water quality and availability. In addition, several fault lines extend into the middle of the study area from the south coast, creating a narrowing wedge of land where basalt rock layers and other geological formations often render access to the underlying Yarragadee Aquifer more difficult and expensive.

Throughout the Rural Agriculture zone, a prime objective of this Strategy is to protect the productive capacity of the land from incompatible land uses, or those uses or developments which may prejudice their viability. One of the economic advantages of the SCP for extensive irrigated horticulture is the large lot sizes and the relatively low land values. To maintain and protect that advantage, there is a clear presumption against any subdivision of land within that zone. The only exception to that may be in the area to the west of Scott River Road, where the proposed subdivision would be to lot sizes comparable to the majority of surrounding lot sizes and the subdivision can be clearly demonstrated to be for productive agricultural purposes.



At the now closed Beenup minesite, current permitted land uses within the Rural Agriculture Zone, even capital intensive developments, should be allowed to proceed until new technology breakthroughs make a recommencement of mining activity a feasible proposition. However, it would not be appropriate to rezone the areas underlain by mineralisation to a more intensive or sensitive use, at least for the foreseeable future, and subdivision to areas smaller than 40 ha should not be contemplated. The area concerned has been identified by BHP Titanium Minerals in its latest environmental approval document. Additional areas of mineralisation are known, but should not be considered in land use planning until the economics of this type of ore extraction improve markedly.

At Jangardup, the style of mining undertaken or being proposed is eminently suited to sequential land use, whereby most other uses can satisfactorily proceed after mining and rehabilitation has been concluded, subject to appropriate environmental approvals. There is a narrow, north-west extension of the Jangardup mine that is covered with Retention Licence 70/22, that may be considered for mining in the future. Land uses possibly sensitive to this style of mining should be very closely examined prior to any decision to consent to them proceeding.

If any areas of potentially extractable ferri-crete occur in the agricultural districts, consideration should be given to protecting them from competing land uses, particularly if an isolated occurrence. Where peat deposits occur in cleared farmland, its extraction may be acceptable and consideration could be given to protecting such areas from other uses that may prevent its future extraction.

9.12.2 Rural landscape and conservation zone

The freehold land areas to the south of the Scott River are characterised mainly by steep coastal dunes with relatively fragile coastal

heath vegetation, but also have significant areas of protected woodland and forest and other areas of richer soils capable of various productive agricultural activities. A large portion of this area is also underlain by the Yarragadee Aquifer, providing ready access to large volumes of high quality water for various land use and development purposes. The coastal belt is exposed to the strong winter storms and summer sea-breezes, presenting a high risk of wind erosion and dunal blowouts. At the same time the whole area has high and varied visual landscape values and considerable potential for recreation, nature-based tourism and lifestyle living. In consideration of those factors, it is proposed that the freehold land south of the Scott River be zoned 'Rural Landscape and Conservation'.

The principal objective of the Rural Landscape and Conservation zone is to protect significant landscapes and environmental features and provide for development which is compatible with and will enhance the landscape and environmental qualities of the locality.

Within the Rural Landscape and Conservation zone, proposed land uses and developments should be assessed in accordance with the following chart (note that where the use is listed as 'permitted', a formal planning application to the council may still be required).

Given the variety of uses that may be permitted in this zone, care must be taken to ensure compatibility of adjoining uses. With large lot sizes being available, each development and use on a lot should be so located as to not have any adverse impact outside the boundary of that lot. In addition, each development or use should be so designed and located as to be compatible with and complementary to the visual landscape and in particular should not be placed on exposed dunes or in visually conspicuous positions.

Table 13. Land Use Strategy – Rural landscape and conservation zone provisions

Use type	Permissibility	Comments and guidelines
House	Permitted	<ul style="list-style-type: none"> • Effluent disposal to be located so as to comply with the environmental objectives.
Additional accommodation	Discretionary	<ul style="list-style-type: none"> • May be permitted only for accommodation of permanent or seasonal workforce on land under the same ownership. • To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.
Holiday chalets	Discretionary	<ul style="list-style-type: none"> • Total number of units to be no greater than one unit per 10 ha of total site area (or appropriate similar performance criteria). • Development to be low key, with all buildings and site works to be compatible with and complementary to the visual landscape of the area. • Additional coastal management plan for the property to be submitted to address the impacts of the additional development. • No units or other development to be placed on exposed dunes or in visually conspicuous positions. • To be positioned on-site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.
Caravan park and/or camping ground	Discretionary	<ul style="list-style-type: none"> • Total number of caravan bays and camp sites to be no greater than one per 4 ha of total site area (or appropriate similar performance criteria). • Development to be low key, with all buildings and site works to be compatible with and complementary to the visual landscape of the area. • Additional coastal management plan for the property to be submitted to address the impacts of the additional development. • No buildings or other development to be placed on exposed dunes or in visually conspicuous positions. • To be positioned on site to avoid conflict with existing or permissible adjoining land uses. • Effluent disposal to be located so as to comply with the environmental objectives.
Irrigated horticulture	Discretionary	<ul style="list-style-type: none"> • All proposals for irrigated agriculture (or expansion) should show they have been considered by the multi-agency approval and assessment process, (see 'Application and Approval Process for New Irrigated Agriculture on the Scott Coastal Plain' and 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'). • Groundwater well licence required from WRC. • Full compliance with well licence conditions. • May require EPA approval – subject to assessment of risk of nutrient losses from the site. • Full compliance with EPA approval conditions. • Clearing permits required from AGWEST where clearing is proposed. • Full compliance with clearing permit conditions. • Observe the Best Management Guidelines for horticulture. • Setbacks from environmental features shall generally be in accordance with the Buffer Distance Guidelines set out in Table 5 of the 'Guidelines for Assessing the Environmental Risk of Irrigated Agriculture on the Scott Coastal Plain'. • Development and use to be positioned on-site to avoid conflict with existing or permissible adjoining land uses.

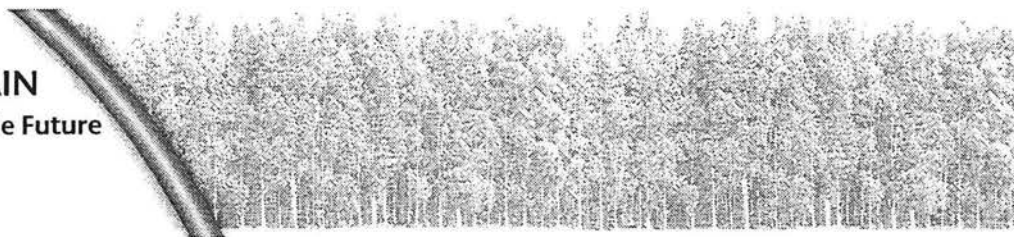


Table 13. Land Use Strategy – Rural landscape and conservation zone provisions (continued)

Use type	Permissibility	Comments and guidelines
Tree plantations	Discretionary	<ul style="list-style-type: none"> • Clearing permits required from AGWEST where clearing is proposed. • Full compliance with clearing permit conditions. • Observe the Best Management Guidelines for tree plantations. • Observe the Timber Industry Code of Practice for timber plantations in Western Australia. • Plantation and associated development and site works to be restricted to areas compatible with the visual landscape protection objectives of the zone.
Dairying	Discretionary	<ul style="list-style-type: none"> • May require EPA approval. • Full compliance with EPA approval conditions. • Effluent disposal to be located so as to comply with the environmental objectives. • Grazing not permitted on dunal areas or other areas susceptible to wind erosion.
Animal husbandry	Discretionary	<ul style="list-style-type: none"> • EPA approval required. • Full compliance with EPA approval conditions. • Effluent disposal to be located so as to comply with the environmental objectives.
Grazing	Permitted	<ul style="list-style-type: none"> • Observe the Best Management Guidelines for grazing. • Not permitted on dunal areas or other areas susceptible to wind erosion.

Other than for agricultural purposes, an essential pre-requisite to an increase in development and usage in this area is the preparation of a coastal management Strategy for the coastal strip extending from the western boundary of the D’Entrecasteaux National Park through to Hardy Inlet. An exception should be where a development proposal is for agricultural purposes and no additional people pressure will impact on the coastal zone. Subdivision of land and increasing development potential that will increase the pressure on the coastal zone will not be supported by the WAPC until the issue of the vesting of the vacant Crown land coastal strip is resolved and a suitable coastal management Strategy is approved and adopted. Negotiations need to be carried out with the respective local governments with a view to their accepting the vesting. Once these requirements have been fully addressed, subdivision of lots down to a minimum lot size of 40 ha may be considered where road access and road upgrading issues have been satisfactorily resolved. Further subdivision of

land to smaller lot sizes for lifestyle purposes will not be considered unless and until urban type services and facilities are provided in close proximity to the subject land and the required infrastructure has been appropriately upgraded.

Areas of private land near the coast that are underlain by limestone or lime sand should be viewed as containing a resource that will probably become more valuable with time and authorities should plan for future access to these areas.

9.12.3 Coastal management

Coastal management to ensure appropriate protection of the coastal environment should be carried out at three separate levels. Firstly, the Warren–Blackwood Regional Planning Strategy (WAPC 1997) recommended that the Ministry for Planning, in conjunction with other parties, prepare a regional coastal management Strategy for the coastline stretching from Walpole to Augusta, addressing issues such as:

- Coastal processes.
- Tourist and recreational demands.
- Options for access, development and settlement.
- Location, type and style of tourist and recreational facilities.
- Areas for conservation and protection.
- Resourcing coastal management.
- Rationalisation of boundaries and vesting of the vacant Crown land coastal strip.

Secondly, the local governments should seek appropriate government funding and assistance to prepare a coastal management plan for the section of coastline abutting the freehold land extending westwards from Black Point. That plan should address such issues as:

- Proposed node(s) for formal public access to the coast.
- Vehicle and pedestrian management.
- Requirements (if any) for public facilities.
- Beach and dune management.
- Conservation requirements.
- Involvement of abutting landowners.
- Guidelines for site management plans.

Thirdly, where there is proposed subdivision or development on lots abutting the coastline or the existing vacant Crown land along the coastline, there should be a requirement to prepare and implement a site coastal management plan by the landowner/developer, relevant to the proposed scale of subdivision or development, addressing issues such as:

- Setbacks for development.
- Dune and vegetation protection measures.
- Beach access points.
- Vehicle movement control.
- Fencing.
- Fire management.
- Visual amenity.

9.12.4 Accommodation

As indicated in Table 10, there may be an existing demand for on-site accommodation across the study area, with those demands increasing considerably in the future if any of the three development scenarios outlined are achieved. Table 10 sets out the projected workforce resulting from the various development levels associated with agricultural activity. Further accommodation demands are also likely to arise in the future from both mining and tourism activities within the study area, but that is difficult to forecast at this stage.

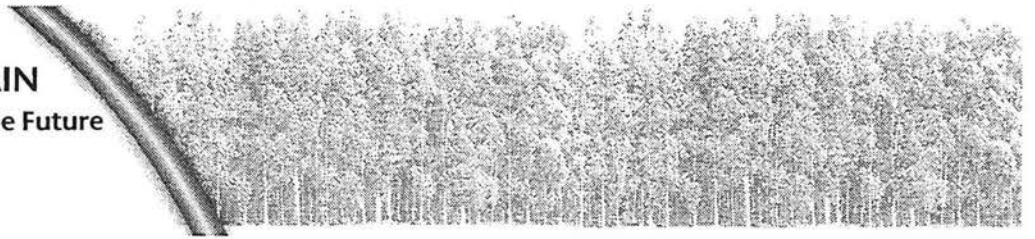
Both permanent and seasonal workers may be satisfied with caravan, hostel, boarding house, chalet or unit type accommodation. Seasonal workers may also be satisfied with camping options, but the permanent workforce, who may also have family with them, may demand the option of detached housing on an urban or rural residential lot. Currently there is a relatively small apparent requirement for off-site accommodation within the study, but the future development scenarios would generate considerably higher demands, along with potential additional pressures from mining and tourism.

If this scale of development is to be achieved on the SCP, it is likely that one or two small townships may need to be established. In the western part of the study area the most suitable general location would appear to be adjacent to Milyeannup Coast Road, south of the Scott River. This area is mostly well drained dunal country, with close proximity to the coast for climatic benefits and recreational access, providing an attractive setting. The principal infrastructure demands (water, power and roads) would be relatively simple to provide to this area. The site could be positioned such that it would not be occupying the more productive agricultural lands and would not raise land use conflicts with agricultural uses. In addition, in this location it would better serve the tourist and recreation demands along the coastal strip and could provide for future lifestyle development.

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The scale and disposition of the SCP suggests that there could also be a need for a smaller townsite development in the eastern sector. In this instance, the best location options would appear to be along Black Point Road on vacant Crown land or as an excision from State forest. In this position it could serve both the agricultural developments and the Jangardup and other future mineral sands mines.

The development of new townsites is also an opportunity to redress the lack of community services and facilities in the area. Sites for commercial facilities, such as convenience goods, tavern/bottle shop and rural supplies, should be allowed for in scale with the perceived development. Options for financial assistance to provide community facilities such as a community hall and sporting amenities should also be investigated.

The need, scale, type and timing of the new townsite developments will be dependent largely upon the scale and timing of other future developments in the area. To facilitate that progression, forward planning for the accommodation requirements should be undertaken at an early stage.

9.12.5 Roads and transport

The levels of heavy truck movements outline for the three future development scenarios set out in Table 11, indicate that funding needs to be sought for considerable upgrading of a number of the existing roads. Progressively, Milyeannup Coast Road will need to be upgraded to bitumen standard possibly to the junction of Woodaburrup Road, and if a new townsite is to be located south of the Scott River, the sealed road will need to be extended to this junction. Scott River Road and Black Point Road have already been sealed to serve the Beenup and Jangardup minesites respectively and will adequately serve the main eastern and western entry/exit points to the study area.

The main east-west connecting roads will also require considerable progressive upgrading. This will apply particularly to Governor

Broome Road and Fouracres Road and to a lesser extent to the first part of Pneumonia Road.

South of the Scott River, both Woodaburrup Road and the extension of Milyeannup Coast Road will require progressive upgrading depending on the scale and type of development that takes place. In particular, there are major horticulture developments along Woodaburrup Road and significant tree plantations along Milyeannup Coast Road, with more likely to develop in the future. In addition, if recreational usage of the south coast and D'Entrecasteaux National Park increases and low key tourism development is established, the roads standard will need to be suitable for cars and caravans. A major constraint to road building in this area is the lack of suitable roadbase material within reasonable proximity. To facilitate planning and funding of the construction, it is suggested that the local governments prepare a development potential concept and a road-upgrading plan to enable a schedule of road contributions to be produced.

Outside the study area, if any plantation timbers are to be transported to the Diamond Chip Mill for chipping, the Stewart Road/Coronation Road/Palings Road route is recommended. In the case of horticultural produce being transported to Manjimup for processing, packing or sorting, it is recommended that the opportunity for using Palings Road to Seven Day Road be investigated. This should result in a reduced road upgrading requirement, will separate tourist traffic on Graphite Road from heavy transport and will bypass the Manjimup main urban area.

9.12.6 Power supplies

The three future development scenarios outlined in Table 10 suggest significantly increased levels of demand for improved power supplies across the study area. This will come mainly from additional horticultural and dairying developments, the vast majority of which would be located to the

north of the Scott River. To this should be added the potential for one or two townsites, the principal one which would more than likely be located to the south of the Scott River, in the vicinity of Milyeannup Coast Road, plus a range of low key tourist developments along the south coast.

It would appear that there are three main options to consider for extension and improvement of the power supply grid within the study area:

Option 1

If the Jangardup Mine is to be connected by way of an extension from the existing Beenup substation, the proposed route should take into account the potential for up to a tenfold increase in the level of irrigated horticultural development, a doubling of the dairy production and the establishment of one or possibly two townsites. In this case, the local landowners and producers and other interested parties should approach Western Power as a collective group to negotiate the most appropriate power line route, connection points, power charges and other factors of common interest.

Option 2

If the Jangardup Mine is not to be connected to the existing power grid, then the local landowners should still approach Western Power as a collective group to negotiate similar issues for the agricultural enterprises, bearing in mind the potential for a new townsite connection in the future, also.

Option 3

There is always the opportunity for individual landowners or small groups to approach Western Power for separate minor extensions. However, due to economies of scale, this is often an expensive and inefficient method of connecting to the grid.

Recommendation 17

It is recommended that the Shires of Nannup and Augusta–Margaret River amend their district planning schemes to incorporate the zonings, zoning table and scheme provision recommendations set out in the Land Use Strategy.

Recommendation 18

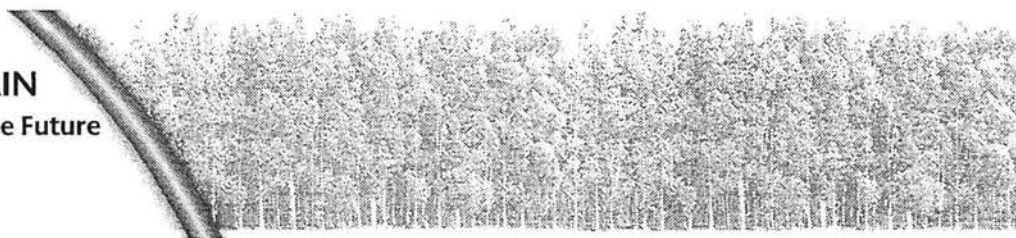
It is recommended that as a prerequisite to increased development along the coast and access to the foreshore area, the vesting of the coastal strip should be resolved and a Regional Coastal Management Strategy and a Local Coastal Management Plan prepared.

Recommendation 19

It is recommended that the accommodation growth demands within the study area be monitored and, as appropriate, detailed investigations be carried out into the preferred siting of a settlement/townsite and the associated infrastructure and community services and facilities requirements.

Recommendation 20

It is recommended that emerging product source locations and processing/transfer destinations be monitored to determine the routes, standards and timings of future road upgrading requirements.



Recommendation 21

It is recommended that a combined approach from the landowners and producers within the study area be made to Western Power to determine the preferred option, connection points, grid layout, staging and associated cost contributions for three-phase power supplies to properties.

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10. IMPLEMENTATION

In preparing this Strategy the Steering Committee has taken account of the economic, environmental and social circumstances in the SCP. All of these are intimately linked and change over time. As an illustration, when this project began in 1996 the most apparent issue was the potential environmental effect of the expansion of horticultural activity. In 1999 the most pressing issue was the closure of a major potato processing works in Manjimup that removed a significant market for the horticultural producers.

The challenge in implementing the Strategy is to develop a framework that can:

- address the economic, social and environmental issues of the SCP;
- assist people to work together for mutual benefit and to minimise the export of problems from one neighbour to another;
- is flexible enough to meet various changing circumstances;
- is robust and has feedback to monitor performance built into it;
- incorporate a range of different programs, strategies, policies and legislation that are available from the Government and private sector to address social, economic and environmental matters;
- operates effectively at both the scale of the whole of the SCP and at the local, farm scale;
- transfer information between these scales;
- resolve issues of decision-making power, management responsibility and cooperation on projects.

The process to develop management strategies is dependent on having enough information on which to make decisions. A limitation for this Strategy is the lack of detailed scientific information on the effects of land use on the environment, particularly waterways.

10.1 Components for implementing a Management Strategy

Any Management Strategy has five principal components:

- Appropriate effort for the appropriate level.
- Agreed ground rules.
- Quality planning.
- Management Group.
- Feedback and reporting mechanism.

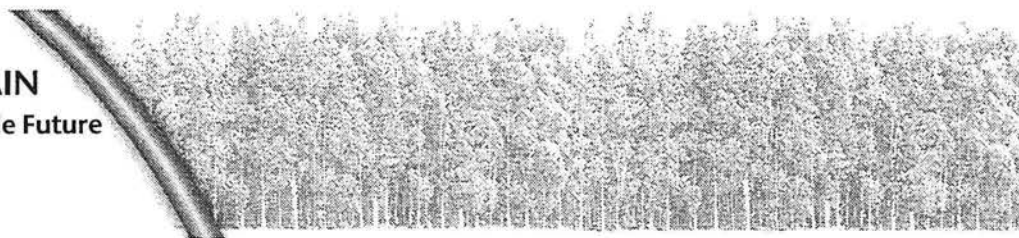
10.2 Appropriate effort for the appropriate level

The implementation of this Strategy must occur at both the **farm** and the **catchment** level, however, there are different mechanisms for implementation for both, e.g. farm level management strategies are needed to take account of individual variations in soil conditions and allow individualised design of farm management plans. These farm plans should also be relevant within a catchment-wide context so that the aggregation of individual practices produces desired outcomes at the catchment level.

Consequently the implementation of this Strategy is discussed for both these levels.

10.3 Agreed ground rules

There is a range of formal and informal means of controlling and managing development, changes in land use and managing potential for impact on the environment. Some of these are more effective at a farm level, others work better at the catchment level.



10.3.1 Formal mechanisms

At the catchment or study area level

It is anticipated that both the Nannup and Augusta–Margaret River Shire Councils will incorporate the Strategy into their respective district planning schemes. *The Town Planning Scheme (TPS)* for both Shires, once amended, will control changes in land use. Use class tables in each scheme text set out permissibility descriptions for each land use and describe general conditions of approval for most activities. Some forms of intensive land use will require council planning approval under the Scheme, others will be permitted within certain zones and will not require council planning approval. Existing land uses which do not conform with a change in zoning suggested by the Land Use Strategy are normally considered non-conforming uses and can usually continue at the current level or extent.

At the farm level

- *An Assessment and Approval Process for New Irrigation Proposals* has been developed by agencies to give landholders a streamlined process to follow in applying for approval to establish irrigation for horticulture or fodder crops in the SCP area. The approval process brings the agencies together, provides a single point contact for enquiries and applications for clearing remnant vegetation (if required), applying for a groundwater well licence and seeking advice from DEP on acceptability of irrigation proposals.
- Groundwater licensing for irrigation (*Rights in Water and Irrigation Act*) requires that proposals for new irrigated agriculture which require groundwater for irrigation will need a groundwater well licence, involving an application to the WRC.
- Clearing of remnant vegetation and drainage is controlled by the *Soil and Land Conservation Act 1945 and Regulations 1992*. Assessment of clearing proposals is managed through the Memorandum of

Understanding between government agencies to protect biodiversity and conservation values. Any proposed clearing of more than 1 hectare should be documented into a preliminary proposal and submitted to the Commissioner for Soil Conservation (see information package for land clearing proposals in Appendix 18).

- Rare or Priority Species is protected under the *Wildlife Conservation Act* and landholders with identified rare or Priority Species on their property have been notified by CALM that the flora occur on their property.
- *The Environmental Protection Act 1986* provides the legislation to protect the environment from damage, degradation or impact from pollution. The Environmental Protection Act can be used to assess environmental impact, to licence potentially polluting discharges, set environmental policy and require clean-up of damage.

10.3.2 Informal mechanisms – Guidelines for good decision making

At the catchment level

The *Strategy for a Sustainable Future* takes an integrated approach and establishes agreed objectives with community, landholders and government agencies for the management of the catchment and region. The process of developing the Strategy has informed many people of opportunities for development and how generally to proceed while meeting the objectives for environmental management. It is hoped that this process will bring landowners and agencies together in managing land and water in a sustainable way.

The Warren Blackwood Regional Planning Strategy has been developed by the WAPC to provide a framework for land use planning within the South West region. It will incorporate the Land Use Strategy from this project to add a further dimension to the WBRPS. It

will form the basis for decision making on subdivision proposals for freehold land and for assessing local rural strategies, district planning schemes and other planning matters.

It is anticipated that both the Nannup and Augusta–Margaret River Shire Councils will incorporate the Land Use Strategy vision and direction for land use and development of the rural parts of their shires, into their *Local Rural Strategies* (LRS). Furthermore, both local governments will become a natural focus for advice and a local link to the community and back to the agencies, when reviewing and updating their LRS.

The report card on catchment performance is an innovative approach for providing a feedback mechanism to the Management Group (see Section 11.6), community and landholders on how well land use and management at the regional level is meeting the objectives of being economically, socially and environmentally sustainable.

At the farm level

Sub-catchment planning and drainage management is proposed in the Strategy to be coordinated by the Lower Blackwood LCDC, with technical assistance from government agencies. Improving the management of land and water through proper drainage can assist improving the environmental quality of waterways. A sub-catchment planning approach is recommended where drainage within a sub-catchment is identified and agreed between all landholders, and incorporating principles for streamlining and riparian management.

Best practice guidelines are reflective of current industry standards for land management, self-regulating and incorporate technical information on cropping and animal production practices. They are usually developed by farmers and the industry.

The report card on catchment performance provides a feedback mechanism to landholders and farmers on how well land management at the farm level, as set out in

the Strategy, is meeting the objectives of being economically, socially and environmentally sustainable.

10.4 Quality planning

Planning at the catchment level

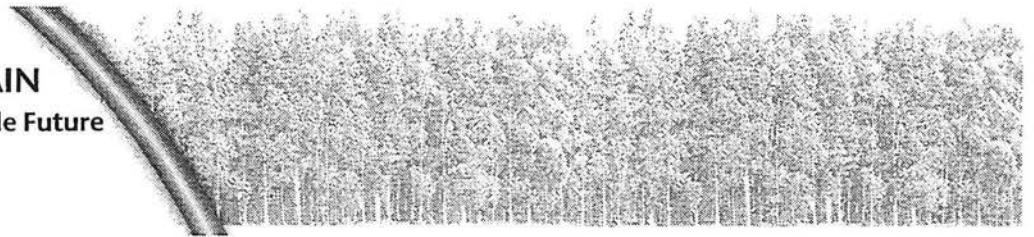
The *Strategy for a Sustainable Future* provides much of the catchment study area level planning for the SCP. The combination of the Water and Vegetation Management Strategy and Land Use Strategy, integrates planning for future development of the SCP by designating areas that are suitable for differing land uses.

It is anticipated that the integration of the Strategy into the WBRPS, the Shires' District Planning Schemes and the involvement of CALM and WRC will add to the recognition that the Strategy is an important part of future planning for the region. The Strategy has an in-built review mechanism that requires that the community and agencies continue the process of improving management of the area.

Assistance with developing rural and agricultural industry and economic activity is provided through programs run by AGWEST³ (Farmbiz, Progress Rural and Better Business and advice on market information), the Department of Trade and Commerce (funding for feasibility studies, advice on market information) and the South West Development Commission that particularly focuses upon assisting with infrastructure development and developing strategic regional initiatives.

Other funding programs covering land care and natural resource management activities can be found in *Funding and Training Directory for Landcare Activities July 1999*, prepared by AGWEST.

³ Details of Farmbiz, Progress Rural and Better Business programs can be obtained from Agriculture Western Australia District Offices in Manjimup and Busselton. Summary of programs provided in Appendix 21.



Planning at the farm level

The major challenge is for the community to implement best practice in both planning and day to day operations. It needs to be recognised that the *Strategy for a Sustainable Future* represents a new level of sophistication in farming operations. It will need a corresponding commitment by farmers to use the best available expertise and to continuously monitor their operations.

The *Strategy for a Sustainable Future* suggests the use of BMP at the farm level and the challenge is before the community to use this information to best effect and to update it as required. Best Practice Guidelines for Irrigated Agriculture, Nutrient Management for Grazing, and Draft Code of Practice for Tree Plantations and others are included in Appendix 28 to 32.

The community consultation has identified that there is considerable opportunity for landowners and the agencies to work together to develop research projects addressing issues such as nutrient application, sound use of biocides, design and construction of drainage and nutrient stripping.

10.5 Management Group – Options for ownership

10.5.1 Characteristics of a Management Group

The Scott Coastal Plain Steering Committee will have completed its work with the finalisation of this Strategy. Ongoing implementation, coordination of the report card and review of the Strategy requires a suitable management group to be identified and formed for this purpose.

The Steering Committee has identified the following characteristics for a suitable management group to oversee the ongoing implementation of the Strategy:

- Geographic range – The area of land most covered in the Management Group’s jurisdiction.

- Type of membership – Who would typically participate?
- Number of groups – How many management groups would operate across the project area?
- Ability to do hands-on management – How effectively does the Management Group effect change on the ground?
- Ability to do hands-on monitoring – How effectively could the Management Group monitor performance?
- Reporting on monitoring – How good is the Management Group at processing and integrating data?
- Main communication mechanism – How does the Management Group communicate with its members?
- Flexibility to respond to changing circumstances – How quickly can the Management Group respond to changing circumstances?
- Access to BMP – How easy is it for the Management Group to develop, access and spread BMP?
- Ability to set policy and change the Strategy – How easy is it for the Management Group to change the Strategy?
- Government agency involvement – Degree to which government agencies are involved.
- Capacity to exercise statutory powers, i.e. licensing bores etc. – The legislative powers available to the Management Group.
- Ability to ensure compliance across the group – What power does the Management Group have to ensure good performance?
- Reporting to government – How easy is it for the Management Group to interact with the government?

Table 14. Management Group characteristics

Characteristic	Catchment area management	Local management
Geographic range	Whole of study area	Farm and neighbours
Type of membership	Most stakeholders – government agencies and landowner representatives	Neighbourhood or individual land owner
Number of groups	One	Many
Ability to do hands-on management	Low	Very high, good capacity to develop neighbourhood approaches
Ability to do hands-on monitoring	Low and only at major points in the landscape Able to measure gross changes	High for local areas Able to measure localised changes
Reporting on monitoring	High at integration and interpretation of data	Low for integration and interpretation of data
Main communication mechanism	Formal – letters, memos, reports, meeting	Informal – neighbourhood discussion, phone calls, visits
Flexibility to respond to changing circumstances	Low	High
Access to BMP	Moderate – with a good capacity to prepare information materials and design programs	Moderate – with a good capacity to work at developing practical examples and test ideas
Ability to set policy and change the Plan	High	Low
Government agency involvement	High	Low
Capacity to exercise statutory powers, i.e. licensing bores etc.	High because of government agency involvement	Low
Ability to ensure compliance across the Management Group	High if legislative powers are used – this is not wanted by the community	Only through common law
Reporting to government	High	Low

As shown in Table 14, the management group has to have a number of necessary characteristics. There is no single entity with powers to effectively manage the ongoing implementation and review of the Strategy. As described earlier the government agencies tend to operate in a sectorial manner and only at the catchment area level with occasional extensions to the local level when licensing, monitoring or for the development of BMP. The landowners are good at on the ground management but do not have good access to the big catchment area picture.

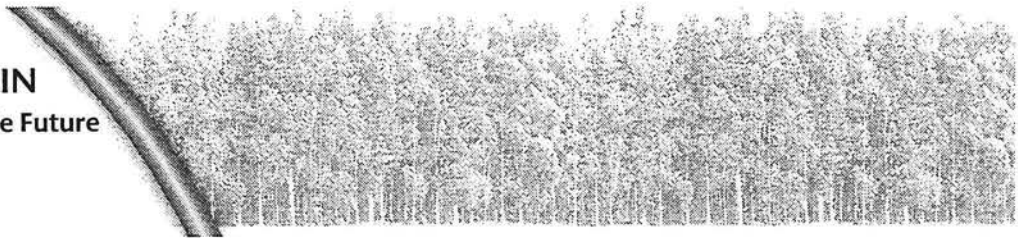
The success of the Strategy at a catchment area level requires cooperation and support from all stakeholders. Ownership of the Strategy will involve coordinating sustainable development activities in the catchment area, regularly updating and adapting the

Strategy in response to the triennial report card (Section 11) and identifying and placing a priority on issues.

The Steering Committee has identified a number of options for ongoing ownership and stewardship of the *Strategy for a Sustainable Future*.

These include:

- Joint Shire Working Group.
- LCDC/Community Catchment Group.
- Blackwood Basin Group.
- SWDC.
- Continue the Scott Coastal Plain Steering Committee.
- Convene a shire/agency Technical Group as needed, or some other arrangement.



10.5.2 Zone Steering Committee of the Blackwood Basin Group

The Blackwood Basin Group (BBG) is a community managed catchment group for the Blackwood River basin, which includes the Scott River. The majority of the SCP lies within the BBG catchment, however, some eastern parts of the SCP are in the Donnelly River catchment.

The BBG was formed in 1992 to address catchment problems with the Blackwood River and to promote sustainable land use activities, through coordination and education. The main focus of the BBG's work in recent years has been to address the salinity problems which occur in the middle and upper catchment of the Blackwood River, however, some work has been done on riparian vegetation surveys in the lower catchment area.

The BBG has no statutory power and relies on support from State government agencies and local government to implement regulatory control over land use and land management. Considerable funding has been brought into the Blackwood catchment as a result of the BBG (and former BCCG) accessing State and Federal government funding initiatives (NHT etc.).

The BBG is divided up into Zones covering the Upper, Middle and Lower Blackwood. The Steering Committee considers that a new zone could be created to cover the SCP. The advantages of this would be that it would give the SCP community access to an established administrative group that has both State and Federal Government recognition and an existing infrastructure within which to progress the initiatives that have been developed in the *Strategy for a Sustainable Future*. Developing the SCP area as its own zone avoids the potential that local issues would get swallowed up into a larger organisation.

The community members of the Steering Committee felt that it was inappropriate that community members be part of a management group that could be required to use regulation to enforce compliance, e.g. refusing or removing a licence for a landowner who was causing environmental damage. They had a strong preference that this is left to a government agency that was independent of the local circumstance. Using the BBG as the management group provides this necessary distance between the government agencies' management and enforcement roles.

Recommendation 22

It is recommended that the most appropriate Management Group for the Scott Coastal Plain is to create a Zone Steering Committee of the Blackwood Basin Group.

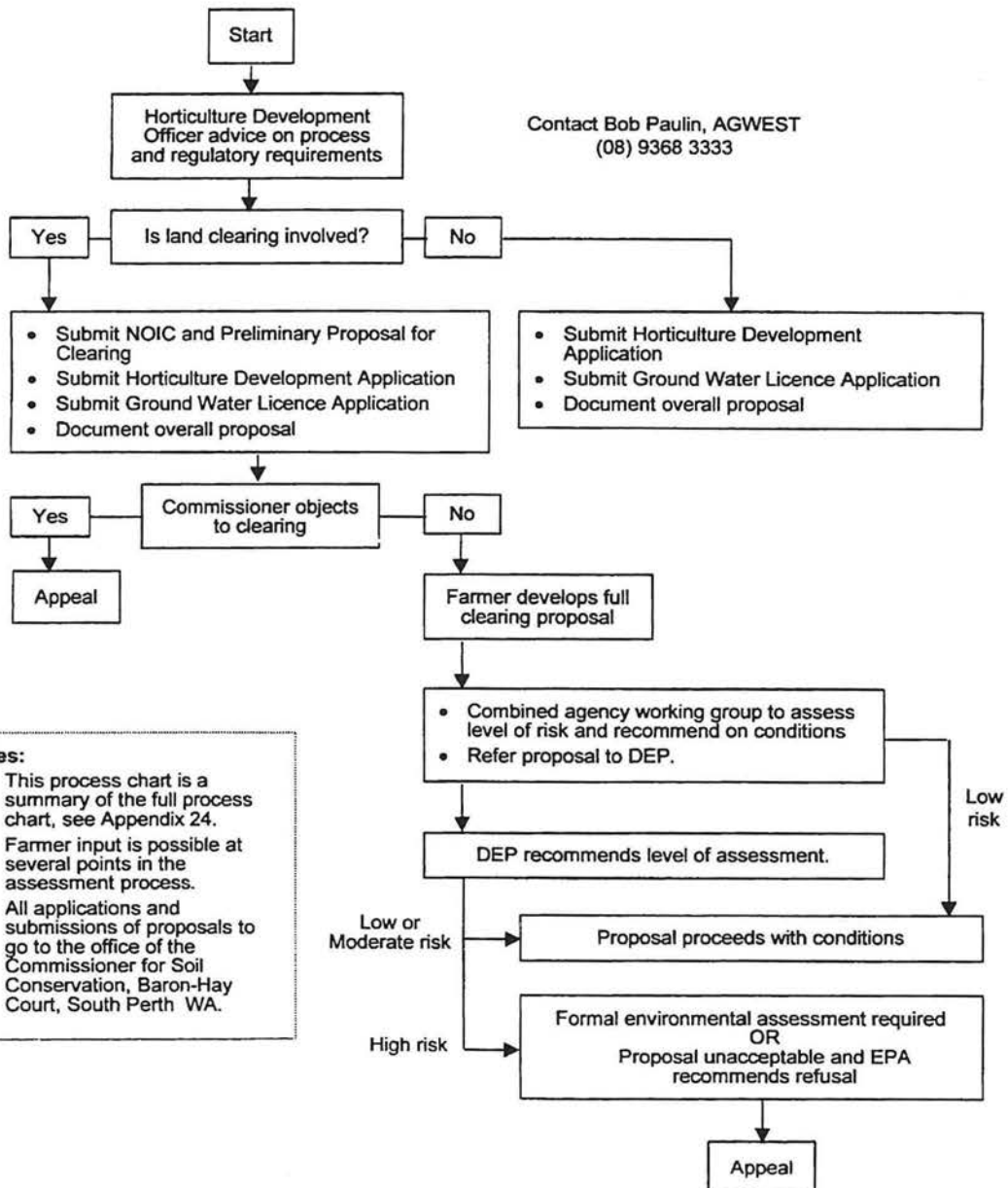
Recommendation 23

It is recommended that the role of this Zone Steering Committee should principally be one of review of the Strategy, coordination of activities and reporting to the community on the Strategy and the results of the Triennial report card. The Zone Steering Committee should not have the role of granting approvals or enforcing regulations. This function should remain with government agencies.

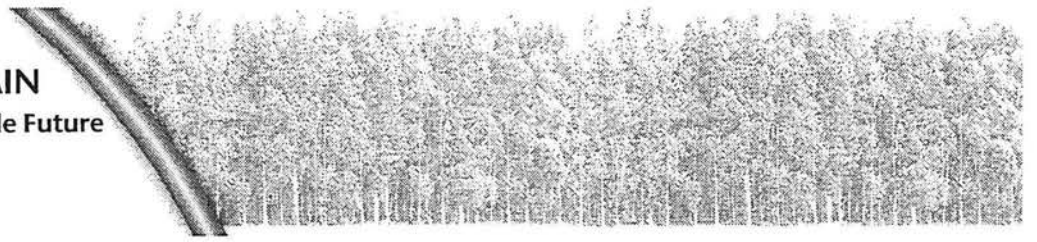
FOCUS TOPIC

— AN ASSESSMENT AND APPROVAL PROCESS FOR NEW IRRIGATED AGRICULTURE PROPOSALS – SCOTT COASTAL PLAIN

SUMMARY PROCESS CHART



SCOTT COASTAL PLAIN
– A Strategy for a Sustainable Future



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11. REPORT CARD – USING SUSTAINABILITY INDICATORS

A report card approach will be used to monitor and report on the effectiveness of proposed management strategies for land and water management for the SCP.

Indicators have been chosen for a range of sustainability criteria for the SCP. These indicators include data on economic, environmental and social indicators and will be collected annually by agencies and landholders. The WRC will report on water quality and health of waterway systems each year. AGWEST will coordinate the preparation of a comprehensive report card on the Scott Coastal Plain every three years. The *Strategy for a Sustainable Future* will be updated based on the results of the report card.

Understanding how well land use generally and agriculture specifically as the major land use in the SCP, is meeting the aim of being economically, socially and environmentally sustainable is important for landholders and for the general community. The Steering Committee developed proposed criteria for sustainability, from information collected at the December 1998 public workshop. These criteria are summarised in Table 15 and the indicators to measure will be drawn from the criteria listed (not all criteria are represented as indicators in the proposed report card).

Indicators that are easily measurable need to be chosen and attributes used to measure each indicator need to be reliable and con-

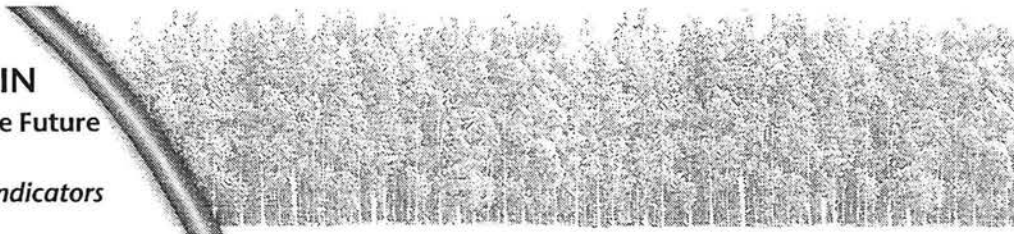
Table 15. Possible criteria for catchment health and sustainability

Sustainability issue	Criteria at farm scale	Criteria at catchment scale
Economic sustainability	<ul style="list-style-type: none"> • The long-term real net farm income. • Diversified agricultural production. • Uptake and use of latest technology in agriculture. • Uptake of best practice for all agricultural production. • Development and use of written business plans. 	<ul style="list-style-type: none"> • The long-term real net farm income. • Diversified agricultural production. • Uptake and use of latest technology in agriculture. • Uptake of best practice for all agricultural production. • Development and use of written business plans. • Extent of monitoring of land assets. • Agricultural farming systems research/trials in the region. • Proportion of production (or total \$) going into export markets.
Social sustainability	<ul style="list-style-type: none"> • Number of people employed. • Extent of services provided. • Number of commercial businesses in the area. • Measure of friendship in the local area. • Community level social functions. 	<ul style="list-style-type: none"> • Measure of local population. • Number of people employed in the area. • Extent of services provided. • Number of commercial businesses operating in the area. • Community level social functions.
Environmental sustainability	<ul style="list-style-type: none"> • Extent of protected riparian vegetation. • Deep pools maintained in Scott River. • Use of best practice for fertilisers. • Monitoring soil and water conditions on farm. • Remnant vegetation on private land protected. 	<ul style="list-style-type: none"> • Extent of protected riparian vegetation. • Deep pools maintained in Scott River. • Use of best practice for fertilisers. • Monitoring soil and water conditions on farm. • Remnant vegetation on private land protected. • Water quality in wetlands, rivers, estuary. • Colour in Scott River water. • Algal blooms in Scott River.

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Report card – Sustainability indicators



sistent. A process for recording and analysing the data and reporting the findings to the community and government, is also needed.

Such processes can be at two levels. Firstly at the farm level, where farmers can measure attributes of land and water relative to a desired state and compile a report card on the condition of their own property (Walker *et al.* 1996). Secondly, at the catchment level, where farm level data is placed in a catchment context, along with measures of land and water attributes taken from areas other than farms, such as streams or other receiving water bodies, to indicate overall catchment performance.

11.1 Key indicators for sustainability

The performance indicators chosen to report on catchment health criteria are shown in Table 16. The indicators take into account local conditions, will address local issues and information needs and provides guidance on method of analysis or evaluation against agreed standards or targets. It has been acknowledged by both government and community that there is very little data available to develop accurate targets for water quality against known standards and that the next three to five years will be used to establish a baseline for most environmental monitoring data.

For the SCP, the reporting issues are twofold; reporting on sustainability for the Scott River catchment and also being aware of the contribution the catchment makes to the health of Hardy Inlet. When considering sustainability, the indicators reflect the objective of reporting on the Strategy's success in achieving economic, environmental and social sustainability for the SCP.

Condition indicator data for the catchment include water quality monitoring programs carried out by WRC and soil condition surveys done by farmers. The condition data can be evaluated against agreed standards (targets for Scott River and Hardy Inlet, water quality standards from ANZECC, etc.) and

then interpreted in terms of local threshold values or circumstances. Environmental attributes measured by condition indicators are not expected to vary greatly from year to year (Walker *et al.* 1996). The condition report card gives a view of the long-term health status of the catchment.

Trend indicators capture short-term changes in catchment health status. Trend indicators relate to attributes of the catchment that can be modified in the short term by changes in land use and land management. Reporting on trend indicators will provide the first indications of how effective the management strategies are in addressing the needs of sustainable development on the SCP.

11.1.1 Financial performance indicators

Measuring economic performance is problematic due to the often complex nature of farm ownership and indebtedness. Farmers' terms of trade are not a local factor, being dependent on the exchange rate and changes in market demands that can be influenced by climatic events in other parts of the world.

In order to remain viable and profitable, farm businesses need to optimise returns on investments, recognise and correct yield-limiting constraints, align products to market specifications and diversify and integrate production systems. This approach will maintain a more reliable farm income and partially cover for fluctuations in commodity prices (Reuter *et al.* 1996).

Variations in farm income are expected across the study area, depending on climatic conditions, decisions on land use options, nature of soil resources, individual effort on the part of the landowner and skills of the landowner.

For the SCP area, the long-term real net farm income is suggested as the principal measure of economic sustainability and may allow useful comparison with other regions and Australian trends, given that the structure for assessing sustainability Australia-wide is already in place. Not all these measures are possible for the SCP. Farmers' terms of trade

are a national attribute, however, may be provided on an industry sector basis (e.g. cropping, livestock, etc.) to indicate the type of economic environment farmers are trading in.

The indicators recommended here to provide an estimate of the long-term real net farm income are *disposable income per family* and *farm business profit/ha*. These represent factors that are relatively easy to measure, have a standard method and are significant at the catchment or study area scale. It is recognised that there may be difficulties in collecting this type of information from individual farmers, however, aggregated data reported on a study area scale should not compromise individual farmers. Some regional scale financial information is collected by ABARE in its annual Farm Surveys and may be useful for this exercise and should be evaluated when preparing the report card.

11.1.2 Environmental performance indicators

A range of physical, chemical and biological parameters have been selected to report on condition and trends in environmental health for both Hardy Inlet and Scott River.

Physical water quality parameters are quick, simple and inexpensive to measure and have a direct relationship to the chemical characteristics of a waterway. These parameters measured in conjunction with chemical parameters provide an overall view of waterway conditions at the time of sampling.

Temperature, turbidity and light penetration all have impacts upon the biological community and upon the type and rate of chemical reactions taking place. These things measured in association with chemical parameters provide an overall view of waterway conditions at the time of sampling. Dissolved oxygen is a standard requirement for aquatic life. It also has a marked affect on chemical cycles. Temperature, mixing, vertical stratification and biological activity influence dissolved oxygen concentrations.

Nutrients are sampled to provide an indication of the trophic state of the waterway.

Eutrophic waterways are those which have become enriched with plant nutrients, specifically phosphorus and nitrogen. Hence these nutrients measured as totals and fractions provide an obvious chemical measure of the health of a waterway.

While the collection and interpretation of chemical data is of importance, there are limitations associated with it. The processes of nutrient cycling in aquatic ecosystems are not well understood making interpretation of data difficult. Data on the phytoplankton species presence and abundance is important in the assessment of trophic state. As a system becomes more eutrophic changes also occur in secondary productivity.

Aquatic macro-invertebrates are reasonably permanent inhabitants of ecosystems and as such are excellent indicators of environmental change. Invertebrate communities in eutrophic systems become simplified, containing fewer species than healthy systems. Also some species of invertebrates are particularly sensitive to toxicants and die when exposed, thus any changes in the population may indicate the presence of pollutants other than nutrients.

It is proposed to collect and study the phytoplankton communities within the study area, as they are well known indicators of water quality. The succession of these microscopic flora is of profound significance in determining the flow of energy within a system. By looking at the presence and relative abundance of different phytoplankton species an understanding of the biological dynamics of the system can be better understood.

11.1.3 Social performance indicators

Social performance indicators have been determined to identify trends in population, business growth and service provision, to estimate the extent to which the social systems are sustainable. Concern has been expressed at the increase in tree plantations in the region, which may result in reduction in people and farmers. Providing increased

SCOTT COASTAL PLAIN

– A Strategy for a Sustainable Future

Report card – Sustainability indicators

services such as three-phase power, better data communications and roads will enhance agricultural and other enterprise in the region. Measures of these social criteria are listed in Table 16, with indicators for total

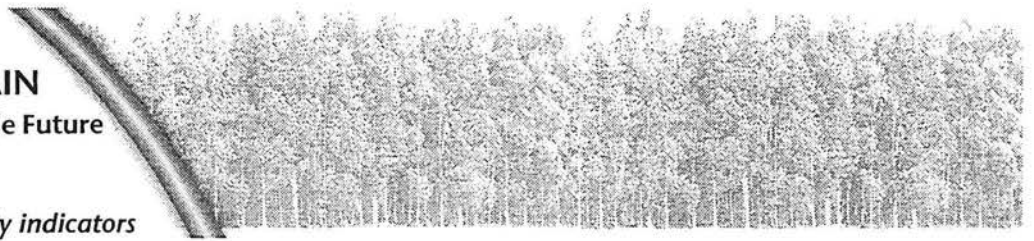
population, number of people in employment, number of business enterprises in the region and extent and level of services such as power and roads.

Table 16. Key indicators for monitoring catchment health and sustainability

Parameter	Level	Sites	Sampling interval	Reporting interval	Evaluation	Standards
<i>Biophysical condition: Hardy Inlet</i>				<i>3 years</i>	<i>Evaluate against standards or adaptive water quality targets</i>	
Physical (temperature, pH, salinity and conductivity, turbidity)	Hardy Inlet	8	Fortnightly	Annual	Standards	ANZECC
Physical (dissolved oxygen)	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Nutrients (dissolved P (FRP), dissolved nitrogen DIN, ammonia NH ₃)	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Nutrients (total N, total P, nitrate, nitrite, silicate)	Hardy Inlet	8	Fortnightly	Annual	Standards	ANZECC
Chlorophyll a	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Chlorophyll b, c and phaeophytin	Hardy Inlet	8	Fortnightly	Annual		N/A
Colour	Hardy Inlet	8	Fortnightly	Annual	Targets	Targets
Phytoplankton	Hardy Inlet	8		Annual	Species and distribution	N/A
<i>Biophysical condition: Scott River Catchment</i>				<i>3 years</i>		
Physical (conductivity, dissolved oxygen, temperature, pH)	Scott River	7	Fortnightly	Annual	Standards	ANZECC
Nutrients (total N, total P, dissolved P (SRP), nitrate, nitrite, ammonia)	Scott River	7	Fortnightly	Annual	Targets	Targets
Total suspended solids	Scott River	7	Fortnightly	Annual	Standards	ANZECC
Metals (Al, Mn, Fe)	Scott River	7	Quarterly	Annual	Standards	ANZECC
Pesticides (OCs, OPs)	Scott River	7	Quarterly	Annual	Standards	ANZECC
Major ions (Na, K, Mg, Ca, HCO ₃ , SO ₄ , Cl, CO ₃ , SiO ₂)	Scott River	7	Quarterly	Annual		N/A
Biology						
Phytoplankton	Scott River	7	Fortnightly		Species and distribution	N/A
Macro invertebrates	Scott River		6 monthly		Species and distribution	N/A
Vegetated streamlength	Catchment		3 years		Total length measure	N/A
Soil fertility (total N, total P, K, trace, S, organic carbon)	Farm	Irrigation and pasture	3 years – as per soil sampling guide		Farm level report. Aggregate to catchment level for area changes	Soil guide
Soil structure/consistency	Farm	Irrigation and pasture	3 years – 2 samples per soil type per paddock		Farm level report. Aggregate to catchment level for area changes	Soil guide
Soil quality/condition (salinity EC, soil pH)	Farm	Irrigation and pasture	3 years – 2 samples per soil type per paddock		Farm level report. Aggregate to catchment level for area changes	Soil guide

Table 16. Key indicators for monitoring catchment health and sustainability (continued)

Parameter	Level	Sites	Sampling interval	Reporting interval	Evaluation	Standards
Biophysical trends:				3 years	Overall comparison with similar systems and trends over time	
Area seagrass	HI		Annual		Report on trends	N/A
Species seagrass	HI		Annual		Species distribution and trends	N/A
Algal blooms	HI and SR				Frequency and species	N/A
Chlorophyll a, b, c and phaeophytin	HI		Annual		Annual median concentration	N/A
Nutrients	HI and SR		Annual		Standards	ANZECC
Turbidity	HI and SR		Annual		Standards	ANZECC
Fish populations	HI and SR		2 years		Species and assemblage	N/A
Periphyton	HI and SR		2 years		Report on trends	N/A
Remnant vegetation	Study area		2 years		Area total and area protected	N/A
Rare or Priority Species	Study area		2 years		Locations and number	N/A
Productivity and financial trends:				3 years	Overall comparison with similar systems and trends over time	State and national averages
% Potential crop yield (per crop)	Farm	Irrigation and pasture	Annual		Aggregate to catchment	
Actual crop yield (per crop)	Farm	Irrigation and pasture	Annual		Aggregate to catchment	
Disposable income per farm family	Farm		Annual		Aggregate to catchment	
Farm business profit/ha	Farm		Annual		Aggregate to catchment	
Diversified production	Farm		Annual		Report total number by diversified production	
Uptake of best practice	Farm		Annual		Report total number in use	
Social structure trends:				3 years		
Population	Study area		Annual		Total population, changes	N/A
Full time employment	Study area		Annual		Total number employed, changes	N/A
Business enterprise	Study area		Annual		Total number, distribution, type and changes	N/A
Service provision	Study area		Annual		Types, changes	N/A



11.2 Use of catchment health and sustainability indicators

Users, groups and organisations which will be interested in the report card include individual landholders, landcare groups (Lower Blackwood Land Conservation District Committee and the Blackwood Basin Group), local government authorities, State government agencies, conservation groups and the general community external to the catchment.

At some point, farmers and landholders will want to relate their land management practices to catchment performance, in a similar way to what they do for economic management purposes. Getting feedback on both economic and environmental performance will lead to better decisions on land management. Landholders will want to clearly identify water quality and general environmental impacts, which have been poorly understood due to a lack of environmental data for Scott River catchment, and monitor trends over time to better understand the level of impacts and seriousness of consequent changes in the environment. Landholders can use the report card approach to show the general community that land use is sustainable, what is working well and what needs further attention.

Landcare groups, conservation groups and the general community will want information on how well land use is managing environmental impacts and conforming with agreed management strategies and targets for water quality in Scott River.

Local government authorities (Shires of Nannup and Augusta–Margaret River) will want information on land use, including changes in land use and the sustainability of intensive agriculture, in order to keep the Land Use Strategy up to date. Monitoring changes in land use can also provide the shires with valuable information on infrastructure needs including land for residential and industrial use, roads, drainage and other servicing.

11.3 Indicators and data sets

For an indicator to be effective it needs, among a range of characteristics, to have data to support it and to be applicable to the economic/social/environmental system to which it is to be applied. Table 16 below lists the indicators that have been selected by the community as potentially being able to report on the sustainability of the SCP.

Some indicators are measured at the farm scale and used by the landholder in property management. These indicators can be aggregated to catchment or study area scale to provide trend information that helps to guide overall land and water management.

The data sets that support the indicators are those that have been identified by the government agencies as being relatively easy to collect from existing data, or proposed monitoring programs.

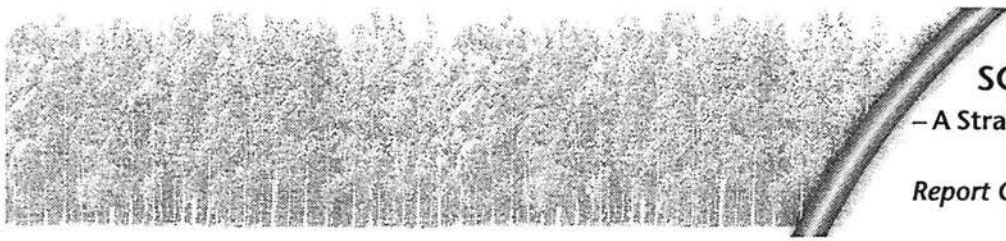
11.4 Monitoring and reporting

A range of people and organisations will carry out monitoring and collection of data.

Water quality and environmental monitoring programs have been established by the WRC and will be supplemented by monitoring done by the Lower Blackwood Catchment LCDC. Some farm level water monitoring is occurring through the NHT project assessing nutrient movement through groundwater at a range of land use sites and is coordinated by WRC. It is proposed that WRC report annually on the water quality monitoring in the Hardy Inlet and Scott River.

Farm level surveys will need to be carried out, by individual farmers and will be coordinated by AGWEST. Farmers need to be consulted on this and it is recommended that the farmers concerned be approached personally to enlist their support.

Standard survey forms will be used to collect data on soil condition for biophysical data and farm productivity and financial trend data. All individual farm information will be



treated confidentially. Farm productivity and financial data will be aggregated up to study area level, to protect the confidentiality of individual farm businesses.

It is recommended that AGWEST coordinate the preparation of the report card on the SCP, to be prepared every three years.

Recommendation 24

It is recommended that landholders provide farm level soil survey and business information, on a confidential basis, to assist with the preparation of the sustainability report card.

Recommendation 25

It is recommended that AGWEST coordinate the preparation of the report card on sustainability for the Scott Coastal Plain, to be prepared every three years. The report card will include monitoring information gathered by Water and Rivers Commission and the Lower Blackwood LCDC and farm level information provided by landholders.

collated and prepared as a pamphlet by one of the agencies for distribution.

- Use meetings of LCDC and grower groups to collect and distribute information.
- Put the collated results of the report card onto the Internet or fax so that the public can access it.
- Reports released in the local newspapers.

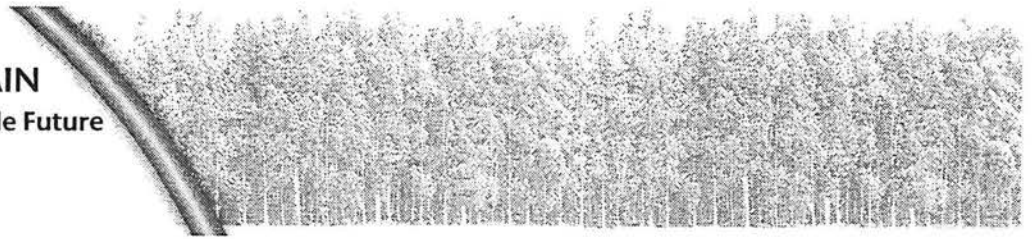
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11.5 Transferring information

For sustainable development to work information has to be transferred up and down from the landholders and farmers to the management group and vice versa. The Steering Committee is seeking feedback from the community on means of collecting and distributing information between landowners, the management group and agencies. Some options are presented below:

- The Management Group prepares pro forma report cards and distributes these to individual landowners. They are then



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ACRONYMS

ABARE	Australian Bureau of Agricultural and Resource Economics
AGWEST	Agriculture Western Australia
ANZECC	Australian and New Zealand Environment and Conservation Council
ARCWIS	Australian Research Centre for Water in Society
BBG	Blackwood Basin Group
BCCG	Blackwood Catchment Coordinating Group
BMP	best management practice
CALM	Department of Conservation and Land Management
DEP	Department of Environmental Protection
DIN	dissolved inorganic nitrogen
DRF	Declared Rare Flora
EP Act	Environmental Protection Act 1986
EPA	Environmental Protection Authority
EPP	Environmental Protection Policy
GIS	Geographic Information System
HRDC	Horticultural Research and Development Corporation
LCDC	Land Conservation District Committee
LRS	Local Rural Strategies
LUS	Land Use Strategy
NHT	Natural Heritage Trust
PRI	phosphate retention index
RIWI Act	Rights in Water and Irrigation 1914 Act
SCP	Scott Coastal Plain
SLC Act	Soil and Land Conservation Act 1945
SWQMS	State Water Quality Management Strategy
TAG	Technical Advisory Group
TEC	Threatened Ecological Community
TPS	Town Planning Scheme
WAPC	Western Australian Planning Commission
WBRPS	Warren-Blackwood Regional Planning Strategy
WMS	Water Management Strategy
WRC	Water and Rivers Commission