Goulburn Broken

Regional Catchment Strategy

November 2003

GOULBURN
BROKEN
CATCHMENT
MANAGEMENT
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Foreword

Stephen Mills.

The future economic, social and environmental outlook for the Goulburn Broken Catchment is strong. We have a robust regional economy that continues to attract new investment. We have accepted and met the challenge of 'living within the limits' of salt and nutrient disposal from the region, and the Murray Darling Basin Cap on water diversions. We have a greatly improved understanding of the region's biodiversity assets particularly its native vegetation.

Many of these achievements relate to our success with implementing our Regional Catchment Strategy (RCS) over the five years from 1996 to 2001. This document builds on the achievements of the RCS and sets the framework for natural resource management within the region for the period 2002 to 2007. It was developed by the Goulburn Broken Catchment Management Authority in consultation with its partner agencies, local government and the community.

While the short- to medium-term outlook for the region is promising, the purpose of the RCS is to take a longer-term view of the challenges for the region. Salinity, nutrient and pest plant and animal management are pressing problems that require ongoing work – we cannot relax our intensive efforts in these areas.

Water underpins the viability of our irrigation area that, in turn, is the foundation of the region's economy and community. Competition for water is increasing – and there will be pressure on how the region balances the demand for increased environmental flows and a fully allocated water resource. This will require some difficult decisions. To maintain and improve river health and water quality we need a balance of measures including waterway management, nutrient reductions, fish passage and environmental flows. A balanced approach is imperative.

However, there are new challenges on the horizon. The Strategy highlights the importance of global warming, loss of soil health and the decline in biodiversity as issues that require priority attention. It also looks at the opportunities presented by landscape change as the means by which we can address many of the challenges facing the region.

This Strategy does not seek to provide the detail of programs to address these issues but rather describes the broad framework for how the issues will be addressed. A key element of the framework is a 'whole of Catchment' approach that promotes investments to generate 'triple bottom line' outcomes and pursue integrated solutions.

We have also emphasised the importance of capacity building including, community engagement, risk management and adaptive planning to the way we do our business. We cannot claim to have the perfect solution for all of the region's challenges, but we want to put in place the best possible framework for addressing them.

Stephen Mills.

Chair, Goulburn Broken Catchment Management Authority.

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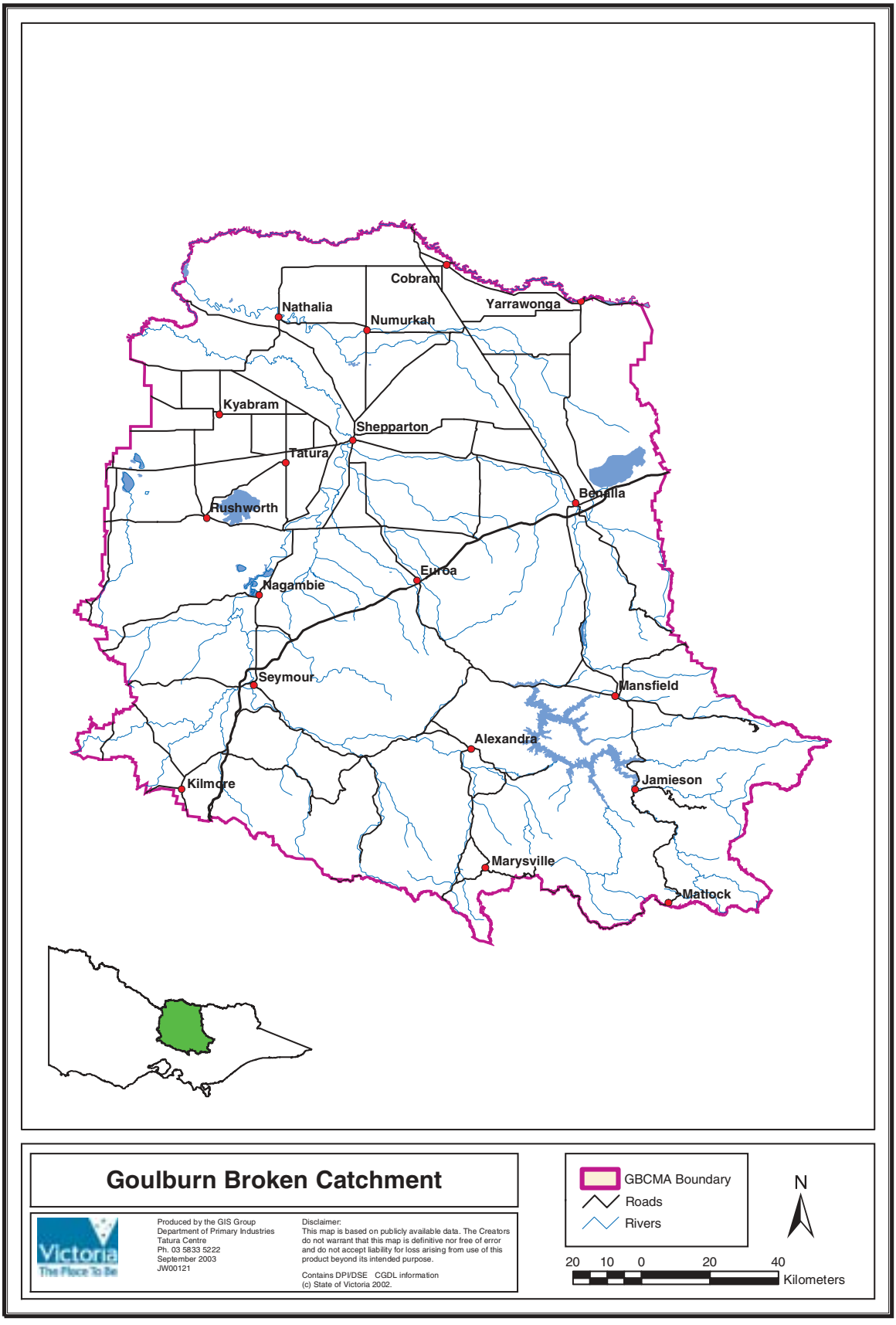


Acronyms

Acronym	Explanation
AAV	Aboriginal Affairs Victoria
AFFA	Department of Agriculture, Fisheries and Forestry Australia
ANZMCFFA	Australia and New Zealand Ministerial Council on Forestry, Fisheries and Aquaculture
ANZECC	Australia and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
BIS	Goulburn Broken Biodiversity Integration Strategy
CAMBA	China – Australia Migratory Bird Agreement
CMA	Catchment Management Authority
COGS	City of Greater Shepparton
DSE	Department of Sustainability and Environment
DPI	Department of Primary Industries
EA	Environment Australia
EC	Electrical Conductivity units – a measure of salt concentration
EMS	Environment Management Systems
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation Act 2000
EOV	End of Valley
EVC	Ecological Vegetation Class
FFG	Flora and Fauna Guarantee Act 1988
GB	Goulburn Broken
G-MW	Goulburn-Murray Water
GMLN	Goulburn Murray Landcare Network
GMOs	Genetically Modified Organisms
GVP	Gross Value of Production
IUCN	International Union for the Conservation of Nature
JAMBA	Japan – Australia Migratory Bird Agreement
JANIS	National criteria for a comprehensive, adequate and representative reserve system for Australia's forests, agreed in 1996 by the Joint ANZECC/MCFFA National Forest Policy Implementation Agreement Sub Committee
KEETA	Koorie Economic Employment and Training Agency
LAP	Local Area Planing
MDB	Murray Darling Basin
ML	Megalitre
NAP	National Action Plan for Salinity and Water Quality
NRE	Department of Natural Resources and Environment
NHT	Natural Heritage Trust
NVMS	Native Vegetation Management Strategy
RCS	Regional Catchment Strategy
SEAR	Significantly Enhanced Aquatic Refugia
SEPP	State Environment Protection Policy
SIR	Shepparton Irrigation Region
SPZ	Special Protection Zone
TBL	Triple Bottom Line - a method for making explicit the trade-offs between social, economic and environmental outcomes to be achieved by the Strategy
TSN	Threatened Species Network
UDV	United Dairyfarmers of Victoria
VCMC	Victorian Catchment Management Council
VFF	Victorian Farmers Federation
VRHS	Victorian River Health Strategy
WQS	Water Quality Strategy

Executive Summary

1.1

The Goulburn Broken Catchment's assets

The Goulburn Broken Catchment is home to 189,500 people and is regarded by many as the 'food bowl' of the Murray Darling Basin. The region's agriculture output – estimated to be worth $1.35 billion a year – supports a regional economy that has an annual economic output of $7.8 billion and employs about 77,000 people.*

This strong performance is due to the region's abundant natural resource assets and the ecosystem services these assets generate. The way we manage our water, land and biota assets is critical to the future sustainability of the region and its community.

1.2

Threats to the Catchment's assets

Salinity, water quality decline, flooding, pest plants and animals, soil degradation and degradation of biodiversity and ecosystem processes are the major threats to the region's natural resource, economic and social assets. Many of these threats have been known for a number of years and the region has in place a sophisticated range of programs to address them.

New research has, however, revealed that issues such as dryland salinity and soil degradation, particularly soil acidification, are much greater problems than first thought. In addition, the competition for the region's water is increasing – and there will be pressure to balance the demand for increased environmental flows and a fully allocated water resource. This will require some difficult decisions. To maintain and improve river health and water quality, we will need a balance of measures including waterway management, nutrient reductions, fish passages and environmental flows.

1.3

What we achieved over the past five years

The Catchment's natural resource management programs are world's best practice. We have won national and international acclaim for the efforts of our community and agencies in dealing with issues such as salinity, water quality and biodiversity. A significant feature of our approach over the past five years has been stronger integration of land, water and biodiversity management.

Our review of achievements revealed that good progress is being made with all of the region's programs, either through meeting targets or through better understanding the issues and challenges. We have also developed a greater understanding of the value of our natural assets in terms of the ecosystem services they contribute to the region's productive capacity. Because of the complex series of interactions that make up the region's environment, degradation of any of the natural assets will have an impact on other assets. We need:

- Further options for managing salt disposal in the irrigation area. Drainage diversion remains an important part of managing salt exports but as drainage flows decrease (because of increased water use efficiency) the salinity concentration will increase reducing the water quality for diverters.
- Better matching of water use and land use to land capacity. Transfer of water entitlement has presented the opportunity for achieving this. The water market is driving the increased water productivity ($/ML), but further effort is needed to ensure that environmental benefits are maximised.

* *An Economic Profile of the Goulburn Broken Catchment (2001), Michael Young and Associates*

- To take advantage of the changing land use patterns within the Catchment. The change is driven by factors such as water markets, commodity prices, and demographics. A new 'mosaic' of land use pattern is emerging. The Strategy needs to consider how our natural resource investment influences this mosaic and how we can drive this change to increase the value of our biodiversity assets.
- To explore the opportunities presented by demographics and the need for land use changes within the dryland for landscape change. This will enable new approaches to be developed to achieve implementation targets in the dryland area.
- To increase our understanding of the impact of threats and threatening processes such as salinity and intensification of agriculture on biodiversity assets and the need for stronger efforts in conserving and restoring these assets.

1.4

Looking to the future

Our regional community is growing. By 2020, we expect the population to be 220,000 and the cultural mix will be diverse. The world demand for food will continue to increase, driving an expansion of our agriculture sector. This growth in production and population will place increased pressure on the region's natural assets. Over the past 20 years we have seen a trend in the intensification of agriculture production. We are using less land for agriculture but have managed a significant increase in agricultural production. This trend is expected to continue. Land is moving from agricultural use to rural living uses, particularly in the areas with easy access to Melbourne.

Within this context, the Goulburn Broken Catchment Management Authority, in consultation with partner agencies, local government and the community, is proposing the following vision for the Catchment:

> "*A catchment recognised locally, nationally and internationally for quality agricultural produce and where community values contribute to the benefits of abundant and well-maintained environmental assets used for tourism and recreational activities.*
>
> *The environmental footprint of irrigation and dryland farming will be significantly reduced, with farmers occupying less land and using less water whilst managing their resources more sustainably. New opportunities will arise for increasing the ecosystem services provided by the land retired from agriculture and by improved environmental flows.*
>
> *The region's economy will be robust, with much of the agricultural produce processed within the region, generating employment and wealth creation opportunities for a regional community actively engaging in natural resource management programs."*

1.5

Changing landscapes

We need to supplement our existing efforts, the best management practice approach alone, will not deliver the outcomes we seek. We have identified landscape change as the new direction for the next five years. Our existing programs remain very important and will be continued, and if funds are available, accelerated. We must look to new ways of addressing some of the more intractable issues facing the region such as dryland salinity, biodiversity decline and floodplain management.

Landscape change is an ongoing process. In irrigation areas, intensification of agriculture is doubling production every 10 years while the area of land used for irrigation is declining. Across the Catchment we could expect to see a significant shift in land use patterns over the next 50 years and this will strongly affect the future landscape. The result is likely to be a mosaic that comprises:

- An intensive agricultural zone with a smaller ecological footprint – 'double the production from half the land'.
- An increased 'conservation' zone where the land previously used for traditional agriculture is managed for nature conservation and ecosystem services.
- Rural living areas where land, particularly near urban centres, is converted to hobby farms and smaller farms where the main household income is from activities other than agriculture and which may offer additional conservation benefits.

Our Landscape change initiatives will include:

- Restoring the Lower Goulburn River Floodplain.
- Pursuing water savings to enhance environmental flows and sustainable regional development.
- Exploring market-based approaches including Environmental Management Systems (EMS).
- Pursuing Multiple Benefits from our investments by building on the successful environmental management grants approach and including other market-based mechanisms such as 'auction' systems, 'annuities' and attracting private investment to enhance public investment in vegetation banks.
- Identifying priority area projects such as the South West Goulburn that is potentially a major source of salt to the Goulburn River and, ultimately, the Murray River.
- Improved Regulatory Framework. The management of dairy shed effluent in the irrigation area is one area where an increased regulatory effort is required and the GB CMA will work the Implementation Committee, Murray Dairy, the United Dairyfarmers of Victoria (UDV) and the Environment Protection Authority (EPA) to develop an appropriate program to take us to 100% compliance.
- Research into water management.
- Enhancing community engagement through the use of 'Deliberative Forums' – an approach that brings together a cross section of the community to review the best available technical evidence about a particular issue and to promote public debate on the processes for dealing with that issue.
- Expanding salt disposal options for the irrigation areas.
- Exploring opportunities for the Catchment to support greenhouse gas abatement programs.

1.6

What we will achieve

This Strategy sets the context for the Catchment's sub-strategies and action plans. Timescales for targets and actions reflect the timescales of different biophysical processes. Some threats can be addressed in the short term by direct intervention. In other cases, such as dryland salinity, management actions will take many years to have a measurable impact on the threatening process. Targets are at different scales of development. Many have been subject to extensive consultative processes. Some are interim only but are included because they provide a useful reference point. See body of document for details.

Asset	Resource condition target
Overall riverine assets	Maintain 2003 condition of 2,400 km of streams until at least 2016.
	Improve condition of 1,400 km of streams by 2016.
In-stream	Ensure no decline in condition of 800 km of fragile in-stream environments by 2016.
	Maintain or enhance 2003 condition of 100 km of aquatic environment by 2016.
	Increase length of river accessible to fish by 200 km by 2016.
	Improve condition of channel form over 200 km of stream by 2016.
Public frontages	Maintain 2003 condition of 350 km of all public frontages rated as 'good' or 'excellent' until at least 2016.
Water quality	Reduce potential phosphorus loads by 65% by 2016 by reducing phosphorus loads from • irrigation drains by 50%; • dryland and diffuse sources by 20%; • wastewater management facilities by 80%; and • urban drainage.
Recreation	Riverine health will be maintained and enhanced when managing for recreation purposes.
Ecologically Healthy Rivers	Maintain condition of Ecologically Healthy Rivers by 2016.
	Improve condition of six rivers to ecologically healthy status by 2016.
Representative Rivers	Maintain Representative River in ecologically healthy condition
Heritage Rivers	Maintain condition of 50% of lengths of Heritage Rivers by 2012.
Native vegetation	Maintain extent of all native vegetation types at 1999 levels in keeping with the goal of 'net gain` listed in Victoria's Biodiversity Strategy 1997.
	Improve the quality of 90% of existing (2003) native vegetation by 10% by 2030.
	Increase the cover of all endangered and applicable vulnerable EVCs to at least 15% of their pre-European vegetation cover by 2030.
Threatened species	Increase 2002 conservation status of 80% threatened flora and 60% threatened fauna by 2030.
Wetlands	Maintain extent of all wetland types at 2003 levels where the extent (area and number) has declined since European settlement.
	Improve condition of 70% of wetlands by 2030, using 2003 as the benchmark for condition.

Threat and impact management targets.

Intermediate outcome (threat or impact managed)	Target	Time frame
Threat / Activity		
Stock grazing	5,200 km	2012
Induced		
Saline water and high water tables – irrigation	Keep groundwater below 2m and remove saline water by consistently pumping groundwater from 216,000 ha of land per year	2020
Saline water and high water tables – dryland	Reduce salt loads from the dryland areas by 34,000 tonnes per year	2050
	Reduce area of dryland that would otherwise be salinised (in foothills and river valleys of highland areas): 1,500 ha	2050
	Treat high recharge areas to protect and enhance 5,000 ha of biodiversity assets	2050
	Manage 30,000 ha of salinised land in the riverine plain	2050
Nutrient rich & turbid water and suspended solids	20 urban stormwater projects	2016
	no. of waste-water management facilities	2016
In-stream & near-stream erosion	250 km	2012
Weed invasion	460 km	2016
Changed flow pattern	20 flow-stressed high value rivers	2012
	5 rivers	2012
Impact		
Habitat loss – terrestrial	2,000,000 native plants planted	2016
Habitat loss – in-stream	200 km increased fish passage	2016
	100 km Significantly Enhanced Aquatic Refugia established	2016
Habitat loss – wetlands	Improve floodplain wetland linkages in 10 areas of national and state significance	2016

1.7

Capacity building

Catchment management presents a series of complex and inter-related challenges. Our overall goals are often in conflict, for example economic development can have environmental costs. Some of the on-ground works can support multiple goals, for example revegetation assists with achieving biodiversity, salinity and water quality objectives. An integrated Catchment management strategy is required. This approach allows for these complex relationships to be made explicit and the trade-offs to be identified and considered so that our efforts work towards maximising the 'triple bottom line' for the Catchment, that is the balancing of social, economic and environmental outcomes. A good example of a process aiming to identify the potential trade off decisions and to make them more explicit are the Biodiversity Risk Mitigation Protocols.

The way we do business in natural resource management is as important as the works we are trying to achieve. Integrated Catchment management recognises that actions to address one resource management issue may interact, both positively and negatively, with actions designed to address another resource management issue. The processes that we put in place must enable trade-offs to be identified and addressed. The CMA's values and best practice outline how this will occur. They emphasise the central role of the community and the need to ensure its members are appropriately engaged. The standards also cover important actions such as monitoring, evaluation, and research and development.

1.8

Supporting documents

This Strategy sets out the 'blueprint' for achieving the vision. The Strategy is supported by a range of sub-strategies, investment plans and reports. It is in these documents that the details of our programs can be found (see below). These documents are located on the GB CMA's website (www.gbcma.vic.gov.au).

Table 1.1 Supporting sub-strategies and plans.

Regional Catchment Strategy 2003				
Riverine Health Strategy	**Salinity**	**Biodiversity**	**Pest plants and animals**	**Others**
• Water quality • Floodplain • Waterways • Riparian and in-stream native flora and fauna • Flows • Recreation • Wetlands	• Dryland • Irrigation	• Biodiversity integration strategy • Native vegetation strategy • Threatened species and non-threatened flora and fauna • Non-vascular plants • Invertebrates	• Rabbits • Weeds	• Climate change • Soil health

Why a Strategy and what is it?

2.1

Policy and Legislative Framework

The Victorian Government established the Goulburn Broken Catchment Management Authority in 1997. It is a statutory authority responsible for the coordination of natural resource management programs within the region. Under the Catchment and Land Protection Act 1994, the GB CMA is required to update the Regional Catchment Strategy (RCS) every five years that establishes the planning framework for land, water and biodiversity management in the region.

The RCS must support the objectives of other related State Government legislation in particular, the Environment Protection Act 1970; the Planning and Environment Act 1987; the Conservation, Forests and Lands Act 1987; the Flora and Fauna Guarantee Act 1988; the Water Act 1989; the Waters of Victoria State Environment Protection Policy (SEPP) (in preparation); and other groundwater and regional surface water SEPPs.

Strategic guidance for the RCS also comes from various Government policies and strategies. The main ones include: Victoria's Salinity Management Framework, Biodiversity Strategy and the Native Vegetation and Pest Management Frameworks, development plans, policies and instruments (e.g. relating to industry, forestry, landcare, regional development, non-government organisations) and Municipal Strategic Statements.

The Strategy must also address the obligations of the Catchment under Commonwealth legislation. In particular, the RCS must support the Environment Protection and Biodiversity Conservation Act 1999; Commonwealth policies such as the National Strategy for Ecologically Sustainable Development, and the National Action Plan for Salinity and Water Quality.

Because of the importance of the Catchment to the Murray Darling Basin (MDB), the Catchment must pay particular attention to the policies of the Murray Darling Basin Ministerial Council as required by the Murray Darling Basin Agreement Act 1992. The policies include the MDB Salinity and Drainage Strategy, the MDB Integrated Catchment Management Policy, the MDB Cap on Future Diversion of Water within the Basin.

It is not possible for the Strategy to describe in detail how the region intends to meet this range of obligations. Rather, it is an overarching document that takes a longer-term view of the challenges and opportunities facing the region. Priority issues and programs have been identified for the period 2002 to 2007. These priorities are described in this document, but the detail of the programs to address these issues is found in the accompanying sub-strategy documents.

The RCS, however, must have sufficient detail to enable the Commonwealth and State Governments to guide their investment under the National Action Plan (NAP) for salinity and water quality and the Natural Heritage Trust (NHT).

2.2

The scope of the Strategy

The Goulburn Broken RCS sets the framework for natural resource management within the Catchment. It cannot contain all the detail of the threats and programs relating to the region's natural resource management. This very detailed information is found in the supporting sub-strategies, action plans and technical papers. The region's sub-strategies are standalone documents about either the threatening process, such as salinity and pest plants, or the asset that we want to protect, such as rivers and biodiversity.

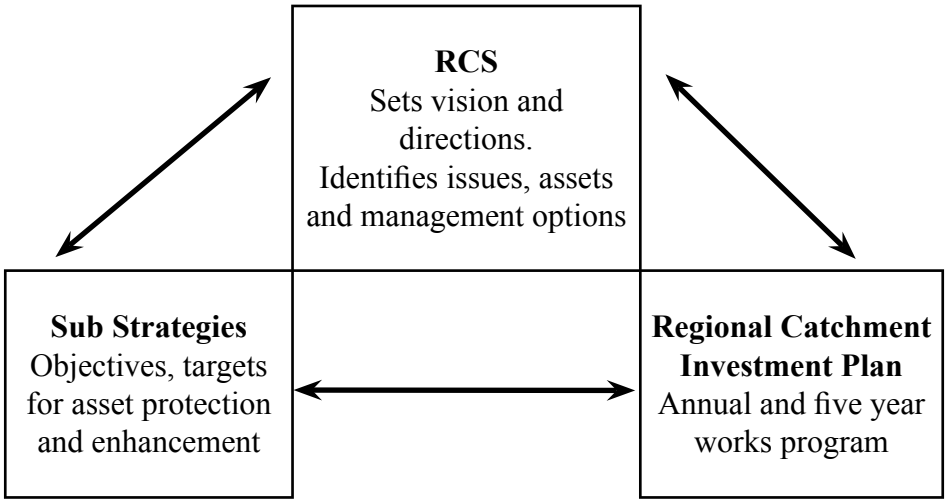


Figure 2.1: The RCS Planning Framework.

Sub-strategies attempt to isolate issues to help us to understand and communicate them. The strong linkages between issues in natural resource management make the task of isolating issues very challenging. The sub-strategies set out a long-term program of works and describe the options and trade-offs for addressing particular issues.

The sub-strategies produced in the Goulburn Broken Catchment reflect the evolution of natural resource management. In many cases, these documents were pilots for Victoria and Australia and are well advanced in implementation. They include:

- Shepparton Region Land and Water Management Plan 1990;
- Goulburn Broken Dryland Salinity Management Plan 1990;
- Goulburn Broken Water Quality Strategy 1996;
- Goulburn Broken Native Vegetation Management Strategy 2000;
- Goulburn Broken Weeds Action Plan 2000; and
- Goulburn Broken Rabbit Action Plan 2000.

These documents continuously evolve in response to changing knowledge. Several documents commissioned during 2001/02 update previous approaches, while several others focus on new and emerging issues. For example, the Shepparton Irrigation Region (SIR) Catchment Strategy 2002 considers all natural resource management issues. The documents generally combine some or all of the elements of asset protection, resource-use and asset threat.

In addition to these sub-strategies, specific five-year investment plans meet the needs of funding programs and annual regional management plans contain even more detail about the work programs. Figure 2.1 shows the links between these plans and strategies.

The RCS sets a comprehensive vision for the Catchment based on how it manages its natural resources to generate environmental as well as economic and social benefits. It is not expected that the GB CMA alone will achieve this vision. Other Commonwealth and State agencies, rural and urban water authorities, landholders, the broader community and local government will play a major role. The vision sets the context for how the GB CMA will interact with these stakeholders.

This RCS will have a major influence over the investment decisions made by the Commonwealth and State governments and the community in natural resource management and sustainable regional development. The RCS covers water, land and biodiversity management programs. It does not go into detail about how the agricultural sector invests in industry development or the how the State and Commonwealth invests. Rather it sets the framework within which these investments will occur.

The RCS must demonstrate how the public and private investment in natural resource management will maximise the 'triple bottom line'. That is, how the economic, social and environmental outcomes from investment will be maximised and how potential trade-offs between these outcomes will be identified and considered.

2.2.1 Local government and other partners

Local government requires specific mention. The RCS is a central part of the overall Catchment management governance system and provides important directions for local government planning schemes and interprets the State Planning Policy Framework at the regional level.

The GB CMA has established strong links with local government over the past five years and was able to use this relationship to ensure local government input during the Strategy formulation. A key factor in the successful implementation of our Strategy will be translating the intent of the Strategy and its supporting action plans into the Municipal Strategic Statements and local planning schemes. This represents an area of 'work in progress' for the Catchment. With the assistance of resources from the National Action Plan for Salinity and Water Quality Program (NAP) program the Municipal Association of Victoria has engaged consultants to develop this translation. A schedule to the RCS will be developed that describes in detail how the Strategy can be adopted within planning schemes. This addendum will cover:

- zones and overlays;
- policies and exercise of discretion;
- further strategic work; and
- other actions (including referral of applications to the GB CMA).

Local government contribution to the Strategy outcomes is greater than the amendment and application of its planning schemes. Local governments play a major role in communicating with local communities; facilitating sustainable regional development and supporting recommended management practices through the provisions of incentives such as rate rebates.

2.3

Process for developing the Strategy

Over the past five years, the region has reviewed and amended existing sub-strategies and, where appropriate, developed new sub-strategies for managing natural resources. A core requirement of these ongoing reviews is community consultation and engagement.

The development of this Strategy draws strongly on our 'continuous learning' approach. Its renewal provides the opportunity to review and reflect on the region's natural resource management programs and ensure that those programs are appropriately aligned. Its development also reflects the community engagement and partnership principles adopted by the GB CMA. Appendix 2 illustrates the range of stakeholders involved in the Strategy development. The major stages were:

- **Review of existing action plans and sub-strategies**. This occurred over 2000 and 2001. Implementation Committees reviewed progress and refined existing sub-strategies and special working groups were established to develop new strategies where appropriate. Each sub-strategy review and development involved specific consultation programs.
- **Review of 1997 Goulburn Broken RCS.** The CMA drew together the outcomes of the sub-strategy reviews and compared progress against the targets set by the 1997 Strategy. The report, Goulburn Broken Regional Catchment Strategy Achievement Report 1997 – 2002, was made available through the GB CMA's website (www.gbcma.vic.gov.au).
- **Development of the Region's Vision.** The vision for the region was developed by the Board in partnership with the community. Three community and agency workshops were held in early 2002 and brought together representatives of local government, water authorities, State and Commonwealth agencies and the community. After considering the findings of the reviews, the workshops helped develop the longer-term vision for the Catchment and the directions for the next five years.
- **Preliminary consideration by the Joint Commonwealth and State Accreditation Coordination Committee**. In May 2002, the committee reviewed the first draft and provided feedback to the GB CMA. Based on this feedback, a final draft of the Strategy was prepared and released for public comment in September 2002.
- **Local government workshop**. Special attention was given to developing the partnership with local government. In August 2002, a local government workshop involving councillors and officers from all of the region's municipalities was held to consider the Strategy and the implications for local government. The outcome was an agreement to jointly develop a schedule to the Strategy that specifies the actions required by local government to support the Strategy's implementation.
- **Formal public consultation period**. The Strategy was on public display over September and October 2002. To facilitate public feedback, a summary brochure and consultation feedback proforma were widely distributed. All of the Strategy's supporting documents were made available on the GB CMA website (www.gbcma.vic.gov.au) Four public meetings were held across the region and a total of 36 written submissions were received by the CMA.
- **Finalising the Strategy**. This occurred over November and December 2002 and involved further discussions with the Accreditation Coordination Committee and review of the public comments by the GB CMA Board.

Table 2.1: Roles of regional stakeholders

Goulburn Broken Catchment Management Authority (GB CMA)
The CMA is responsible for the preparation of the RCS and reporting on progress towards its targets and outcomes. It is also responsible for works on waterways, regional drainage and floodplain management, and co-ordinates Commonwealth and State natural resource management investment in the region. Through its Implementation Committees, the GB CMA provides strong community ownership and input to the Strategy and its supporting sub-strategies.

Department of Sustainability and Environment (DSE)
The DSE, through its responsibilities to the Minister under the Water Act and the CALP Act, provides financial, policy and strategic support for the development and implementation of the RCS and its sub-strategies. The department is also responsible for Statewide land use planning and the implementation of the Planning and Environment Act.

Department of Primary Industries (DPI)
DPI provides technical and extension support for developing and implementing the RCS. These services are provided through the Northern Irrigation and North East regional offices. Of particular importance is the research and development input provided by the department's research institutes.

Local government
The Catchment includes the municipalities of Moira, Campaspe and the City of Greater Shepparton in the SIR and the Benalla Rural City and shires of Mitchell, Mansfield, Murrindindi and Strathbogie in the dryland part of the Catchment. Local governments are central to the Strategy's implementation through their responsibilities for land use planning, development approvals, rates and a variety of services such as road construction and maintenance.

Goulburn Murray Water (G-MW)
G-MW provides irrigation, drainage, water supply and management of specific water supply catchments. It licenses surface and groundwater extractions, and plays a major role in irrigation salinity management, water quality management and regional economic development. It also contributes significantly to other riverine health outcomes.

Urban water authorities
Goulburn Valley Water and North East Water provide water and wastewater services to urban communities in the region. These authorities manage specific water supply catchments and contribute to the water quality outcomes of the region by investment in improved wastewater management services.

Environment Protection Authority (EPA)
The EPA co-ordinates all activities relating to the discharge of waste into the environment and the generation, storage treatment, transport and disposal of industrial waste. It seeks to control pollution and protect the quality of the environment. The EPA's efforts are guided by the State Environment Protection Policy Waters of Victoria.

Landholders
Achieving the Strategy outcomes requires changes in the way we manage our natural assets. Under the Catchment and Land Protection Act Landholders are required to: 1) avoid causing or contributing to land degradation which causes or may cause damage to land of another owner; 2) conserve soil; 3) protect water resources; 4) eradicate regionally prohibited weeds; 5) prevent the growth and spread of regionally controlled weeds; and 6) prevent the spread of and, as far as possible, eradicate established pest animals.

Landcare
Landcare groups enable the community to participate directly in natural resource management, particularly by identifying and setting direction for on-ground works and mobilising community involvement in their local area. Landcare groups and networks will continue to play a major role in implementing the RCS.

Parks Victoria
Approximately 94,421 ha of the Catchment is State and National parks managed by Parks Victoria. Its primary role is to ensure the conservation values of the parks and reserves network is protected.

Aboriginal Groups
The Aboriginal community possess knowledge of their cultural history and the natural environment that is valuable in the development and implementation of natural resource management programs. Over the coming five years the CMA will build on existing arrangements to create an environment that promotes indigenous involvement, ownership and input.

Universities and TAFE
Universities and TAFE Colleges operating in the region must continue to provide a high level of service and to produce graduates with an extensive knowledge of natural resource management issues. They have an ongoing role in providing support to natural resource managers through student and staff involvement in Catchment initiatives.

Trust for Nature
Trust for Nature is a non-profit organisation which works to protect threatened ecosystems. The Trust focuses on its conservation covenant program and the purchase and re-selling of high conservation value land through its revolving fund. It helps community groups buy property, provides information and seeks to add value to regional research.

VicRoads
VicRoads is responsible for maintaining and improving Victoria's 22,240 km of arterial roads, and 4,924 bridges and major culverts. VicRoads is actively involved in developing roadside management plans for its major roads. These plans will assist in managing roadside environments and include sections on pest plants and animals, retention of significant roadside areas, maintenance strategies and maintenance of firebreaks.

Industry
Through its operating practices and peak industry groups, such as Murray Dairy and the Victorian Farmers Federation (VFF), industry is able to exert strong influence over natural resource management outcomes.

Environment groups
These groups are major contributors to the outcomes of the RCS by either involvement in shaping the its direction or delivering on-ground works. The groups include the region's Environment Alliance Network, and the Goulburn Valley Environment Group.

Establishing the vision

3.1

Drivers for the region's natural resource management

3.1.1

Protecting and enhancing the asset base

The Catchment is one of the few non-coastal rural areas that continues to grow. This growth is based on abundant natural assets, particularly water for irrigated agriculture. The Strategy's main purpose is to protect these assets. Their loss – and loss of the benefits for the current and future generations – can often be irreversible. While the primary goal of the RCS is to protect and prevent further degradation of the assets, it is critical that we also take all feasible steps to restore degraded assets.

3.1.2

Natural resource management in 1990s – learning from our efforts

The 2002 Goulburn Broken RCS Achievement Report (see Appendix 1 for a summary) laid the foundation for this update of the RCS. Good progress is being made with all of the region's programs, either through meeting targets or through a better understanding of the issues and challenges.

The main findings of the review were:

- The region has worked within the salt disposal, water cap and water quality limits set by the Murray Darling Basin Ministerial Council.
- The SIR Program has become strongly integrated and is largely on track to meet targets; government-funding constraints remain the main barrier.
- The Dryland Program underwent a major refocus in 1999/2000 after a number of years of below-target performance. It has developed a multi-benefit approach to on-farm investments.
- The Water Quality Program is exceeding works targets within the irrigation area and overall has demonstrated a major reduction of phosphorus and nitrogen loads at key regional sites (see Figures 3.1 and 3.2).
- Upgrading the region's sewerage treatment plants has reduced phosphorus loads from 50 tonnes a year in 1997 to 10 tonnes a year (2002). A further reduction to 3 tonnes a year is expected by 2004. This achievement is well in excess of the target of 80% reduction by 2015 set by the GB Water Quality Strategy.

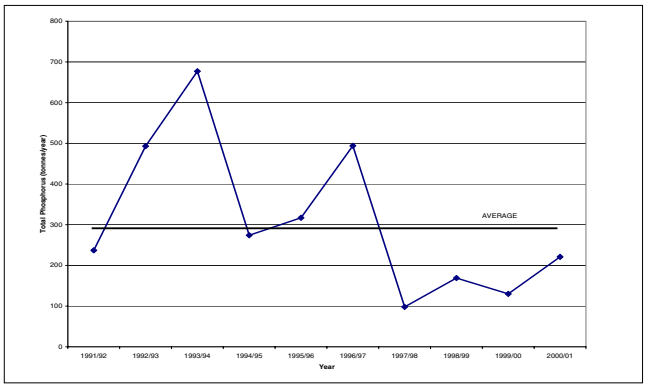


Figure 3.1: Total phosphorus exported from the Catchment.

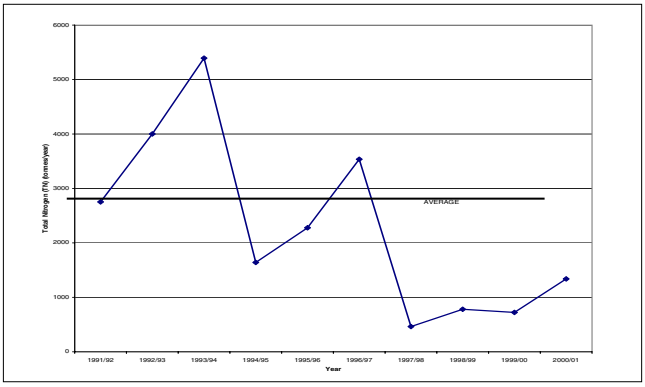


Figure 3.2: Total nitrogen exported from the Catchment.

- A strategic approach to vegetation management and biodiversity protection has established the foundations for improving biodiversity outcomes. While these outcomes will continue to be difficult to measure, regional policies such as the multiple benefits approach to grants will ensure that biodiversity outcomes are achieved.
- Our review of achievements over the past five years suggests we need to supplement existing efforts because the best management practice approach alone will not deliver the outcomes we seek. Existing programs remain very important and will be continued, and if funds are available, accelerated. But we must look to new ways of addressing the more intractable issues facing the Catchment such as dryland salinity, biodiversity decline and floodplain management.

3.1.3

Increased understanding of ecosystem services

The region has a greater understanding of the value of natural assets in terms of the ecosystem services those assets contribute to the region's productive capacity. Natural assets are interconnected and degradation of any natural asset may degrade other natural assets. Biodiversity assets, in particular, are under threat from salinity and intensification of agriculture.

3.1.4

Emerging water markets and demand for environmental water

Water markets and water reform programs are, and will continue to be, major drivers of land use change. The need for water savings to meet the Snowy River commitments, and the increased interest in establishing environmental flows for the Murray River and the Catchment's rivers and streams will put pressure on our water assets.

Transfer of water entitlement has presented the opportunity to better match water and land use to land capacity. The water market is driving the increase in water productivity ($/ML), but further effort is needed to ensure that environmental benefits are maximised.

3.1.5

Land use, commodity prices and demographic change

Land use patterns are changing within the region, driven by factors such as water markets, commodity prices, and demographics. A new 'mosaic' of land use pattern is emerging. The Strategy needs to consider how our natural resource investment influences this mosaic and how we can use this change to increase the value of our biodiversity assets. Progress in achieving implementation targets in the dryland area is constrained by commodity prices. However, the demographics and land use changes will allow landscape change options to be explored.

3.1.6

Salt disposal constraints

Further options for managing salt disposal in the irrigation area will need to be developed. Drainage diversion remains an important part of managing salt exports but, as drainage flows decrease (because of increased water use efficiency), the salinity concentration will increase, which will reduce the water quality for diverters. This will require more effort in identifying other salt disposal options, such as greater use of evaporation basins within irrigation areas.

3.1.7

Drought and global concern for climate change

At the time of preparing the RCS, parts of the Catchment were experiencing a 1 in 20 year drought. This, combined with increasing global concern about climate change, will influence the design of many of the RCS on-farm works programs and the targets set by the sub-strategies for those programs.

3.2

Implications for the future of the region

The region is changing. Agricultural industries are becoming more efficient, with the level of production doubling every 10 years and land used for agriculture decreasing. We are using significantly less water, yet water is becoming increasingly scarce, with strong competition between environmental, agricultural, urban and recreational demands.

Our region's population is growing, and the cultural and demographic mix changing. There are likely to be fewer farmers, but more landholders as more people buy smaller properties for lifestyle reasons.

The regional community's understanding of the importance of its biodiversity assets has grown significantly and there is an increased community expectation that those assets should be protected and rehabilitated from the effects of clearing, salinity, nutrients and pest plants and animals.

3.3

The vision

The prosperity of our Catchment in 50 years depends on how well we manage our land, water and biodiversity assets now. Within this context, the Board has set this vision for the Goulburn Broken region:

> *"A catchment recognised locally, nationally and internationally for quality agricultural produce where community values contribute to the benefits of abundant and well-maintained environmental assets used for tourism and recreational activities.*
>
> *The environmental footprint of irrigation and dryland farming will be significantly reduced, with farmers occupying less land and using less water whilst managing their resources more sustainably. New opportunities will arise for increasing the ecosystem services provided by the land retired from agriculture and by improved environmental flows.*
>
> *The region's economy will be robust, with much of the agricultural produce processed within the region, generating employment and wealth creation opportunities for a regional community actively engaging in natural resource management programs."*

3.4

The region's goals and the 'triple bottom line'

The GB CMA recognises the importance of 'triple bottom line' accounting of our investment in natural resource management. Actions that are promoted by this Strategy and the sub-strategies often generate environmental, economic and social benefits. In some cases, the actions might generate an economic or social benefit, but an environmental cost. It is important that these costs and benefits are made explicit so that investors and decision-makers can carefully consider the multiple benefits that can arise from investing in particular actions and the trade-offs that might be required.

The GB CMA has adopted the following 'triple bottom line' goals:

Environment goal

To protect and enhance natural assets and their ecosystem processes and functions in a way that provides benefits for native biodiversity, social and economic aspects.

Social goal

To manage natural assets and their supporting infrastructure in a way that is responsive to the visions and values of communities of interest, is what the community wants to achieve socially, and that recognises the opportunities for management presented by existing and evolving social networks.

Economic goal

To manage natural assets and their supporting infrastructure in a way that is responsive to what the community wants and can afford to achieve economically and that recognises the opportunities for the further sustainable development of those assets.

3.5

Achieving the vision – setting the strategic directions

This section sets the strategic directions for the region's natural resource management programs. These directions will be developed further in the subsequent sections of this Strategy.

3.5.1

The importance of long-term sub-strategies

In one sense, the challenges facing the Catchment remain largely unchanged since the first RCS. This reinforces the need to develop and implement long-term plans and sub-strategies. Implementation of the Shepparton Irrigation, Goulburn Broken Dryland, Waterway and Water Quality, Pest Plant and Animal, and Native Vegetation Management sub-strategies remain major priorities. They are all 20-30 year strategies that are part way through implementation. Progress to date represents significant investment by governments and the community. It is essential that investment in these sub-strategies continue in order to capture the benefits of the investment made to date.

The Catchment community is relatively mature in terms of natural resource management. The processes of community engagement and science-based decision-making have been refined since the 1980s. Section 8 of this RCS documents these processes.

3.5.2

Landscape focus

Best management practices for existing land uses will not make the difference alone. We need to identify how large-scale changes can be achieved, including more appropriately matching land use with land capability within the constraint of existing property rights. The changing demographics and land use across large tracts of the Catchment mean there are opportunities for improving natural resource management by influencing these changes without impinging on property rights. On current trends across the Catchment, we could expect to see a significant shift in land use patterns over the next 50 years and this will strongly affect the future landscape. The result is likely to be a mosaic made up of:

- an intensive agricultural zone with a smaller ecological footprint – 'double the production from half the land';
- an increased 'conservation' zone where the land no longer used for traditional agriculture is managed for nature conservation and ecosystem services; and
- rural living areas where land, particularly near urban centres, is converted to hobby farms and smaller farms where the main household income is from activities other than agriculture and which may offer additional conservation benefits.

Listed below are priority areas for the region that have been identified in the course of preparing the Strategy and sub-strategies:

Restoring the floodplain

Historical settlement patterns have resulted in conversion of floodplains to agricultural land. As well as losing the important ecosystem services provided by floodplains, many of these developments cannot be economically protected from flood damage.

The Lower Goulburn River Floodplain is one such area. The 156 km stretch of the Goulburn River between Shepparton and Kanyapella is flanked by a system of levees built prior to 1900. During a large flood the levees cannot contain the water flowing down the Lower Goulburn. Despite controlled releases at Loch Garry and elsewhere, in floods equal to or greater than approximately a 10-year Annual Recurrence Interval, water spills over and through the levees onto the surrounding floodplains to both the north and south of the river.

In addition, the high levels of nutrient and salinity loads carried into the Murray by the Goulburn River floodwaters pose an environmental problem. In the past, damaged levees were repaired using Natural Disaster Funds, but such funding is unlikely to be available in the future unless the community is willing to put in place strategies to minimise flood damage.

The Lower Goulburn Floodplain Rehabilitation Project seeks to resolve the flooding problem by rehabilitation of the floodplain so that it operates in a more natural fashion. It will require the development of a leveed floodway of about 10,500 ha with a possible buy back of up to 9,700 ha from the relevant landholders. Overall this project will deliver substantial environmental and economic outcomes.

Priority Area Projects

Where geographic areas can be identified as major contributors to the threatening process, they will receive priority attention. For example, the South West Goulburn has been identified as a potential major source of salt in the Goulburn River and, ultimately, the Murray River. This area also has severely depleted native biodiversity. A major research investigation program combined with enhanced community participation processes will be undertaken in the South West Goulburn over the next five years.

3.5.3

Water savings

The region has many unique challenges in this regard. Water savings will come from major infrastructure projects such as piping of irrigation supply systems or from better use of storages such as Lake Mokoan.

Water savings will also come from a more environmentally sensitive and productive use of available water resources both in irrigation and rain-fed production systems. To mitigate the adverse environmental impacts of inefficient use of water requires a better understanding of where particular land uses should best be located in the Catchment, and the development of appropriate practices to better manage water in both irrigated and dryland contexts. In particular, recharge rates under particular land uses and irrigation practices need to be quantified.

3.5.4

Salt disposal

The irrigation area recognises the need to maximise the benefits of limited salt disposal credits available to the region and has investigated other options for salt disposal. Options include: conjunctive water use, serial biological concentration and evaporation basins. The community has some acceptance of conjunctive water use, but there is a less acceptance of serial biological concentration options because they require a higher level of management, have high infrastructure costs and are marginally profitable. Evaporation basins have had limited community acceptance and, at this time, the community does not see them as part of their landscape. Further work is needed on maximising the use of salt credits and developing opportunities for works that would generate further salt credits.

3.5.5

Market-based approaches

Price signals have proven an effective mechanism to increase water use efficiency in irrigation areas. This type of approach needs to be considered by other sub-strategies. The development of Environmental Management Systems (EMS) provides an opportunity for markets to directly influence land management practices. EMS provides a mechanism for consumers to express preference for goods that are produced in a clean and green manner. The GB CMA will work in partnership with the VFF, industry groups and agencies to develop an appropriate EMS for the region.

Market-based approaches rely on a strong understanding and ability to quantify the relationship between the works and the natural resource management outcome of those works. To improve this understanding the region needs to explore other market-based mechanisms such as:

- Using ‘auction’ systems to reveal the price landholders are willing to accept for delivering Catchment natural resource management benefits. This approach is not limited to individual landholders. The principles could be expanded to cover plantation investments by the private sector where an incentive could be offered, commensurate with the multiple natural resource benefits provided by the plantation.
- Developing ‘annuities’ as a way of funding management actions that span a number of years.
- Developing a vegetation bank as a means of attracting large-scale private investment in vegetation works.

3.5.6

Pursuing multiple benefits

Many of the threatening processes that affect the Catchment's assets can be considered to be diffuse source threats. It is not always possible to identify specific locations or actions to deal with these threats and management requires wide-scale adoption of works by many landholders across sub-catchments. The region has responded to this challenge by developing an environmental management grants approach where the level of incentive offered to a particular landholder is proportional to the total benefits generated by the agreed works. This concept will be expanded to other Catchment works programs.

3.5.7

Improved regulatory framework

Where the threat to a natural asset can be clearly identified and attributed to individuals, consideration needs to be given to supporting recommended management actions with regulation. The management of dairy shed effluent in the irrigation area is one area where an increased regulatory effort is required. The GB CMA will work with its Implementation Committees, Murray Dairy, the UDV and the EPA to develop an appropriate program to take the region to 100% compliance with EPA guidelines.

Pest management is another area where regulation is considered vital. In the Goulburn Broken Catchment, the Catchment and Land Protection Act 1994 is enforced where individual land managers fail to adequately manage pests on their land, compromising the co-ordinated efforts of the greater community. This approach underpins the implementation of the Goulburn Broken Region Weed Action Plan and the Goulburn Broken Rabbit Management Action Plan.

3.5.8

Enhancing community engagement

The region's robust community participation structures and processes are discussed within Section 8. We will explore new ways of engaging the community in addressing the substantial issues facing the region. Of particular interest is the use 'Deliberative Forums' – an approach that brings together a cross section of the community to review the best available technical evidence about a particular issue and to promote public debate on the processes for dealing with that issue.

3.5.9

Focus on natural assets and ecosystem services

The relatively new emphasis on assets management does not change the natural resource management issues that need to be considered when developing sub-strategies, but it does change how information is collated and shared. Our experience with developing an ecosystem services approach is complementary to a focus on natural assets. The ecosystem services approach provides a framework for making management decisions that are holistic. We are at the leading edge of developing and implementing this framework.

3.5.10

Biodiversity Action Planning

Biodiversity Action Planning is a process that analyses and collates ecological information (based on bioregions) to influence decisions at several scales. Priority areas for protecting and enhancing biodiversity assets from farm to landscape scale are determined and can be overlayed on priorities for other issues such as salinity. This allows private and public land managers to understand the multiple benefits and trade-offs of various options. This process involves the local community in planning and implementing and is well under way in several parts of the Catchment (see also Case Study 1- Page 66).

3.5.11

Accountability and integration

New Government programs and policies are emphasising the importance of integrated Catchment management and regionally based funding programs. Integration of the sub-strategies into annual sub-catchment works programs ensures that conflicts between the sub-strategies actions and the multiple benefits that are generated by certain actions are identified. As a consequence of increased decision-making responsibilities being devolved to the regions, more robust monitoring, evaluation and reporting processes will be required.

Organising visions, goals, targets and actions

The RCS is a dynamic document. The list of goals, targets, and especially actions will be refined continually.

National Framework

Many of the documents that provide information for this RCS were developed independently and well before any consistent national approach was considered. This is the first attempt to gather existing goals and targets from all sources and sort them. The goals and targets are mostly consistent with the 'National Framework for Natural Resource Management Standards and Targets'. While many problems have been resolved, several inconsistencies in terminology and linkages between levels of vision, goals and targets remain as challenges.

Definitions

- 'Visions' are long-term and broad in scope.
- 'Goals' are more specific aspects of the vision and indicate general direction such as maintain, increase or decrease.
- 'Targets' define how far and by when we want to go in the direction set by a goal. Targets are based on what the community regards as being achievable given a reasonable level of public and private investment. Short-term targets are based on long-term goals or aspirational targets. As we progress down the decision-making hierarchy, we assume that achieving lower level targets will contribute to achieving higher level targets. The testing of these assumptions forms the basis of the monitoring and evaluation program. There is not necessarily a linear relationship between the short-term and long-term. For example, we expect that the uptake of works benefiting native biodiversity will accelerate as awareness increases and as mechanisms that encourage external investment are developed.
- Goals can be replaced by 'Aspirational Targets' when enough information is known to state how far and by when. Aspirational targets are generally long term (20+ years).
- 'Resource condition targets' can be measured over the short or long term. Goals or aspirational targets usually relate to resource condition.
- 'Management Actions' are either direct physical changes (works) such as fencing off a remnant or the organisational actions that need to be put in place so that preferred physical changes can occur. These have been respectively called 'Works (Management) Actions' and 'Capacity Building (Management) Actions'.
- 'Accountable targets' are those for which one is held to account and hence are formally agreed. These targets are expected to be achieved given the funding that has been provided.

Our approach to Catchment management

4.1

Asset-based approach to natural resource management

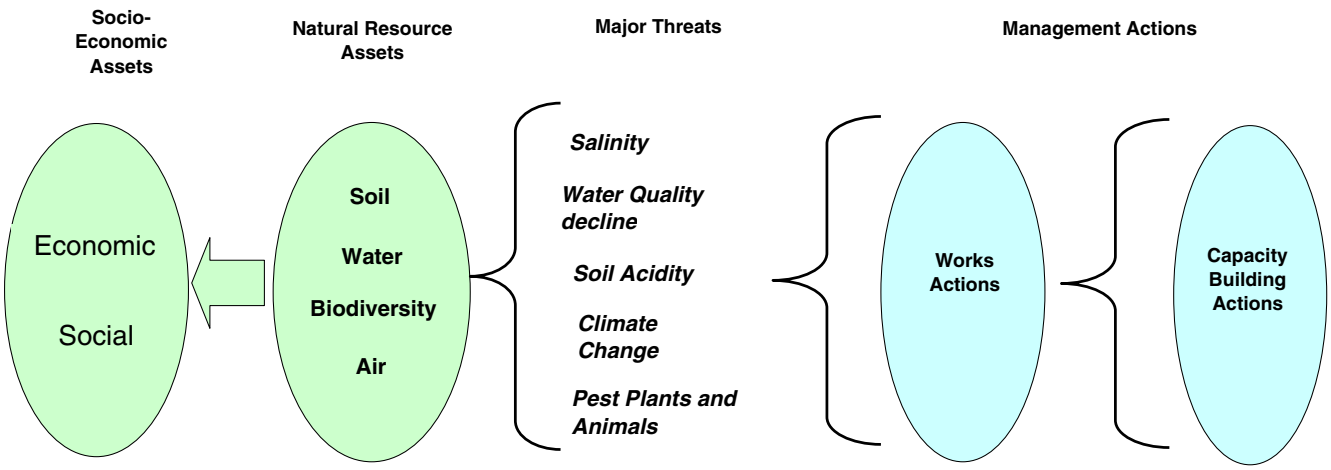
As our understanding of natural resource management improves we can target our investments so that our environmental, economic and social assets are more efficiently protected. In this section we establish the framework for catchment management. Over the next few sections we will:

- Describe the region's natural resource assets and the range of benefits those assets provide;
- Outline the threats to the assets;
- Describe the management actions that will be pursued to address and manage the threats;
- Describe how these management actions are implemented through the region's sub-strategies and action plans; and
- Identify targets for management actions and resource condition over the next five years.

Figure 4.1 summarises our approach. The region's social assets, consisting of its people (individually and as communities of interest) and its economic assets (physical and financial assets) depend upon ecosystem services provided by our natural assets. Threats to natural assets are threats to our social and economic assets. Major threats include salinity, water quality decline arising from nutrients and sedimentation, pest plants and animals, greenhouse, soil acidity and soil health decline, and the loss of biodiversity.

The Catchment is moving away from threat-based to asset-based sub-strategies in parallel with the trend across Australia. The mixture of asset and threat-based sub-strategies described in Section 9 reflects historic and recent trends and provides the most comprehensive available information.

Figure 4.1: Assets, threats and actions framework – Works Actions target both past and present causes that impact on natural assets.



4.2

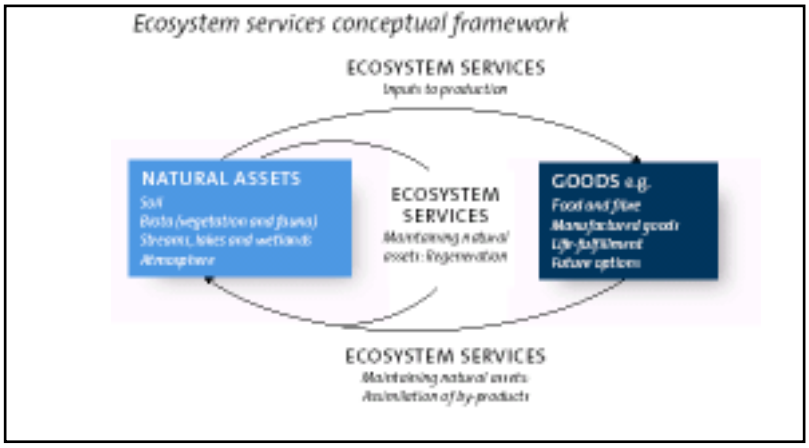
Understanding ecosystem services

Natural assets are the stock of natural resources from which many goods are produced. At the highest level these assets can be described as: soil, biota (vegetation, fauna and other living organisms), water systems (streams, lakes and wetlands) and atmosphere. Natural assets must be kept in good condition for at least two reasons. First, their health directly impacts on their capacity to continue to provide inputs to production; and second, natural assets have value in their own right to the extent that people derive value directly from their existence.*

Natural assets such as soil, water, air and biodiversity are the foundations of our ecosystem. These assets are valued in their own right as important resources that we strive to protect so that they are available for future generations. We are now beginning to appreciate the inter-connectedness of these assets and how protecting one provides benefits for other natural assets.

The term 'ecosystem services' is used to describe the benefits that the natural assets provide (see Figure 4.2). For example, natural assets provide clean water, recreation and lifestyle opportunities, replenishment of soil following a cropping cycle and maintaining habitat for wildlife.*

Figure 4.2: Ecosystem services



4.3

Program logic

Program logic is the term used to explain the links between Strategy outcomes, sub-strategy outputs (management actions), assumptions and annual investment planning (these are also known as Regional Management Plans).

In deciding on the appropriate mix of management actions, we make assumptions about the relationship between the management action and the impact of that action in terms of addressing the threat or enhancing the asset. In some cases, the assumptions have been well tested and we can move forward with confidence. In other cases we are less sure, but are confident that the actions generally produce natural resource management benefits. The latter group is the subject of ongoing research and development.

The assumptions we make are an important part of the Strategy. We are addressing threats and processes with many years, sometimes decades, between the cause and effect. The management actions can take just as long before they have a significant impact on the threat.

This presents challenges for reporting to the community and government on progress towards achieving outcomes. Figure 4.3 shows the relationship between outputs, assumptions and outcomes.

* *CSIRO, An Inventory of Ecosystem Goods and Services in the Goulburn Broken Catchment.*

A second area of complexity in measuring outcomes is attaching a 'value' to the natural asset. As discussed in Section 4.1, the region's work with CSIRO on ecosystem services will assist with valuing natural resource assets. Where the asset generates goods such as agricultural produce, the direct economic benefit can be readily measured in dollars. Many ecosystem services result in benefits that are measured in different 'currencies', such as improved recreation and "habitat hectare" values. The different currencies create a challenge when comparing values and communicating the 'triple bottom line' of environmental, social and economic outcomes of a project.

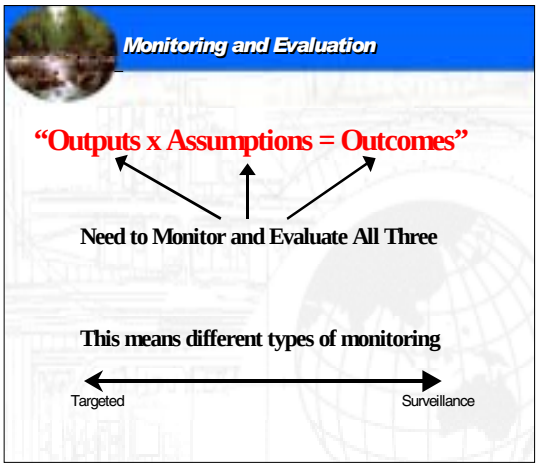


Figure 4.3: Relationship of outputs, assumptions and outcomes.

4.4

The monitoring and evaluation framework

The uncertainty around investment decisions requires the region to have a strong monitoring and evaluation framework. Information generated from this framework enables the region to review progress and adapt programs in the light of better information.

Adaptive management systems are based on measurable targets. Targets define how far we want to go in a given direction by a certain time. Targets further help to establish a common sense of purpose and the framework for monitoring and evaluating progress. Targets need to be set so that they inform the appropriate level of decision-making, from broad Catchment-scale to site-specific decision-making. This means that there will be a spread from coarse (outcome-oriented) to fine (output-oriented) targets.

Investment in evaluation becomes important where there is little research or previous experience to quantify the assumptions that link outputs and outcomes.

The importance of monitoring and evaluation cannot be understated. In Section 8 we consider actions that will build our monitoring and evaluation capacity (specifically a commitment to develop a Monitoring and Evaluation Strategy) and in Section 9 we describe specific management actions relating to monitoring and evaluation of sub-strategies.

Principles of evaluation

Assumptions

Part of the process of applying the evaluation framework is to make the key assumptions overt. Assumptions have been made and included in the development of the various strategies over time and this 'corporate knowledge' does not always flow fully to the next generation of documents or people involved. This is being addressed as part of our new investment planning process.

Unexpected outcomes

There are likely to be unexpected outcomes from management actions that can have positive or negative impacts. Monitoring must capture these unexpected outcomes. Catchment condition monitoring will highlight changes that could alert program managers to unintended outcomes. On a more local level, participant 'learning logs' can also identify some of these unintended outcomes.

Program logic

Connections between the outcomes of the RCS, sub-strategies and annual investment plans such as the Regional Management Plan are based on a logic that certain actions will lead to other actions and ultimately to the outcomes. The steps in this logic must be drawn with the links shown overtly so they can be tested and used to show how the various elements of the strategies, sub-strategies and annual programs fit together.

Discipline

Using the common phrase 'monitoring and evaluation' leads people to think monitoring comes first and then you evaluate what is collected. However, to make the evaluation more effective, more discipline is needed in finding out who needs to know what, and identifying the weak links in the assumptions, rather than the easier task of improving the monitoring.

Time

The RCS has a 30-50 year view and cannot be evaluated on the same basis as the Regional Management Plan that is upgraded each year and accountable for the immediate dollars and actions.

When applying the evaluation framework, a balance is needed between short term (where most of the focus will be) and long-term (where careful selection of performance measures is needed to allow the long-term trends and impacts to be seen).

Questions

Determining who has the interest in each area of the Strategy is vital in order to find out their key questions. These questions set up the whole evaluation process.

Goulburn Broken assets

The Goulburn Broken Catchment in northern Victoria is part of the Murray Darling Basin. The Catchment is made up of the Goulburn and Broken River catchments and part of the Murray Valley (downstream of Bundalong). It covers 2,431,654 ha or 10.5% of the State (See Table 5.1 and Map 2).

Table 5.1: Land use in the Goulburn Broken Catchment. Data derived from data generated by GIS Unit, NRE Tatura 1998 (from Draft NVMS 1999).

Land use type (land manager)	hectares
Public land	
State forest (forests management, commercial forests, NRE)	439,445
Victorian Plantations Corporation (VPC)	17,352
Gazetted Reserve	18,792
Public land and water frontage reserve (licensed by Land Victoria)	22,107
Proposed Gazetted Reserve	51,827
National Park Act Reserve (Parks Victoria)	94,421
Proposed National Parks Act Reserve (Parks Victoria)	87
Alpine Resort Management Boards	5,049
Commonwealth Land (Ministry of Defence)	41,454
Freehold – vested with Government bodies	69
Total public land	**690,603**
Private land	
Intensive agriculture	270,655
General agriculture (dryland)	1,397,130
Urban / other private land	73,266
Total private land	**1,741,051**
Total land	**2,431,654**

5.1

Natural assets

The Goulburn Broken region's natural assets are its soils, water, air and biodiversity. These assets are interconnected and, collectively, they support the region's social and economic assets. This interconnectedness means that a decline in the health of the soil asset, for example, can contribute to a decline in the biodiversity and water assets.

5.1.1

Soils

The health of the Catchment's soils is critical for the region's continued prosperity. The Catchment has a range of different soil types as shown in Table 5.2 and Map 3.

Most (41%) soils on the Catchment's lower slopes are classified as Sodosols. They are characteristically sodic and are poorly drained with dense subsurface clays. They are low in nutrients and many are strongly acidic.

Seasonal waterlogging may be a problem and the surface soil structure can deteriorate with cultivation and form hard surface crusting after heavy rain. Salinity can also be a problem on these soils in the floodplains.

Map 2: Land use in the Catchment.

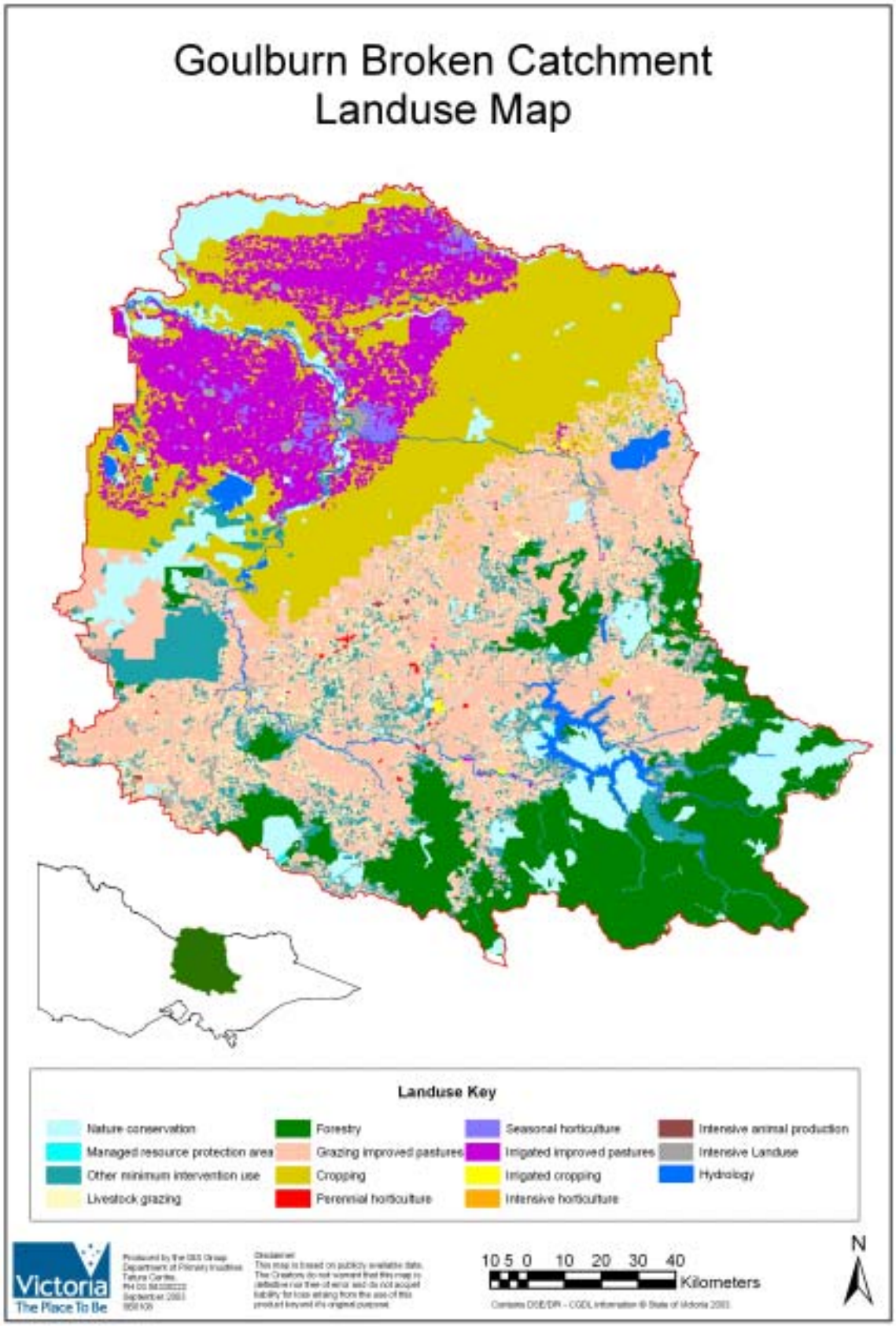


Table 5.2: Soils of the Goulburn Broken Region.

Dominant soil orders	Land area (ha)	%
Calcarosols	1,407	0.1
Chromosols	352,545	14.8
Dermosols	510,732	21.5
Ferrosols	30,840	1.3
Hydrosols	7,904	0.3
Kandosols	211,000	8.9
Kurosols	97,671	4.1
Rudocols	18,054	0.8
Sodosols	983,808	40.8
Tenosols	72,120	3.0
Vertosols	105,463	4.4
Totals	2,391,544	100.0

Chromosol (15%) and Dermosol (22%) soils are found across the Catchment, but mainly in the mid and upper areas. Chromosols dominate in the lower and mid Catchment. They are poorly drained with dense subsoil clays of moderate to low fertility and low to moderate erosion potential. Dermosols dominate in the upper part of the Catchment. They have good drainage and are currently used for forestry or contain native forest vegetation. These soils are of granitic origin and are commonly acid in the surface and subsurface profile making them unsuitable for cropping and productive grazing without significant inputs of lime.

5.1.2

Water

The Goulburn Broken Catchment produces 11% of the Murray Darling Basin stream flow from less than 2% of the land area. It also imports water into the Catchment from the Murray River and exports water to adjacent Catchments for irrigation, urban and stock and domestic supply. Table 5.3 summarises where the region's surface water resources are used. The region also contains Victoria's largest and arguably most important water supply catchment – Lake Eildon.

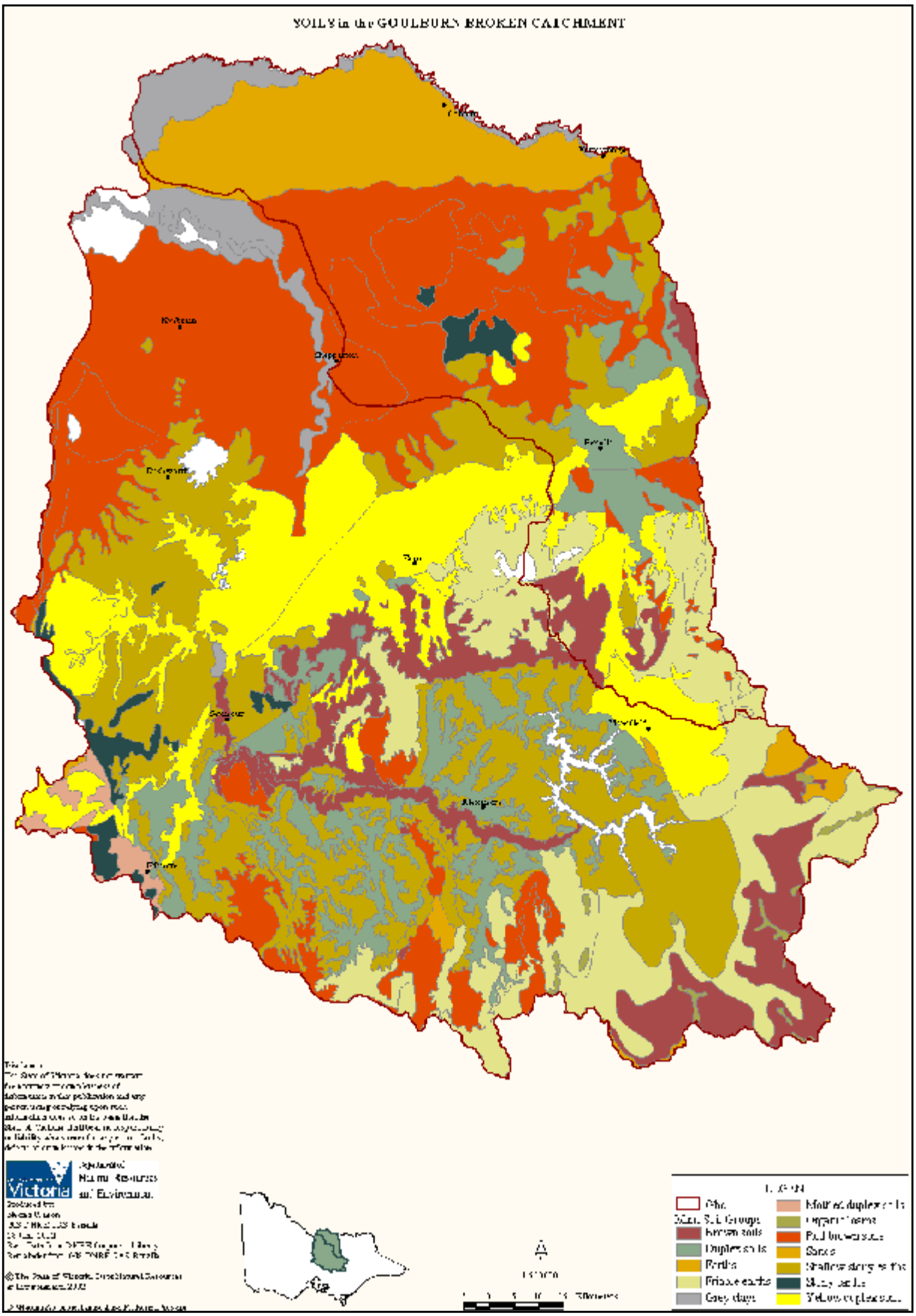
Within the Catchment, 803,000 ML is used to support one of Australia's major irrigated agriculture regions, the Shepparton Irrigation Region. The water is used to create agriculture products worth an estimated $1 billion a year and, in turn, support a food processing sector generating $1.7 billion a year in output.

The region covers part of two major groundwater basins – the Murray Basin and the Highlands Basin. Groundwater is an important resource for many towns and water users within the region and is a major contributor to the base flow of streams within the Catchment. In the Shepparton Irrigation Area, more than 1,100 bores are currently licensed to pump more than 45,000 ML a year.

Table 5.3: Goulburn Broken annual water resources.

Use within the Catchment	803,000+ ML
Murray Valley, from Murray River	200,000 ML
Exported to adjoining Catchment (For irrigation, stock and domestic)	565,000 ML
Average flows to Murray River	1,760,000 ML

Map 3: Soils within the Catchment.



5.1.3

Biodiversity

'Biodiversity' (or biological diversity) is, "the natural diversity of life: the sum of all our native species of flora and fauna, the genetic variation within them, their habitats, and the ecosystems of which they are an integral part. (Victoria's Biodiversity Strategy 1997)

The Catchment was once almost entirely covered in native vegetation, forested in the south and open woodlands in the north. Native vegetation has been retained in the mountainous far south, where slopes are steepest, but clearing has been extensive in the valleys and plains. About 70% or 1.7 million ha of native vegetation has been cleared since European settlement.

Our biodiversity has evolved over millions of years generating diversity of species and complexity of interactions to underpin processes that provide a range of ecosystem services. Science cannot predict the impact of losing species or delivery of ecosystem services so risks and losses should be minimised.

Bioregions depict the patterns of ecological characteristics in the landscape and provide a meaningful framework to address, and report on, biodiversity conservation. Bioregions in the Catchment include Victorian Riverina, Goldfields, Murray Fans, Northern Inland Slopes, Highlands- Northern Fall, Highlands – Southern Fall, Central Victorian Uplands and Victorian Alps. Biodiversity assets in the Catchment are described in more detail in Biodiversity Action Planning documents.

This section lists some of the key components of our biodiversity. The accompanying 'soils', 'water' and 'air' and air sections also list components of the ecosystem that are critical for biodiversity. The number of nationally and state-listed threatened species and critical habitat is very large and it is not appropriate to include all of them in the RCS (these detals are contained in the Biodiversity Integration Strategy).

Native vegetation

There are two Threatened Ecological Communities listed under the EPBC Act:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions;
- Grassy White Box Woodlands.

Extent

- 30% (715,000 ha) of native vegetation cover remains.
- Most remaining native vegetation is on mountainous public land to the south.
- Most extensive clearing has been in bioregions most suited for intensive agriculture, such as Victorian Riverina 97% and Northern Inland Slopes 89%.
- There are 128 Ecological Vegetation Classes, complexes and mosaics across eight bioregions.
- More than 2,105 species of vascular and non-vascular plants of which 10% are threatened in Victoria.
- "Endangered" (less than 10% of original cover) and "vulnerable" EVCs with less than 15% cover are mainly found in the north of the Catchment.
- Many EVCs are well below the 15% recommended by JANIS (1997) criteria and are well below the 30% of habitat across the landscape below where accelerated rates of extinction of native species may be expected*.
- Most threatened species of flora are understorey (grasses, herbs and low shrubs).
- Cryptogams - many species, many unknown, conservation status unknown.

Condition

- A vast amount of the remaining vegetation on private land is of poor quality (limited diversity, lack of understorey, lack of ground litter etc).
- Number of hollow bearing trees (fauna habitat) has been reduced in parallel with decline of the extent of native vegetation.
- Box-Ironbark Forests have especially suffered loss of hollows on public land.
- The 30% vegetation cover remaining in the catchment is polarised into two size class categories: larger blocks (greater than 1,000 ha) or small blocks (less then 1 ha).
- 98% of the remaining patches of vegetation are less than 1 ha.
- Threatened EVCs are mostly highly fragmented.

* *Wierzbowski, P. et al. Biodiversity Action Planning: Strategic Overview for the Victorian Riverina Bioregion, Department of Natural Resources and Environment, Draft November 2002.*

Trends

- Conservation status of many species declining, because populations are below threshold levels.
- Declines in extent have largely stabilised with small incremental losses still occurring (anecdotal evidence). Extent expected to increase in next few years due to accelerated action over past decade (replanting, direct seeding and grazing control programs).
- Isolated trees and small remnants on farmland declining due to removal and dieback (often called incremental loss).
- Dead trees with hollows are still being removed on private land.

Table 5.4: Summary of biodiversity figures.

Flora, Fauna and Community Category	Number	Threatened in Victoria [1]	FFG listed (Action Statement)[2]	JAMBA/ CAMBA	Threatened Nationally[3]	EPBC listed (Recovery Plans)
Native Vegetation						
EVCs Murray Fans	15 (12)[4]	14	-			-
EVCs Victorian Riverina	25 (31)[4]	24	1			2
EVCs Goldfields	23 (15)[4]	22	1			-
EVCs Northern Inland Slopes	19 (10)[4]	17	2 (1)			1
EVCs Central Victorian Uplands	25 (23)[4]	21	-			1
EVCs Highlands Northern Fall	30 (6)[4]	15	-			-
EVCs Highlands Southern Fall	10 (0)[4]	1	-			-
EVCs Victorian Alps	19 (0)[4]	4	2			-
Flora species (vascular and non-vascular plants)[5]	2,105	217	45 (14)	-	43	7 (2)
Water dependant flora[6]	188	39	7	-	8	8
Cryptogams[7]	c. 5,000-10,000			-		
Wetlands						
Total number	1,818(over 1 ha)					
Total area	82,181 ha(includes natural & man-made)					
Native fauna[8]						
Vertebrate fauna[9]	433	92		15	-	17 (4)
Birds	282	47	20 (8)	15	47	3
Water birds[6]	84	25	6	15		
Reptiles	57	6	3 (1)	-	6	1
Amphibians	24	4	2 (1)	-	5	2
Water dependant reptiles & amphibians[6]	23	8	3 (1)	-	8	2
Fish	19	7	7 (2)	-	7	3
Mammals	51	13	9 (3)	-	13	3
Water dependant mammals[6]	3	1		-		
Invertebrates	14110		16 (terrestrial)	-		

(Footnotes)

[1] Includes EVCs classified as extinct, endangered, vulnerable, depleted or rare as per the Bioregional Conservation Status of EVCs described in Victoria's Native Vegetation Framework 2002. Includes species classified as extinct, critically endangered, endangered, vulnerable, rare and lower risk as per NRE Threatened Species Lists 2000.

[2] EVCs are comprised of floristic communities. Floristic communities are listed under FFG and EPBC Act.

[3] Those species listed under ANZECC as extinct, critically endangered, endangered, vulnerable or rare.

[4] The true number of EVCs for each bioregion is listed. Mosaics and complexes are combinations of EVCs and are listed in brackets.

[5] NRE Flora Information System 2002.

[6] Arthur Rylah Institute 2002 – figures are indicative only.

[7] Paul Ryan, 2002.

[8] NRE Atlas of Victorian Wildlife 2002.

[9] Figures provide an indication of diversity of vertebrate fauna. Figures are based on recording an occurrence in Catchment and are only indicative of those that reside.

[10] Based on museum records only - these represent a small fraction of the total number.

- Hollows in current plantings won't form until at least 2100, which may be too late for many fauna species that need them.
- Understorey plantings and pest plant and animal control programs are increasing.
- Connectivity is improving after massive impact since European settlement, with revegetation efforts focusing on connectivity over past decade.
- Climate change likely to impact on species which currently exist at the limit of their range.

Table 5.5*: Extent and occurrence of various-sized remnants[1].

Remnant	Occurrences		Extent		
size (ha)	no.	%	ha	% of remaining	% of all
<1	714,958	98.5	42,518	5.6	1.8
1-5	8,864	1.2	17,883	2.3	0.7
5-10	1,141	0.2	7,866	1.0	0.3
10-25	649	0.1	10,025	1.3	0.4
25-40	173	0.02	5,422	0.7	0.2
40-100	167	0.02	9,971	1.3	0.4
100-500	124	0.02	27,133	3.6	1.1
500-1,000	25	0.003	17,456	2.3	0.7
1,000-5,000	20	0.003	43,555	5.7	1.8
>5,000	16	0.002	581,335	76.2	24.2
Total	726,137	100	763,164	100	31

Footnotes

* Note slight discrepancy in % of remnants remaining between Tables 5.5 and 5.6.

1. Wilson and Lowe 2002

From the mountains to the rivers

Much of the upper Catchment is managed as State Forest, alpine resorts, and National or State Park. Four Flora and Fauna Guarantee Act listed communities occur in the (sub-) alpine area, as do numerous rare or threatened species of flora and fauna. Significant native species include the nationally listed Leadbeaters Possum, Mountain Pygmy-possum, Purple Eyebright, Striped Legless-Lizard and Spot-tail Quoll.

In the mid Catchment, moist foothill forests give way to drier foothill forests and grassy woodlands and fertile valley forests dominate. The drier climate and variable soil types of the slopes create complex patterns in the distribution of vegetation types. This part of the Catchment contains scattered large and small blocks of remnant vegetation; forests and woodlands along the major rivers; linear networks along creeks, swampy drainage lines, railways and roadsides; wetlands; paddocks of native grass pasture with scattered trees; scattered old trees in exotic pastures. Some large blocks are managed as State Forest with some smaller conservation, streamside and road reserves. Much of the remnant vegetation is on private land and is important. Significant native species in this part of the Catchment include nationally listed Buxton Gum, and Barred Galaxias and state-listed Brush-tailed Phascogale and Euroa Guinea-flower.

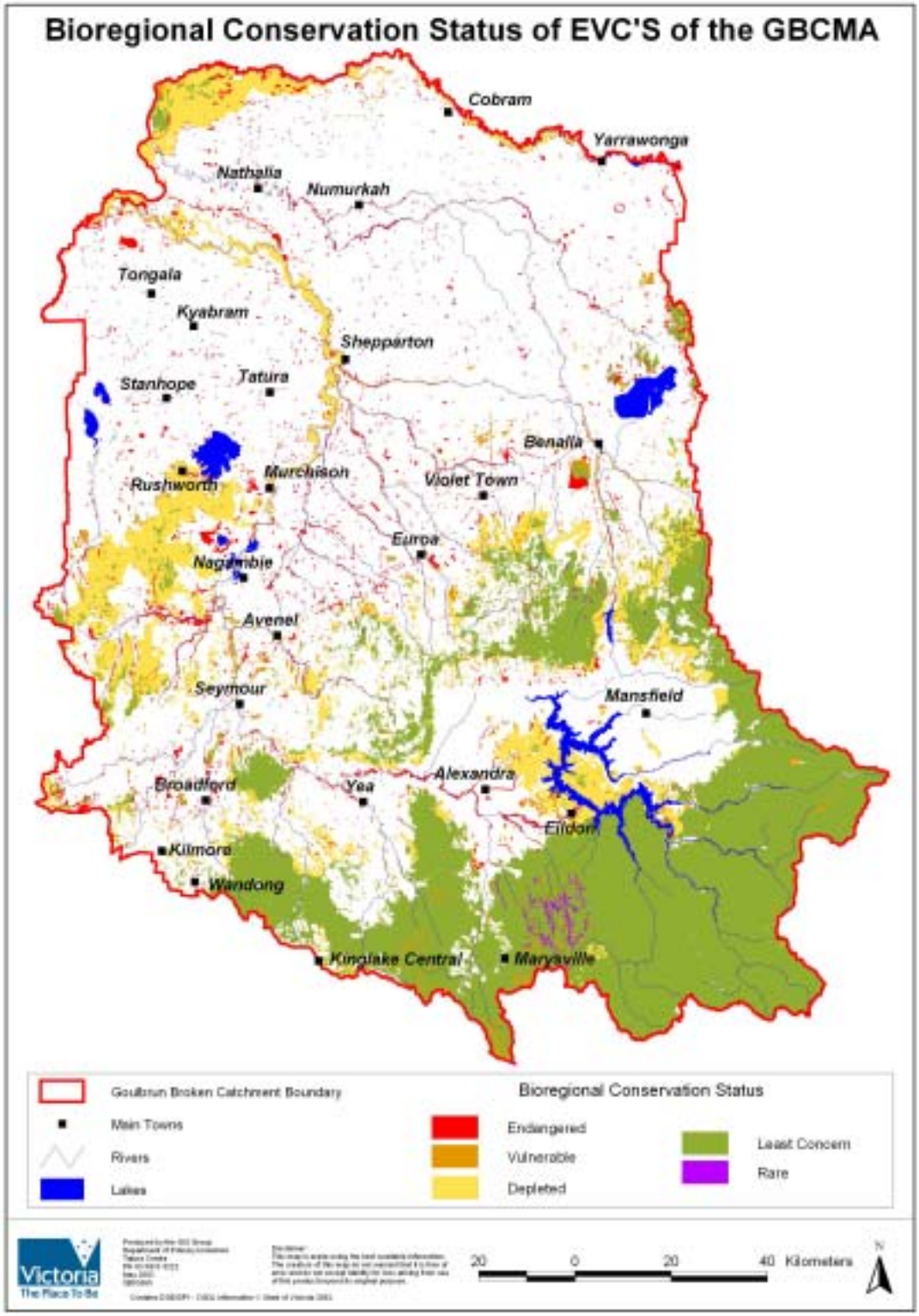
White Box Grassy Woodland (listed under the Environment Protection and Biodiversity Conservation Act 1999), Grey-box Buloke Woodland and Natural Temperate Grasslands (both listed under the Flora and Fauna Guarantee Act 1988) are important features of the upper and mid Catchment landscape.

The lower Catchment contains grassy and shrubby woodlands and box-ironbark forests that dominate the low undulating hills, while the relatively flat, fertile plains adjacent to the major river systems typically support grassy woodlands. Characterised by their dry, open appearance, the woodland complexes of the lower Catchment are surprisingly diverse. Subtle variations in rainfall, topography and soil type have resulted in a variety of vegetation types. This is the most depleted part of the Catchment with the majority of the vegetation types being endangered or vulnerable. Remaining native vegetation exists as scattered, small blocks of remnant woodlands with linear reserves/networks along creeks, railways and roadsides; forests and woodlands along the major rivers; wetlands; grassland remnants in paddocks and along linear reserves and scattered old trees in exotic pastures/crops.

Very little of the vegetation and habitats are in conservation reserves. In this part of the Catchment, threatened native species can be found including the nationally listed Regent Honeyeater, Swift and Superb Parrot, Small Scurf-pea and Stiff Groundsel and the State-listed Grey-crowned Babbler, Bush Stone Curlew, Kamarooka Mallee and Yarran Wattle.

Some 28% of the Catchment is public land and it contains most of the remaining native vegetation. This is managed according to a range of reservation types and supports some of Victoria's most valuable National and State Parks, alpine resorts and forest industries.

Map 4: Bioregional Conservation Status of EVCs.



Notes to Table 5.6 (facing page)

* percentage of original Ecological Vegetation Class remaining. NRE's 1993 Tree 100 layer used to calculate areas remaining against the bioregional boundaries updated in 2002. Information derived from NRE's Corporate database. Minor discrepancies occur due to different scales of data captured (1:250,00 and 1:100,000).

^ Terminology used in Goulburn Broken Native Vegetation Management Strategy is pre-European rather than pre-1750 to simplify communication. (Pre-1750 is terminology used on NRE Corporate Database from which EVC information is extracted.)

Table 5.6: Ecological Vegetation Class Coverage: Pre-European Settlement and 1993

Bioregion	Ecological Vegetation Classes, complexes and mosaics. No.	Conservation Status	Pre-European Total Area	Vegetation Cover (1993) Total Extant Area		Private (Freehold) Land		Conservation Reserves (incl Forests SPZ)	Other Public Land (incl unknown)
			Ha	Ha	%	Ha	% of 1993 Cover that is Freehold	Ha	Ha
Murray Fans	22	Endangered	187,992	5313	3%	2403	45%	540	2369
	2	Vulnerable	6559	456	7%	56	12%	329	71
	2	Depleted	67,829	39,144	58%	2509	6%	6360	30,275
	1	Least Concern	2295	2039	89%	0	0%	1333	706
TOTAL	**27**		**264,676**	**46,951**	**18%**	**4968**	**11%**	**8562**	**33,421**
Victorian Riverina	3	Presumed Extinct	1482	0		0		0	1
	42	Endangered	719,812	11,723	2%	7725	66%	1780	2219
	9	Vulnerable	19,937	3269	16%	2271	69%	253	745
	2	Depleted	8272	5719	69%	1534	27%	605	3581
	1	Least Concern	212	22	10%	5	23%	15	2
TOTAL			**749,714**	**20,733**	**2.8%**	**11,535**	**56%**	**2653**	**6548**
Northern Inland Slopes	2	Presumed Extinct	821	0	-	0	-	0	0
	19	Endangered	57,803	1342	2%	901	67%	303	138
	2	Vulnerable	24,799	2272	9%	1248	55%	291	734
	3	Depleted	625	418	67%	88	21%	329	0
	3	Least Concern	8680	5951	69%	1992	33%	3364	595
TOTAL			**92,727**	**9983**	**11%**	**4228**	**42%**	**4288**	**1467**
Goldfields	24	Endangered	48,220	3158	7%	1078	34%	41	2039
	8	Vulnerable	11,637	1640	14%	913	56%	18	709
	5	Depleted	101,068	55,450	55%	8242	15%	1815	45,393
	1	Least Concern	9288	5227	56%	1067	20%	1150	3010
TOTAL			**170,213**	**65,474**	**38%**	**11,299**	**17%**	**3024**	**51,151**
Central Victorian Uplands	24	Endangered	185,973	6765	4%	4522	67%	1280	963
	13	Vulnerable	162,232	11,355	7%	9493	84%	1209	653
	5	Depleted	153,747	63,489	41%	33,181	52%	18,674	11,634
	1	Rare	103	27	26%	27	100%	0	0
	5	Least Concern	20,883	10,063	48%	4262	42%	2767	3034
TOTAL			**522,937**	**91,968**	**18%**	**51,485**	**56%**	**23,930**	**16,283**
Highlands - Northern Fall	6	Endangered	4231	675	16%	624	92%	15	36
	7	Vulnerable	10,580	4549	43%	854	19%	2757	937
	3	Depleted	5744	2785	48%	1274	46%	715	796
	2	Rare	581	444	76%	48	11%	391	5
	17	Least Concern	493,938	381,002	77%	44,935	12%	117,686	218,381
TOTAL			**515,075**	**389,454**	**76%**	**47,734**	**12%**	**121,564**	**220,157**
Highlands - Southern Fall	1	Vulnerable	6	6	100%	0	0%	6	0
	9	Least Concern	966	900	93%	16	2%	257	627
TOTAL			**972**	**906**	**93%**	**16**	**2%**	**263**	**627**
Victorian Alps	2	Vulnerable	1092	1035	95%	0	0	762	273
	2	Rare	2565	2565	100%	0	0	1276	1289
	15	Least Concern	86,727	86,419	100%	16	0	30,069	56,318
TOTAL			**90,384**	**90,019**	**100%**	**16**	**0%**	**32,106**	**57,880**
TOTAL for GB Catchment			**2,406,699**	**715,443**	**30%**	**131,250**	**18%**	**202,003**	**387,929**

Wetlands*

- 1,818 wetlands (greater than 1 ha each) cover an area of 82,181ha (including natural and man-made wetlands). (See Table 5.7).
- There are many other high value wetlands along the floodplains of the middle reaches of the Goulburn River and its tributaries.
- 47% are naturally small in size (1-5ha).
- While 4% of wetlands are greater than 100 ha in size, these larger wetlands account for 75% of the total area of the region's wetlands.
- Some 73% of wetlands occur on public land with the remainder on private land. These are not only natural wetland ecosystems - man-made lakes and dams are included.
- 1 wetland of international significance (Barmah).
- 10 wetlands of national significance.
- 113 wetlands of bioregional significance.

Impact from European settlement to 2002

- 27,000 hectares lost.
- 56,000 ha affected by drainage and altered water regimes.
- Private land: similar declines in freshwater meadows and shallow freshwater marshes, although increases in deep freshwater marshes and permanent open freshwater wetlands and the creation of permanent saline wetlands.
- Overall increase in the area of wetlands since European settlement: primarily reflects a large increase in permanent open freshwater wetlands (847% increase) as a result of impoundments for water storage.
- Increased nutrient loads and salinity affect many wetlands and fringing vegetation, causing substantial declines in bird and fish populations.
- Many wetlands on the floodplains are no longer 'connected' as part of wetland systems due to infrastructure development.
- Controlled river flows have substantially reduced wetting of floodplain wetlands.

Figure 5.1: Current proportion of wetland categories (by number) in the Catchment.

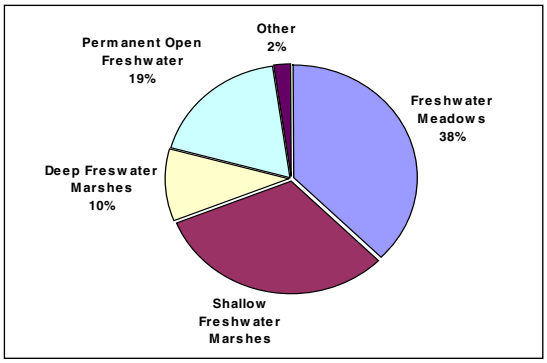


Table 5.7: Listed significant wetlands.

List	Wetland
International Ramsar Convention on Wetlands	Barmah Millewa Forest (Barmah Forest component – Millewa is in NSW).
Directory of Important Wetlands in Australia (1995-2000)	Barmah Millewa Forest, Broken Creek, Kanyapella Basin, Lower Broken River, Lower Goulburn River Floodplain, Muckatah Depression, Wallenjoe Wetlands and Central Highlands Peatlands.
National Land and Water Resources Audit	113 bioregionally significant wetlands. These wetlands are in addition to those listed in the 'Directory' (see previous). Where a wetland was listed as important in the Directory it was not included in the list.
JAMBA and CAMBA	Habitat for listed species: Barmah-Millewa Forest, Broken Creek, Kanyapella Basin, Lower Goulburn River Floodplain, Muckatah Depression and Wallenjoe Wetlands.

* *Most data listed in Howell, M. and McLennan, R. Wetlands Directions Paper for the Goulburn Broken Catchment. GBCMA, August 2002.*

Rivers and streams

Rivers and streams are the lifeblood upon which most of the other Catchment's assets depend. Refer to Section 5.1.2, Water, for further context.

The Catchment has more than 9,849 km of streams (Mitchell 1990), with 8,157 km in the Goulburn Basin and 1,692 km in the Broken Basin. There are three declared Heritage Rivers (the Goulburn below Eildon, the Big and the Howqua). The Acheron, Yea and Murrindindi Rivers in the North Central Uplands satisfy the criteria of a 'representative river' (one of them is to be chosen). All of these rivers are tributaries of the Goulburn River.

Some 30% of the Catchment's streams are in good condition as measured by the Index of Stream Condition (ISC) (see Table 5.8). The index is a measure of a stream's change from natural or ideal conditions. The ISC considers about 2,500 km (25%) of the Catchment's streams on a representative reach basis. It presents an indication of the extent of change in respect of five key 'stream health' indices:

- hydrology (change in volume and seasonal flow);
- physical form (stability, degradation/aggradation, influence of artificial barriers and abundance/ absence of in-stream debris);
- streamside zone (plant species – native / exotic, spatial extent, width, continuity and links);
- water quality (assessment of total phosphorus, turbidity, conductivity and pH); and
- aquatic life (abundance and type of macro invertebrates).

The Catchment has 166 km of streams that are regarded as 'ecologically healthy'. Criteria used to measure how 'ecologically healthy' a stream is include:

- Riparian vegetation (structural intactness);
- Cover of exotic vegetation;
- In-stream physical habitat;
- Barriers;
- Longitudinal continuity; and
- Bed condition.

The Catchment's Seven Creeks supports one of only two viable populations of Trout Cod in the state.

Table 5.8: Percentage of rivers in good or excellent condition according to ISC.

Parameter	Good or excellent condition	
	Goulburn	Broken
Stream length	11-30%	<10%
Streamside zone	10-39%	1-9%
Physical form	10-39%	10-39%

Table 5.9: Ecologically healthy rivers.

Basin	Reach	Stream	Length (km)	ISC score
1	44	Limestone Creek	20	41
4	21	Broken Creek	20	24 (hydro = 2)
5	8	Goulburn River	35	21 (hydro = 0)
5	55	Yea River	20	39
5	63	Acheron River	27	42
5	64	Taggerty River	17	42
5	67	Big River	27	45

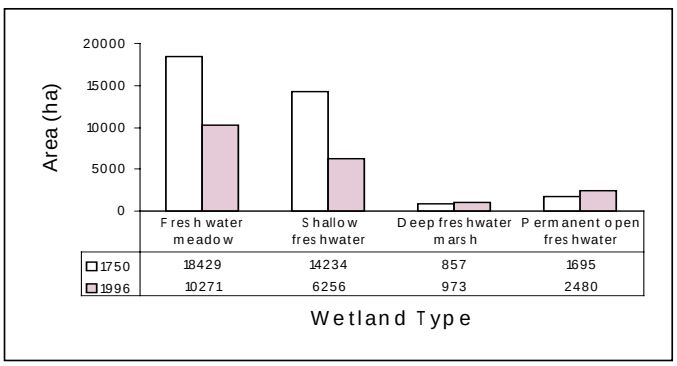


Figure 5.2: Change in area of wetlands on private land in the Goulburn Broken Catchment since 1750.

Trends (Examples)

- The condition of riparian zones and the condition of channel form has improved in activity sites (priority areas).
- Vegetation quality condition has improved in frontage zones subjected to action.
- Access for recreational pursuits has improved in a range of river reaches.

Floodplains

Flooding is a natural phenomenon and floodplains represent important biodiversity values. Floods replenish wetlands, transport food supplies and trigger stages in the life cycles of many plants and animals.

Floodplains provide natural overland flow paths and storage areas where floodwaters remain for slow release as stream heights recede, thereby reducing the potential for channel erosion from high energy flows. Nutrients, debris and sediment settle out during this process, protecting waterways from high sediment and nutrient loads and contributing to floodplain productivity. Construction of levees for flood protection and conversion of floodplains to agriculture land has led to a decline in ecosystem services provided by floodplains within the Catchment.

Native fauna

The Catchment has 431 vertebrate species and an unknown (but very large) number of invertebrates. Invertebrates are often forgotten but play an extremely important role in the health of the Catchment.

Many species exist beneath minimum threshold habitat levels and natural and human-induced events can cause their extinction within the Catchment. For example, several ecologists believe that a landscape with less than ~30% native vegetation cover will have relatively rapid extinction of woodland bird species. Much of our Catchment is well below this level, so we can expect further species decline if nothing is done.

With the extensive clearing of native vegetation and fragmentation of habitat, populations of fauna (and flora) are often isolated which limits gene flow. The ability of species to adapt to new conditions, such as changing climate, is severely reduced if the gene pool is limited.

Fish and other aquatic species have been prevented from migrating because of structures on rivers and streams such as weirs, which has dramatically affected fish populations. The removal of several barriers in recent years is expected to have a very positive effect on fish populations.

Some species are at particular risk from predation, such as the Brolga and Bush Stone-curlew.

Table 5.10: Summary of vertebrate fauna numbers.

Threat Category[a]	Birds	Mammals	Reptiles	Amphibians	Fish	Total
Extinct	0	2	0	0	0	2
Critically endangered	5	1	0	2	3	11
Endangered	19	5	2	0	1	27
Vulnerable	17	3	3	2	3	28
Lower risk	6	2	1	0	0	9
Insufficient known	6	3	1	1	4	15
Total Threatened	47	13	6	5	7	77
No of species in Catchment	282	51	57	24	19	433
% threatened	17	25	11	17	37	18

[a]NRE 2000; threat categorisation follows IUCN classification system.

Several species are "Nationally Listed Species" under the EPBC Act:

- Regent Honeyeater
- Barred Galaxias
- Swift Parrot
- Leadbeaters Possum
- Spot-tailed Quoll
- Warty Bell Frog
- Spotted Tree Frog
- Trout Cod
- Mountain Pygmy Possum
- Superb Parrot
- Striped Legless Lizard

There are also seven terrestrial species covered by migratory provisions and seven species covered by the marine provisions of the EPBC Act.

Trend (examples)

- Native fish numbers are improving in zones where barriers have been removed or modified.
- The number of groups of Grey-crowned Babbler and number of birds within each group have declined over the last 10 years.
- Community surveys show that the population of Superb Parrots seems to be increasing in areas where works to improve habitat have been undertaken.

Soil biodiversity

The below-ground flora and fauna represents one of the most species rich components of terrestrial ecosystems but is often ignored because it is not well known or understood.

Recent research is also showing there is a strong link between above ground and below ground biodiversity. Healthy remnants and biodiverse soils go hand in hand. This is likely to influence how we revegetate.

5.1.4

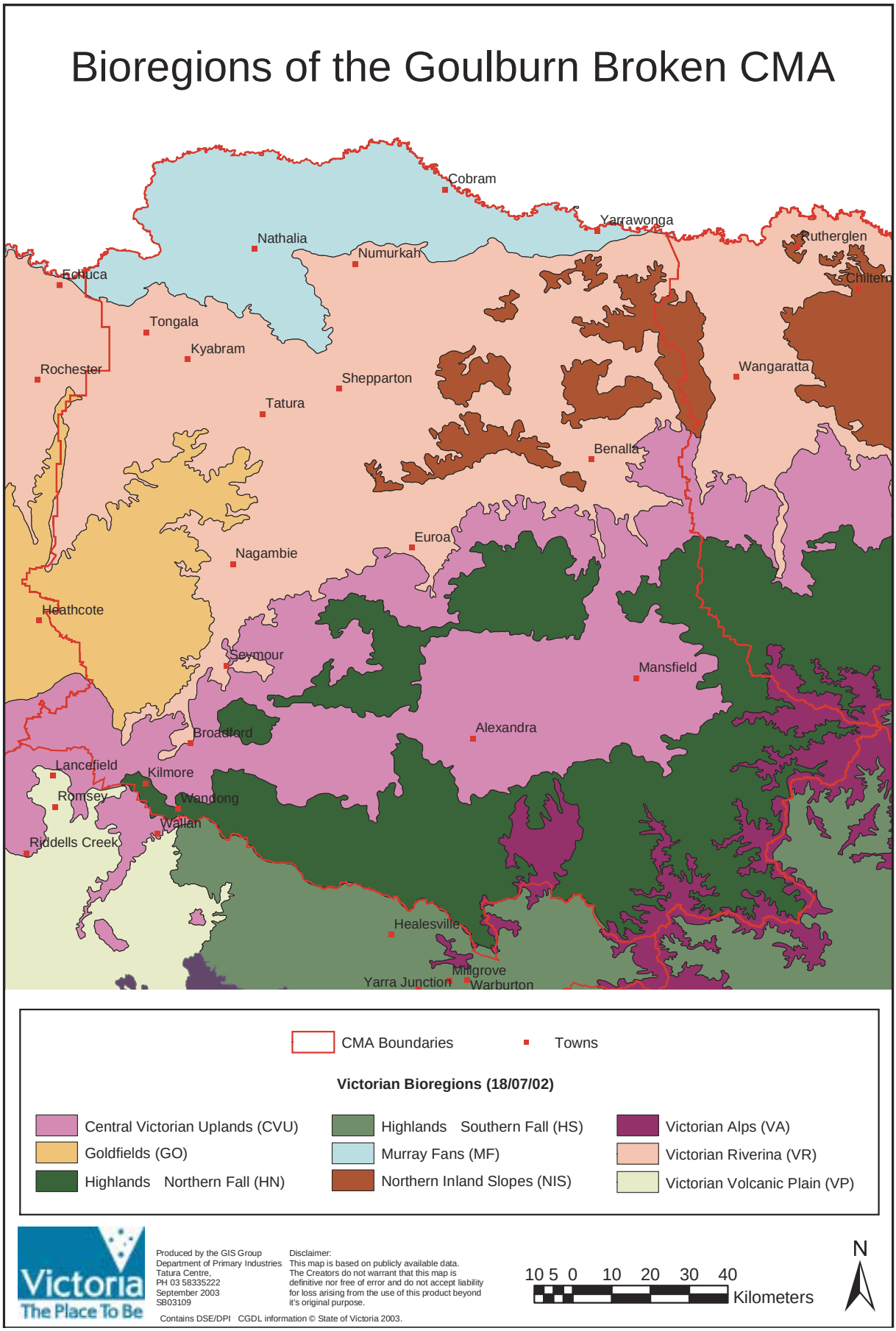
Atmosphere

In common with many other areas, the Goulburn Broken Catchment is only beginning to grapple with the question of how its industries and other land uses affect the composition and function of the atmosphere. The Catchment has a lot at stake; its primary industries – among them fruit growing and dairy – would suffer as a result of climate change and instability.

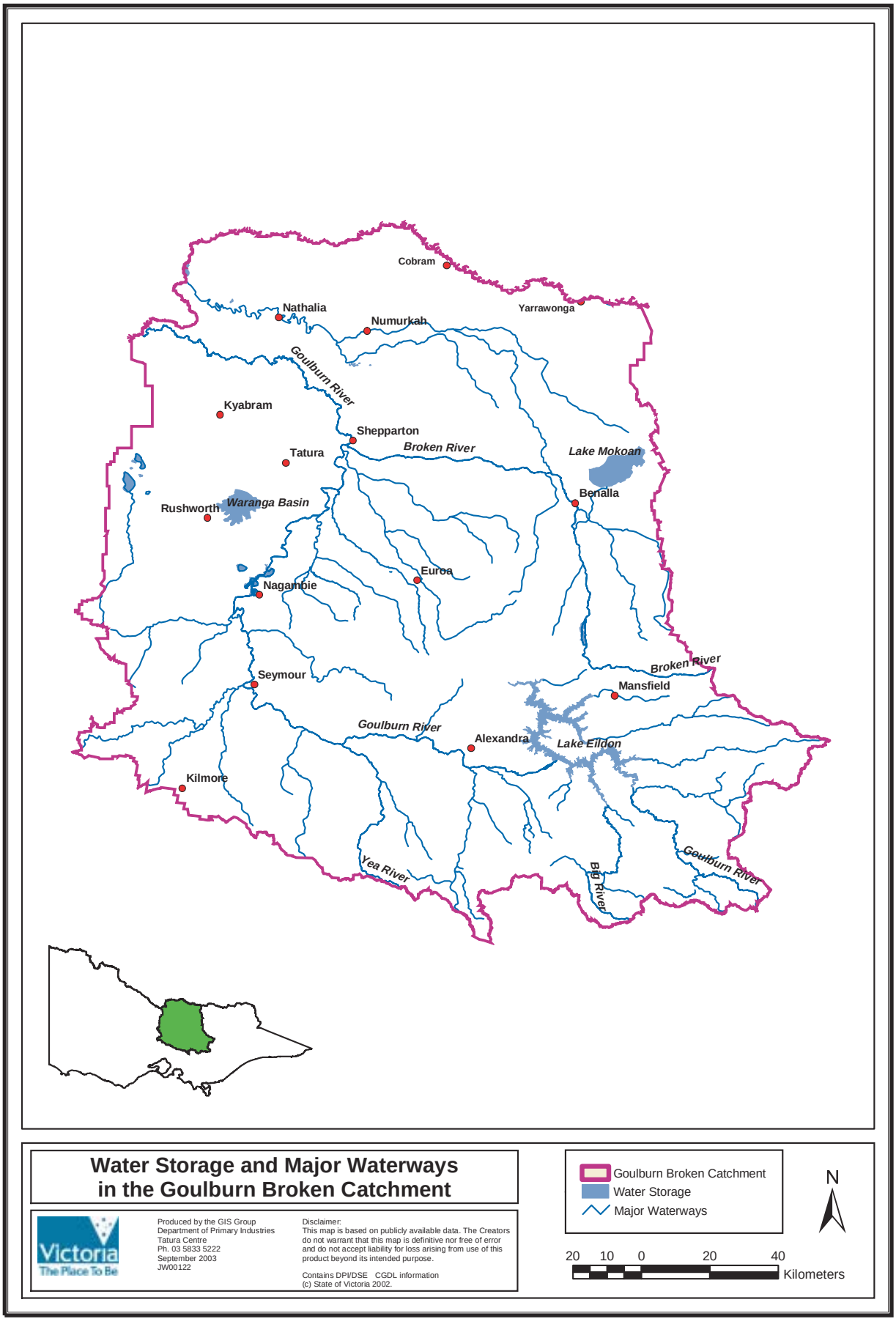
The region is both a positive and negative contributor to climate stability. Contributions to greenhouse gas emissions are made through intensive dairy, cattle and sheep farming, while carbon sinks are provided in the Catchment through existing vegetation and revegetation efforts.

See also Climate change, within Section 6.3.2, ‘Induced threats’.

Map 5: Bioregions within the Goulburn Broken Catchment.



Map 6: The Catchment's water resources.



5.2

Economic assets

The region supports a range of economic assets that rely on the natural resource base. These include farm production, irrigation and drainage infrastructure, food processing, transport, retail, services, tourism and recreation assets. The human and intellectual capital – the skills, knowledge and experience of the regional community, drives the efficient production of output from these assets and leads to the development of new capacity and the creation of new economic assets.

5.2.1

The region's economy

Agriculture

The Goulburn Broken Catchment is widely regarded as the 'food bowl' of Murray-Darling Basin. The main primary industries are horticulture, dairy, cropping, viticulture, wool, forestry and grazing (sheep and beef) (see Table 5.11). The region supports a large fruit and vegetable food processing industry centred on Shepparton, with value adding in other commodities such as milk products, wineries and meats.

The Catchment's gross value of production from agriculture, horticulture, forestry and aquaculture production and processing is nearly $3.0 billion a year, with the Catchment as a whole producing approximately $7.8 billion across all sectors of its economy. Of that total, the irrigation region contributes approximately $5.9 billion and the dryland area contributes $1.9 billion. This is the most significant contribution of any non-metropolitan Catchment in Victoria.*

Over the past five years, capital investment in food processing has been $630 million. The existing assets are being increased by about $100 million each year (or $1 billion over 10 years). Total employment in the Goulburn Broken Catchment was 77,000** distributed across all sectors in the regional economy.

Hardwood forestry

Hardwood forestry is based on native forests and is centred on the Murrindindi Shire, which produces 15% of Victoria's sawn hardwood, with smaller volumes coming from the Mitchell Shire. The value of production

Table 5.11: Agriculture industry profile in the Goulburn Broken Catchment.

Industry	Total	Irrigation (SIR)	Dryland
Dairying – milk	$453,348,107	$440.85 m	$12.50m
Livestock slaughter	$210,898,408	$145.94 m	$64.96m
Fruit (excluding grapes)	$169,239,297	$167.66 m	$1.58m
Timber	$85,600,000		$85.60m
Hay production	$61,869,172	$49.56 m	$12.31m
Wool	$49,424,727	$15.71 m	$33.71m
Cereal Grain	$51,857,549	$41.08 m	$10.78m
Vegetables	$27,869,372	$24.19 m	$3.69m
Pastures for seed	$10,821,915	$2.22 m	$8.60m
Aquaculture	$10,700,000		$10.70m
Egg production	$7,907,664	$1.00 m	$6.91m
Potatoes	$5,185,258	$3.50 m	$1.68m
Grapes	$4,313,806	$1.30 m	$3.01m
Beekeeping	$1,180,472	$0.94 m	$0.24m
Non-cereal grains	$953,489	$ 0.78 m	$0.17 m
Total GVP (1996)	$1.151 billion	$894.73 m	$256.44 m
Estimated in 2000	$1.349 billion	$1.048 billion	$301.00 m
% of total		78%	22%

* *Michael Young and Associates 2001.*

** *An Economic Profile of the Goulburn Broken Catchment (2002) Michael Young and Associates.*

from hardwood sawlogs and residual pulp for 1999/2000 is estimated to be approximately $7.5 million (just under 1% of the gross value of production from the Catchment or 3% of the value of production from the dryland areas).

Softwood plantation forestry

There are about 20,000 ha of plantation softwood forests in the Goulburn Broken Dryland. Estimated softwood production is some 220,000 cubic metres with a primary value (farm gate equivalent) of approximately $78 million and an added value of $78 million after processing, giving a total gross value of production of $156 million. Timber production is by far the most important contributor to the Farm Gate Gross Value of Production in the Goulburn Broken Dryland.

Aquaculture

Since 1998, the aquaculture industry in the Catchment has grown at 10-18% a year. Salmonoid fisheries represent $10 million of the aquaculture total of $10.7 million (1998), with all farms being adjacent to the Goulburn River or its tributaries, between Eildon and Nagambie. These trout and salmon fisheries are dependent on the cold water that flows from the bottom of the Eildon Dam and from the surrounding alpine areas.

5.2.2

Employment in the Goulburn Broken Region

The importance of primary production and manufacturing (mostly food processing) as an employer is highlighted above. Retailing, as a single sector, is almost as important as manufacturing and reflects the discretionary expenditure that flows on from the other sectors.

The SIR provides 62% of total employment and 75% of farm jobs in the Catchment. The breakdown of employment in the agriculture, forestry and fisheries sector is illustrated in Table 5.12.

Although agriculture and horticulture are the most important farm employers in the Catchment, the

Figure 5.3: Employment by economic sector in the Catchment.

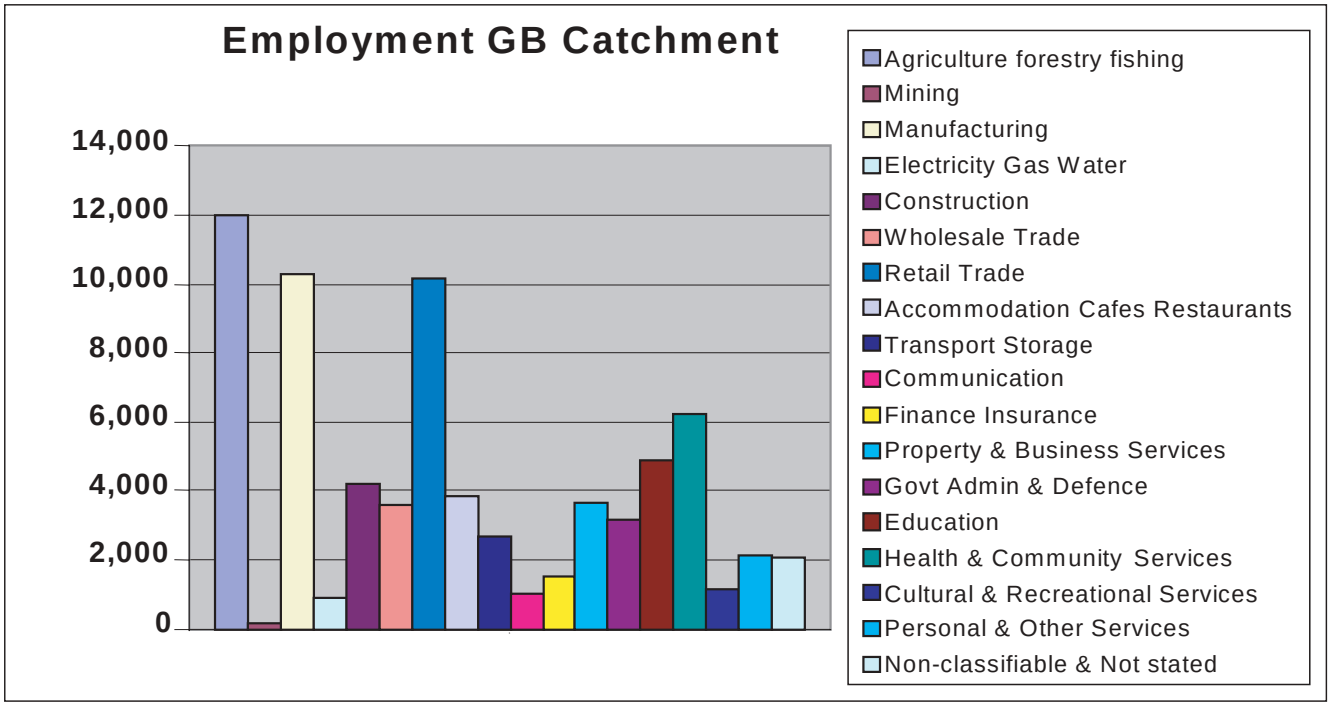


Table 5.12: Employment in primary production by local government area.

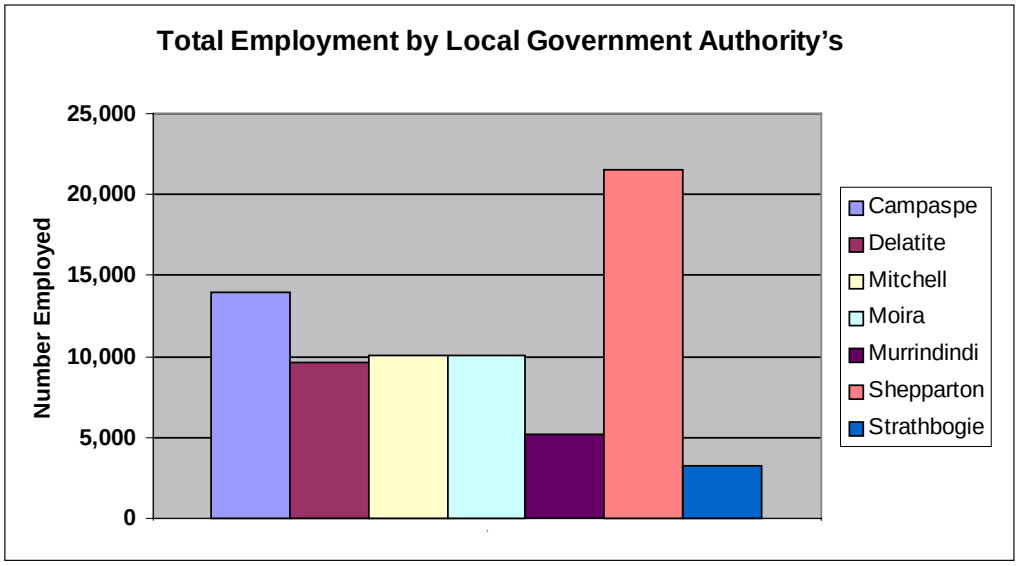
Industry Shire		Ag Services	Forestry Logging	Forestry Processing	Commercial Fisheries	Other	Total
Campaspe	3,008	80	16	53	4	11	3,119
COGS	2,834	103	13	100	3	11	2,964
Moira	2,744	85	11	50	3	11	2,853
Delatite	856	47	34	252	0	3	940
Mitchell	500	34	23	239	3	11	571
Murrindindi	637	12	27	161	55	6	737
Strathbogie	754	18	10	28	0	7	789
Total	11,333	379	134	883	58	59	11,904

timber industry plays an important role (production and processing) particularly in the dryland shires (as a percentage of total jobs).*

Supporting this strong economic profile is the asset base of Goulburn-Murray Water's (G-MW) irrigation infrastructure that is estimated to be worth $2.6 billion.

Tourism is increasingly important to the Catchment. In the southern areas, easy access from Melbourne provides numerous options for tourism and recreational activities. In the northern areas, the Murray River remains a strong tourist attraction. Main tourism activities include wineries, snow and water skiing, camping, four-wheel driving and fishing.

Figure 5.4: Total employment for all sectors in the Goulburn Broken Catchment by local government area.



** ABS 1996; total excludes timber processing.*

5.3

Social assets

The major rural towns and cities in the Catchment include Shepparton, Mooroopna, Benalla, Seymour, Kyabram, Cobram, Yarrawonga, Numurkah, Nathalia, Mansfield, and Yea (See Map 1). Some 189,590* people live in the Catchment providing an employment pool of 77,000. As with most regions, a greater proportion of the community is living longer. Rapid population growth is occurring in some parts of the Catchment, notably centres within commuting distance of Melbourne and the City of Greater Shepparton.

Population numbers swell considerably during the fruit harvest season from December to March, when about 10,000 itinerant workers from throughout Australia and overseas converge on the SIR.

The social assets of the Catchment are the abilities, knowledge and skills of each individual resident as well as the capacity of communities that make up the Catchment. Community and physical assets include:

- A diverse multicultural community. The region is a popular destination for migrants and this has resulted in a diversity of cultures. The region is home to people of Italian, Greek, Turkish, Middle Eastern and Indian descent, among others.
- Strong regional centres, including Benalla, Seymour and Shepparton.
- A close network of social organisations (e.g. sporting clubs, community arts groups, environmental groups, welfare groups and family support groups).
- Strong community representation through a wide range of organisations (e.g. councils, businesses, government agencies and social clubs).
- Good cross-section of educational facilities including primary and secondary schools, colleges and universities. The University of Melbourne has a strong presence in the region through its Department of Rural Health and the Dookie College campus. The La Trobe University has a campus at Shepparton.
- Public transport services.
- Resource centres such as libraries and internet access centres.
- Active community group network (e.g. Landcare groups, field naturalist groups and field and game branches).

** An Economic Profile of the Goulburn Broken Catchment (2001), Michael Young and Associates.*

Table 5.13: Department of Infrastructure population predictions by local government area.

Shire	1996	1999	2001	2006	2011	2021	% increase	Annual %
COGS	54,179	55,549	56,168	58,076	59,893	63,494	17.19%	0.69%
Moira	25,856	26,272	26,476	27,038	27,659	28,928	11.88%	0.48%
Campaspe	34,708	35,501	35,854	36,589	37,372	38,954	12.23%	0.49%
Delatite	20,080	20,750	21,049	21,747	22,247	23,070	14.89%	0.60%
Mitchell	25,675	27,308	27,633	28,978	29,958	32,914	28.00%	1.13%
Murrindindi	12,896	13,156	13,203	13,274	13,440	13,882	7.60%	0.30%
Strathbogie	9,285	9,271	9,207	8,989	8,790	8,680	-6.52%	-0.26%
Total – all	184,675	189,806	191,591	196,697	201,370	211,943	14.91%	0.60%

5.3.1

Cultural heritage

The region has a rich cultural heritage. The Murray and Goulburn Valley supported a relatively large Aboriginal population for many thousands of years prior to the arrival of European settlers. Watercourses provided a focal point for human activity and are an important aspect of the regions cultural heritage. Within the upper Catchment, the Bootherboolok occupied the headwaters of the Goulburn River. Further down the Catchment, the Natrakboolok tribe covered Yea, Seymour, Euroa area and the Ngooraiulum tribe the adjacent area to Toolamba. The Bangerang tribe and its many sub-tribes occupied the lower Goulburn area up to the Goulburn and Murray junctions.**

In 2002 there were more than 6000 Koori people in the Catchment, including 4000 in Shepparton, the single largest Koori community in both rural and urban areas of the State.

There are currently 2163 pre and post contact Aboriginal heritage sites and places registered within the region. More than 70% of these sites are located within 1 km of water courses.

The region has a variety of Indigenous and Koori organisations that play a strong role in the community. These include the Koori Economic, Employment and Training Agency (KEETA); the Rumbalara Co-operative, Rumbalara Football Netball Club (a key organisation that runs many wellbeing and cultural programs); Yorta Yorta Nations, Bangerang Cultural Centre and the Taungurang Nation along with the DPI/DSE indigenous facilitators for the region.

* *Don Chambers*, Violet Town or Honeysuckle in Australia Felix 1836–1908. *Melbourne University Press, 1985.*
** *Raymond West*, Those Were the Days. *Waterfowl Press Pty Ltd, Shepparton, 1962.*

Identifying threats to the Catchment's natural assets

The region's natural assets are under threat while they generate enormous economic and social benefits. The threats are described in this section. The framework proposed is derived from *The Victorian River Health Strategy* that separates threatening activities (such as grazing) from impacts (such as weed invasion and reduced regeneration). This framework enables the threats causing the impacts to be targeted.

6.1

Categorising 'threat'

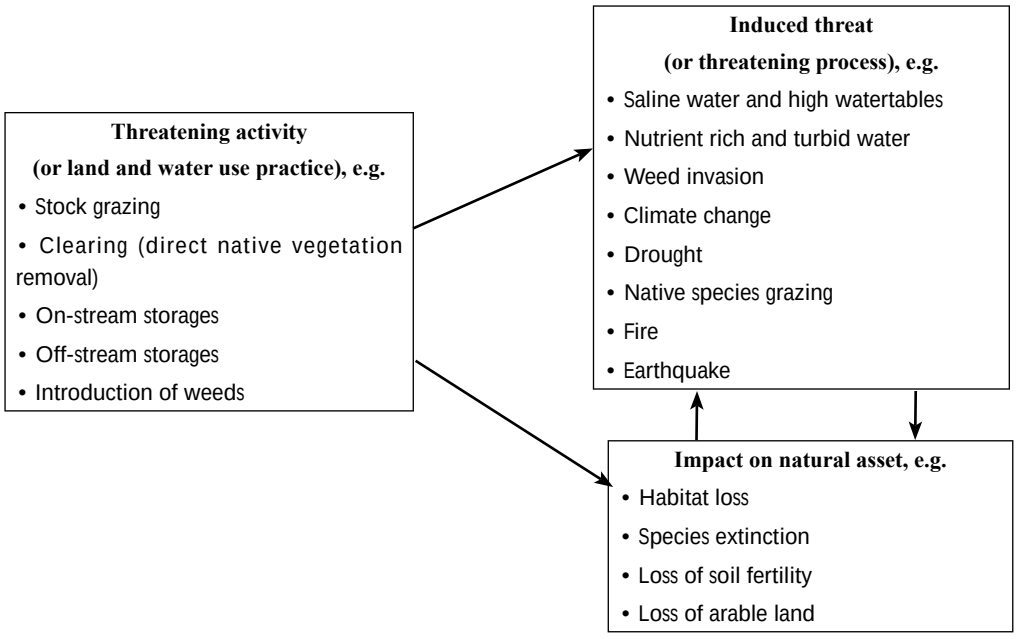
As shown in Figure 6.1, 'threatening activities' (land and water use practice) threaten natural assets directly as well as indirectly via other threats they induce. These 'induced threats' usually occur naturally, however, their impacts have increased dramatically. For example, the impacts of 'natural threats' such as drought and kangaroo grazing are often exacerbated in environments that have been substantially modified.

Threats formally listed under Commonwealth and State legislation and action plans have not been categorised like this. They are a mixture of these two types of threat and the impact.

Habitat that remains is under ongoing threat. For example, the Commonwealth's Environment Protection and Biodiversity Conservation Act 1999 listed 'Key Threatening Processes' (see www.ea.gov.au) that include processes related to feral goats, feral cats, feral rabbits, Foxes, feral pigs, root-rot fungus, and land clearance. 'Potentially threatening processes' (see www.nre.vic.gov.au*) have also been listed under Victoria's Flora and Fauna Guarantee Act 1988. These include processes related to predation by cats and foxes, poisoning from lead shot in cartridges by hunting waterfowl, collection of native orchids, loss of hollow-bearing trees in Victorian native forests and removal of wood debris from Victorian streams.

6.3

Figure 6.1: Relationship between threatening activity, induced threat and impact on natural asset.



* Website address is likely to change.

6.2

Identifying threat risk levels

An important step in developing priorities for action is to identify the greatest risks from all threats to the benefits flowing from our natural assets. Greater clarity is achieved when conducting this process by separating the relative impact that threats have had historically on specific assets from the risk the threats pose currently to these assets.

The Catchment community has a long history of conducting similar processes to identify risk, although the information has often been from different disciplines and so has not been in a form that can be readily communicated. We are committed to rectifying this.

An action can be focused on threatening activities or induced threats or impacts. It is critical to note the cyclical process in Figure 6.1: it is often important to address the induced threats or impacts because they can also induce greater risks. For example, the impact of habitat loss in the form of native vegetation can itself be a cause of the induced threats of salinity and climate change which, in turn, can cause further habitat loss.

Table 6.1 lists major threats to natural assets and shows the type of table that will soon be completed in consultation with the community to confirm and communicate the greatest risks. It is envisaged that semi-quantitative ratings of risk will be used to complete such tables. Ratings will consider likelihood and consequence of the threat, consistent with the risk management process described in Section 8. Biodiversity Risk Mitigation Protocols have been developed and these use the approach of likelihood and consequence.

Table 6.1: Risk matrix – threats and impacts. This is a concept matrix only. A similar matrix is to be completed during 2003.

Threat and Impact	Overall Risk to Asset	Risk to Individual Assets				
		Soil	Water Quantity	Water Quality	Biodiversity	Air
A. Threatening Activity						
A1. Land and water use practice						
1. Clearing (direct native vegetation removal)						
2. Stock grazing						
3. Cultivation, cropping and pasture management						
4. Irrigation						
5. Groundwater use						
6. Timber harvesting						
7. Firewood gathering						
8. Recreation						
9. Apiculture (bees)						
10. Infrastructure – road and rail						
11. Infrastructure – waterways and floodplain						
12. Fire management						
13. Culverts, regulators and on-stream water storages						
14. Off-stream storages						
15. Levees and floodplain development						
16. Mining						
17. Collection of plants						
18. Introduction of weeds						
19. Introduction of pest animals						
20. Transportation (of pathogens – especially phytophthora)						
21. Snag removal						
22. Effluent disposal						
A2. Potential land and water use in new areas						
23. Irrigation						
24. Subdivision – rural blocks						
25. Subdivision – peri-urban areas						
26. Infrastructure – road and rail						
27. Tourism						
28. Reforestation						
29. Introduction of Genetically Modified Organisms						
B. Induced Threat						
30. Saline water and high watertables – dryland						
31. Saline water and high watertables – irrigation						
32. Nutrient-rich and turbid water and suspended solids						
33. Colder than 'natural' water						
34. Other water contaminants e.g. pH, pathogens, biocides, heavy metals						
35. Stream instability and bank erosion						
36. Changed flow pattern						
37. Weed invasion						
38. Pest animals						
39. Flood						
40. Fire						
41. Native species grazing						
42. Native species invading						
43. Wind						
44. Earthquake						
45. Soil threats – various						
46. Drought						
47. Climate change						
C. Impact						
48. Habitat loss – various						
49. Reduced water yield						

6.3

Threat descriptions

Many threats that pose perceived major risks are described here, although not presented in order of importance. This is not a complete list of threats.

6.3.1

Threatening Activities : A1 – Land and water use practice

Stock grazing

Some 72% of the Catchment is privately owned. Sheep, cattle and mixed cropping are the major agricultural pursuits. Large areas of public land along streams are also licensed for grazing or illicitly grazed. Grazing is causing active degradation of biodiversity values on-site and downstream over vast areas of the Catchment.

Groundwater use

While rising groundwater levels is the major cause of salinisation of land and streams, groundwater within the Goulburn Broken is a significant water resource for irrigation and for industry and urban supply. In such circumstances, a balance is necessary between pumping to provide salinity control while protecting the groundwater resource and the rights of groundwater resource users.

Increasing demand for groundwater has been apparent in recent years because of a series of dry seasons and the cap on surface water diversions within the Murray Darling Basin. In some areas, increased demand is threatening the sustainability of the groundwater resource. These areas require higher level management. They include the Murray Valley Deep Lead (Katunga Water Supply Protection Area), and the Nagambie and Kinglake areas.

Culverts, regulators and on-stream water-storages

This threat is closely linked with the induced threat of changed flow patterns (see Section 6.3.2).

Major barriers within the Catchment prevent the migration of native fish species. These include:

- Broken River: Gowangardie Weir, Caseys Weir, Mokoan Offtake Structure, Lake Nillahcootie and Hollands Branch/Mokoan offtake structure.
- Goulburn River: Goulburn Weir and Eildon Pondage and Lake Eildon.

Many other smaller barriers exist, with priority zones for action being the upper Broken Boosey Creeks and Seven Creeks system.

Development and use of the land adjacent to streams, recreational activities, the use of the natural river systems for transporting stored water to downstream developments and flood mitigation works on the floodplains have changed the ecological functioning of many of our river systems. These changes have led to in-stream instability, bank erosion, loss of in-stream and riparian habitat values, and isolation of wetlands and billabongs from the stream.

Raised structures such as levees, channels, raised roads and railways, spoil banks and bridges have had a significant impact on flood behaviour, affecting flow distributions, flow velocities and depths. While they can have significant benefits in reducing flood damages, they can, however, have a number of 'dis-benefits' including:

- A reduction in riverine and floodplain habitats, leading to an isolation of wetlands, and general fragmentation, leading to habitat decline, altered nutrient processes and further loss;
- An increase in flow concentration and stream power, leading to increased flow rates and flood levels, and stream and bank erosion;
- A reduction in the frequency of deposition of fertile material across the floodplains;

- Intensification of land use in the protected areas of the floodplain, with a resultant increase in social disruption and flood damages when the levee fails;
- A reduction in soil moisture; and
- Creating a false expectation of being immune from floods greater than the levees are designed to protect.

Cultivation, cropping and pasture management

Cultivating to prepare soils for cropping and pastures and to create firebreaks (especially along roadsides) can damage existing native vegetation, prevent natural regeneration of remnant vegetation and encourage pest plants. This activity usually occurs on the best soils for agriculture - which equates to the most threatened EVCs. Land managers are becoming increasingly sensitive to biodiversity needs as awareness grows but the risk is still substantial.

Threatening Activities: A2 – Potential land and water uses in new areas

Irrigation

With the advent of tradeable water entitlements in recent years, new areas are being irrigated. This land usually has the most arable soils, which often have remnants of endangered EVCs. This places these EVCs under direct threat from clearing and insensitive irrigation management practices.

Sub-division – rural blocks

There has been a marked increase in rural residential sub-division over the past decade and this trend is likely to continue, especially around Broadford, Kilmore, the Strathbogies and Seymour. Native vegetation is often cleared or degraded as a result of rural living practices.

Reforestation

Large-scale tree planting for timer production in parts of the middle and upper Catchment can help manage watertable and salinity levels. This could have significant risks such as planting of forests in native grasslands, if not planned correctly. Other possible risks are decreased water yield in certain areas and introduction of non native genes to the gene pool.

Introduction of Genetically Modified Organisms (GMOs)

Genetically Modified Organisms are likely to become an issue over the next few years. GMOs carry several risks that will need to be managed, including contamination of the gene pool of native species and invasion of native grasslands.

6.3.2

Induced threats

Salinisation of the region's land and water assets remains the greatest threat to our future prosperity and a major threat to our biodiversity. Salinity results from a hydrological imbalance where too much water reaches the groundwater systems. Habitat in the lowest parts of the landscape are under most immediate threat (streams and wetlands). Trees are at substantially increased risk when watertables are within 3 m of the surface.*

Salt loads in rivers and streams also contribute to a decline in water quality.

* *Pers com, Paul O'Connor DPI Tatura.*

Saline water and high watertables – Dryland

Developing a detailed, site-specific knowledge of causes and effects of dryland salinity is complex and investment in understanding it has been relatively small until recently. Although it has been more than a decade since dryland salinity was recognised as a problem for the Catchment, we have only recently gained

an appreciation of the scale of its consequences; far more assets are at risk than originally thought.

Clearing of native vegetation results in less water being used and more water entering the groundwater systems. Consequently, groundwater levels are rising across the Catchment and mobilising natural salt previously stored in the soil profile.

Salt that reaches the surface is also mobilised by overland flow of water and enters rivers and streams. In total, more than 260,000 tonnes of salt is exported to the Murray River each year. The situation is worsening. The area of high watertables in the dryland part of the Catchment is anticipated to increase from 1,170 km^2 now to 6,600 km^2 by the year 2100. Estimating the area of land that could be salt affected is controversial. The National Land and Water Audit* estimates that 135,000 ha of land in the Goulburn Broken will be severely affected by 2060 and a further 500,000 ha will be moderately to severely affected. This increase in dryland salinity could result in an additional 160,000 tonnes of salt being mobilised to the land surface (MDB Audit, 1999). Much of this salt will be retained in the landscape.

Consultants assisting with the review of the region's dryland salinity program provide a more conservative estimate of the area of severely salt-affected land. They estimate that 30,000-50,000 ha will be severely salt affected by 2060. This difference is due to more detailed information being available within the region. A priority for the region's research and development effort over the next five years will be to develop an agreed position on future salt projections.

Regardless of the methodology used to estimate the potential overall salt impact within the region, the approaches used agree that there are two areas of primary concern: the Riverine plains and the Plains-upland interface along the foot of the Strathbogie ranges.

If we do nothing, salt loads from the dryland Catchment will result in an estimated salinity increase of 23 EC in the Murray River.* This is an increase from the original 15 EC estimate made by the Murray Darling Basin Salinity and Drainage Strategy (1989).

Salinity levels will also increase significantly in water within the Catchment. The Goulburn River at the Goulburn Weir will increase 20 EC (to 140 EC by 2100), the Broken River at Casey's weir salt load will double (up from 130 EC to 270 EC) and the Murray upstream of the Catchment will increase 100 EC (to 230 EC).

The estimated annual economic loss from salinity and high watertables in the dryland area has been estimated to reach $38 million a year by 2050. This estimate does not include within-Catchment costs, such as those faced by local government (roads and other infrastructure), domestic and industrial water users or the agriculture sector. The within region costs have been estimated at around $250 m.+

These are the measurable economic impacts. In addition there are major potential impacts in terms of biodiversity assets,** water quality and land degradation. Some 20% to 40% of the region's significant wetlands, 12% to 25% of the threatened flora and 18% to 35% of threatened fauna will be subject to areas of high watertables and salinisation. Up to 8,000 km of the region's waterways will be in areas of high watertables by 2050 and between 25% and 58% of the region's dryland area will be subject to high watertables and salinity.

The area of high watertables in the dryland part of the Catchment is expected to increase from 1,170 km^2 now to 6,600 km^2 by 2100.*** It is difficult to estimate the area of land affected. Estimates range from 30,000 to 135,000 ha severely affected by 2060, with up to 500,000 ha moderately to severely affected.

* *National Land and Water Resources Audit: Theme 2 – Dryland Salinity. Extent and Impact of Dryland Salinity in Victoria, November 2000. Prepared by SKM.*

** *Salt loads at Morgan in South Australia are used by the Murray Darling Basin Ministerial Council as an indicator of the salt loads of the Murray River.*

*** *Pers Com, Mark Cotter, GB Regional Dryland Salinity Coordinator.*

Saline water and high watertables – Irrigation

Salinity and waterlogging issues are even more pressing for irrigation areas. About 20% of the Catchment is irrigated, with most of this falling into the Shepparton Irrigation Region (SIR).

In 2001, 23.5% of the SIR was underlain by watertable within 2 m of the surface (this varies from year to year depending on the seasonal conditions). The rise was very rapid until 1995, when a peak of 47% was reached, with the watertable levels predicted for the year 2000 in the 1990 SIR Salinity Plan surpassed. A combination of dry seasons and progress with the salinity works program led to the reduction.

Without active management, 65% of the SIR will have a high watertable by 2020 and there will be severe land salinisation, resulting in significant loss to the region's economic assets and irreversible degradation of most major wetlands within the Shepparton area.

At the farm scale, irrigation can cause wetlands and remnant vegetation to undergo changed hydrological cycles that significantly degrade them. Algal blooms in some wetlands are increasing as a result of increased nutrient levels. Land forming can also directly affect these features.

Nutrient-rich and turbid water and suspended solids

In addition to salt, the Catchment generates 360 tonnes of phosphorus and 2,854 of nitrogen each year. Some 289 tonnes of phosphorus and 1,951 tonnes of nitrogen are exported from the region. The Goulburn Broken Catchment contributes 33% of the Murray River water flow above the Murrumbidgee, but 58% of the turbidity.

Because of the nutrient and chemical loads, the risk of algal blooms is high and they occur frequently in and downstream of the Catchment. The increased nutrient loads affect many native species.

Major sources of nutrients include irrigation drainage, sewage treatment plants, sediment mobilisation, urban stormwater and intensive animal industries such as fish farms.

Commonly used pesticides in intensive horticulture within the SIR have been found in surface drainage water following application to soils.** Studies of shallow well sites in the Tongala-Kyabram region of the SIR have indicated contamination of groundwater with herbicides.***

Weed invasion

The Catchment has 70 species of declared noxious weeds and a number of emerging environmental and agricultural weeds. Weeds have a major impact on the quality of remnant vegetation.

There is no legislation or formal mechanism for ensuring management of emerging environmental and agricultural weeds that are not declared noxious weeds in the region. If there is a need to implement a co-ordinated control program targeting non-declared species, the capacity of agencies to provide regulatory support will be limited.

Of particular concern in irrigated areas of the Catchment are the emerging aquatic and pasture weeds for which there are currently limited control options.

Drought

Although drought is essentially a natural process, it can place species of flora and fauna at greater risk, especially where the populations of these species are below threshold levels and habitat refuges and migration routes have been reduced.

Changed flow patterns

Harvesting, storing and delivering water for urban and agriculture use has dramatically altered the flow patterns of our rivers and creeks, often by reversing the season's when high and low flows would naturally

* *Draft Goulburn Broken RCS, August 2002.*

** *Stork and Jerie, 1999.*

*** *Watkins et al, 1999.*

occur. This has had a direct impact on the region's aquatic biodiversity through changed watering patterns and temperature regimes and the quality of water.

This threat is closely linked with that of 'culverts, regulators and on-stream water storages' (see Section 6.3.1). These structures can cause wetlands and rivers to undergo changed hydrological cycles, including reduced river flows, increased nutrient input and increased sedimentation. Release of cold water from major storages benefits trout farming at the expense of native fish.

Climate change

The Catchment is expected to undergo a significant change in climate because of increased concentrations of greenhouse gases.

Climate change has implications for the long-term sustainability of our environment, economy and community. It will provide conditions that favour the survival and spread of pest species, increase the likelihood of fire, and directly affect the physiology of most plant and animal species.

Greenhouse gases are having an impact on Australia's weather patterns. Work by CSIRO* predicts that by 2030, annual average temperatures will be 0.4 to 2.0°C higher over most areas of Australia. By 2070, this could be 1.0 to 6.0°C. The number of winter days below 0°C will decrease from the present average of 15 days to 6-13 days in 2030 and 0-9 days by 2070. Rainfall averages are likely to remain constant, but changes in variability are likely to occur with more frequent intense rainfall events.

Species will need to adapt to changing environmental conditions or migrate to other areas. This particularly impacts on species at the upper limit of their temperature range with a limited ability to adapt. For example, the Mountain Pygmy Possum is confined to alpine areas, which will be severely reduced with global warming. It is estimated that this species will be lost with only 1°C of global warming.**

Many eucalypt species will be threatened in native forests as rainfall reduces and temperatures increase. Wetland and riverine environments currently affected by reduced environmental flows will be under further pressure due to a decrease in rainfall.

Other environmental pressures, such as increased fragmentation and isolation of communities in managed reserves, will further limit the ability of species to colonise new areas.

Irrigated production systems in the Catchment are conducive to high levels of greenhouse gas emissions, particularly nitrous oxide from irrigated pastures and methane from grazing ruminants. Abatement of these emissions is important, particularly in the face of intensification of irrigated production.

Pest animals

Pest animals pose a major threat to our assets, not only in terms of direct impact, but also because they limit the impact of actions designed to address other threats.

Rabbits, foxes and wild dogs are the key pest animal threats in the region. Rabbits threaten high value remnant vegetation, reducing regeneration and promoting invasion of exotic weed species. High rabbit numbers also cause serious erosion problems in the upper Catchment. Foxes and wild dogs have a significant impact on livestock and native fauna as well as contributing to the spread of noxious weeds. The impact of fox and wild dog predation to individual farmers and their families can be significant, both emotionally and economically.

Native animals such as cockatoos, kangaroos and noisy minors can also become pests, especially in our highly modified environment.

Soil threats – various

Soil acidification is a major land degradation issue threatening the sustainability and productivity of

* *CSIRO, 2001a.*

** *Climate Change and Biodiversity in Australia, Hughes L, 2002, in Life Lines Newsletter, Community Biodiversity Network.*

agricultural soils in the Catchment. While soil acidification is a natural process, as illustrated by the strongly acidic subsoils in the high rainfall areas of the region, agricultural practices have greatly accelerated the rate of acidification of all soil types.

Soil pH decline has been highest in the region on the red duplex soils that have been subject to cropping and intensive pasture activities. Soil pH has changed little on the more highly buffered yellow duplex and friable earths subject to permanent pasture production.

The major impacts from declining soil pH are likely to include:

- increased nitrate contamination of groundwater and the potential for reduced water quality;
- reduced farm yields, leading to reduced farm income and regional export earnings;
- reduced options for agriculture;
- reduced vegetation cover, leading to accelerated runoff and erosion;
- irreversible clay loss if soils are allowed to acidify below pH of about 4.0;
- decreased land values;
- increased infrastructure costs; and
- increased risk of salinisation resulting from reduced ground cover in recharge zones.

Erosion is a naturally occurring slow process. Human intervention has increased the rate of erosion. Soil without vegetation cover and exposed to wind and rainfall results in the loss of soil particles, leading to a general decline in the productive capacity of the soil and the movement of soil particles to waterways.

Table 6.2: Percentage of surface soils affected by acidity in the Goulburn-Broken region.

Erosion type	pH* <4.5	4.5-5.0	5.0-5.5	5.5–6.0
Red duplex soils	20	40	40	
Yellow duplex soils	20	60	20	
Friable earths	unknown, but 100 likely			

* pH measured in calcium chloride.

Agricultural and infrastructure barriers (roads, mines and urban development) contribute to soil losses.

The different forms of soil erosion include:

- sheet erosion – when a layer of soil moves from the land surface by rainfall and runoff;
- rill erosion – the loss of soil from the numerous small channels across the soil surface;
- gully erosion – when rills become large (deeper than 300 mm);
- tunnel erosion – subsurface soil is removed by water but the surface soil remains intact; and
- stream bank erosion – the loss of soil from the stream bank as a direct result of water flow.

The use of heavy metal elements, their extracting agents and organic agricultural chemical sprays has resulted in the accumulation of toxic concentrations in soils in parts of the Catchment. Heavy metals are also found at specific sites in the lower Catchment.

The below-ground flora and fauna represents one of the most species-rich components of terrestrial ecosystems but is often ignored because it is not well known or understood. Loss of soil biodiversity is thought to be significant in the lower reaches of the Catchment because of decline in surface soil pH, the high

Table 6.3: Likely occurrence of different forms of soil erosion for the Goulburn Broken region.

Erosion type	Upper	Mid	Lower
Sheet	√	√	
Rill	√	√	
Gully	√		
Tunnel		√	√
Stream bank	√	√	√

proportion of dispersive soils and the increased use of artificial fertilisers (Know Your Catchments 1997).

The middle reaches of the Catchment may have also experienced significant degradation and is probably at highest risk of continued loss with intensive horticultural increasing. The upper reaches of the region would be expected to have diverse soil communities. These soils could be at risk, particularly if forest and horticultural industries expand.

The main impacts of declining soil biodiversity include:

- weakened soil resilience resulting in reduced recovery capacity and increased susceptibility to disease incursion;
- poor performance of plant species in acid, alkaline, sodic and saline soils;
- reduced capacity of soils to 'filter' contaminants and tie-up nutrients posing a threat to the sustainability of the soil and water resource through pesticide and heavy metal accumulation and increased run-off into rivers and streams;
- reduction or extinction of vital processes such as N-fixation, P-solubilisation, S-oxidation; and
- loss of valuable source of pharmaceuticals, bio-fertilisers and bio-pesticides.

Sodicity is the presence of sodium in sufficient concentrations to: affect soil behaviour during wetting and drying phases, interfere with plant nutrient balances or, be directly toxic to plant cells.

The large area of SIR land with shallow watertables is likely to become sodified in the future. Groundwater in this area is sodic and enters the soil, either through recycling of pumped water and applied to the soil surface, or via capillary rise from shallow watertables during dry periods.

Estimates of soil structural decline reported by the Commissioner for the Environment (1991) indicate that areas along the Broken River valley are more severely affected than along the Goulburn River valley (Table 6.4). For both Catchments, structural decline was greatest in areas with horticultural land use.

Table 6.4: Assessment of land degradation in the Goulburn Broken Catchment (1985-91) due to soil structural decline. (After OCE, 1991).

Basin	Area of agricultural	Insignificant	Moderate/ Low	Severe	land[a] ('000 ha)
Broken River	591	0%	19%	81%	
Goulburn River	1156	4%	35%	61%	

a Includes areas of remnant vegetation on agricultural land.

Deciding which actions to take

This section expands on Catchment principles relating to rigorous priorities (see Section 8.2). It describes in general terms how decisions are made to determine which actions to take. Specific decision-making processes are discussed in the sub-strategies.

Generally, actions are taken to:

- reduce the risk of current and future threats; or
- remedy the impacts of past and current threats.

The criteria for deciding what action, amongst a range of actions, to take include:

- relative risk rating of all threats to benefits flowing from natural assets;
- costs and benefits of action, including details of who should pay; and
- government priorities and funding levels.

We are committed to working with partners to prioritise and implement actions on Federal and State lists, such as the Murray Darling Salinity and Drainage Strategy and Victorian Action Statements and National recovery plans that contain very specific actions.

7.1

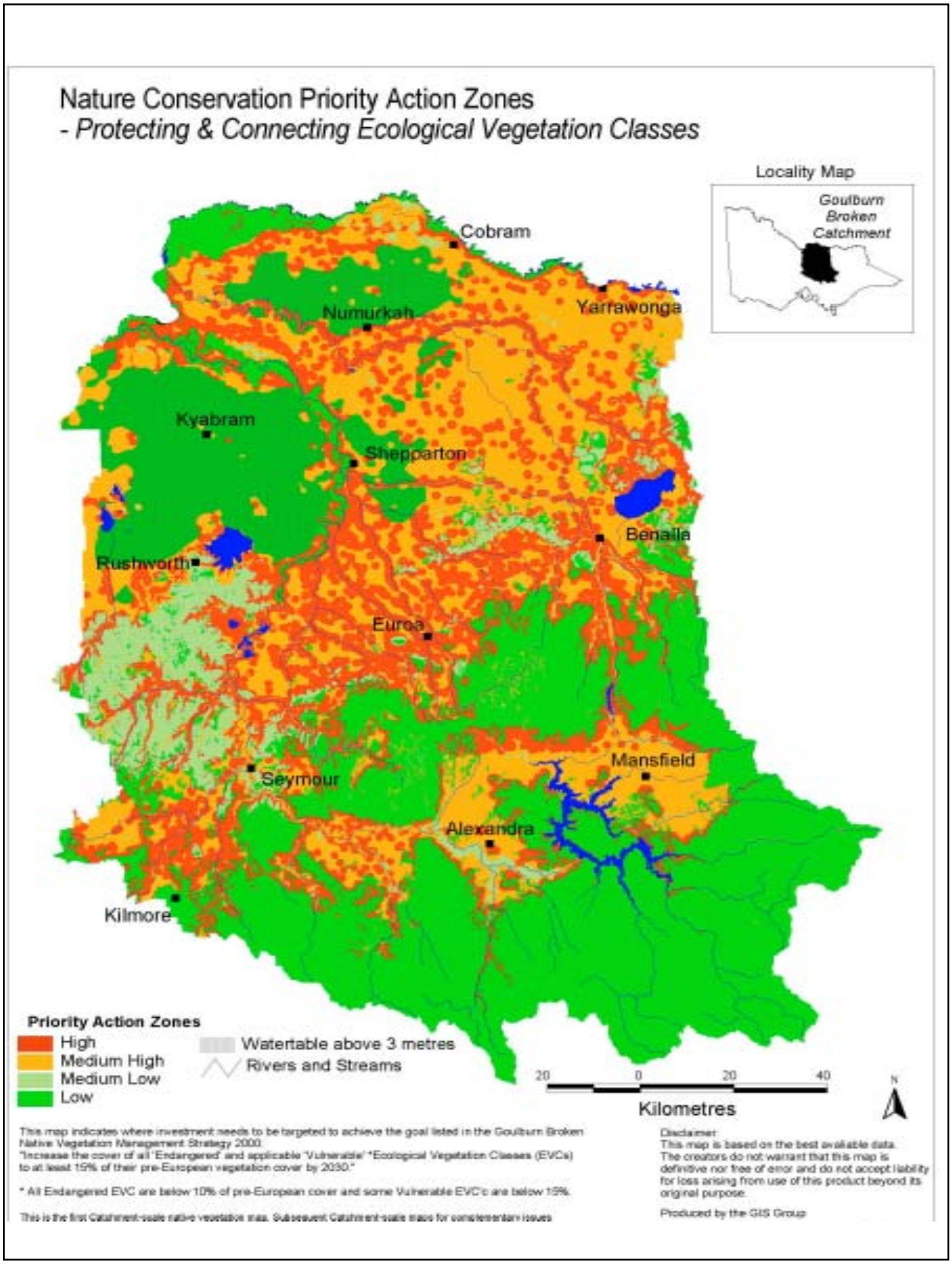
Sub-strategies: historic emphasis and new issues

The Catchment community's understanding of which threats pose the greatest risk to assets and where the most difference can be made is reflected in the sub-strategies that have been developed over the past decade or more. These sub-strategies (and their associated investment plans and technical reports) contain a myriad of actions and it is not appropriate to list them all in this overarching document. Although often single-issue focused, the sub-strategies do take into account triple-bottom-line outcomes and the relationship with other natural resource management issues.

This update of the RCS highlights the fact that the actions described in the original RCS are essentially correct: We must continue to address threats of salinity and high watertables, nutrients and pest plants and animals and ensure biodiversity assets are protected and enhanced. In all cases we must increase our efforts.

Several issues have been given elevated prominence within the Catchment, reflecting local and global community concerns. These include riverine health in general, climate change and soil health (especially soil acidification and soil biodiversity). The Catchment community has responded by identifying actions contained in consolidated reports and sub-strategies and implementation is beginning. (See also Section 3.1, 'Drivers for the region's natural resource management').

Map 7: Priorities for nature conservation in the Goulburn Broken after overlaying salinity risk in the Shepparton Irrigation Region on native vegetation priorities.



7.2

The multiple issues approach to decision-making

Selecting the appropriate action or mix of actions is difficult in natural resource management because the components of the environment are highly interconnected. Actions usually have an impact on other assets and threats as well as those specifically targeted. This can create further risk and opportunity. Integration of actions is particularly important for biodiversity, which is affected (either positively or negatively) by virtually every natural resource management action.

Historically, actions were selected to specifically target threats or assets. Although it is still useful to do this, we are more aware of the other risks and opportunities that these actions present.

Prioritisation principles differ slightly from asset to asset and threat to threat, usually reflecting the natural resource management discipline from which they are derived. Sub-strategies and background papers detail these principles.

The focus for allocating investment is shifting away from discrete issues such as salinity and biodiversity to management actions that generate multiple issue benefits. This has major implications for all levels of planning and implementation and especially for monitoring and evaluation programs.

Map 7 provides an example of the bringing together of disciplines to provide a more holistic sense of priority at the Catchment scale. By overlaying the threat of salinity on priority remnant vegetation in the SIR, the balance of public funds can be directed to areas likely to yield the best long-term outcomes Note that watertable data was not available at the time this map was produced for the dryland.

7.2.1

Works and capacity-building management actions

The multiple benefits generated by management actions reinforce the need to take an integrated Catchment management approach to natural resource management. This occurs at the sub-strategy and works implementation level. For example, the Native Vegetation Management Strategy needs the successful implementation of the actions proposed by the salinity and water quality sub-strategies to achieve its outcomes. Similarly, the salinity and water quality strategies depend on each other and the biodiversity sub-strategy to achieve their goals.

Despite the complexity of integrated Catchment management, there are only a few management actions – no matter what the issue. The challenge is to determine the mix of management actions that generate the most multiple benefits that have acceptable trade-offs between the Strategy's different objectives.

This changed approach has been adopted extremely well operationally in the Catchment (see Case Study 1) although major challenges remain in planning at higher levels.

A major hurdle is the inconsistency of 'language' between the various disciplines of natural resource management, the Catchment Community, and Federal and State funders. One of the ways in which we are addressing the language challenge is by developing a consistent set of management actions. This will enable greater clarity of:

- the assumptions that underpin these actions;
- the outputs to be used when monitoring and evaluating; and
- the outcomes expected for a given investment.

There are two types of management actions:

- works actions; and
- capacity-building actions.

Works actions result directly in changed land or water use and reduce risks posed by threats. Works actions include fencing, installing a reuse dam and adopting other farm management practices.

Capacity-building actions enable works actions to be undertaken or prevent potentially threatening actions. They include community-based planning, extension, research and development, and developing voluntary and enforceable codes of practice and regulation. The Catchment community, local government, the GB CMA and other natural resource management agencies undertake these actions.

Table 7.1 is work in progress showing how we are improving the planning process by aligning threats and works actions so that it is clear what the suite of benefits (and additional risks) are to the assets. The documentation of this integrated approach is significantly lagging the reality of the community's mindset and what is happening on the ground.

Descriptions of many of the works actions are provided in Appendix 3 and capacity-building actions are described throughout Section 8, 'Capacity building, values and principles'.

Table 7.1: Link between works actions, threats and impacts, and outcomes.
This is a concept matrix only, a similar matrix is to be completed during 2003. This links with Table 6.1

Output		Intermediate Outcome		Outcomes	
Works Action	**Quantity**	**Threat or Impact Managed**	**Quantity**	**Asset[a]**	**Quantity**
		A Threatening Activity			
		A1 Land and water use practice			
Fence existing feature		Stock grazing			
Off-stream watering					
Management Agreement					
		B Induced Threat			
		Saline water and high watertables			
Landform/lasergrade		Surface water management			
Drain – primary					
Drain – community					
Weir – replace					
Farm reuse system					
Drain – divert water					
Irrigation systems – improved					
Pasture – plant					
New groundwater pumps – public		Sub-surface water management			
New groundwater pumps – private					
Maintain existing pumps					
Tile drains – install					
Waste water treatment plants – install		Nutrient-rich and turbid water			
Urban stormwater management actions					
Bank protection actions		Stream instability and bank erosion			
Grade control					
Water allocated		Changed flow pattern			
Drain (see surface water management actions)					
Weeds – woody weed management		Weed invasion			
Weeds – aquatic weeds controlled/ eradicated					
Weeds – riparian weeds					
Rabbit control actions		Pest animals			
Fox control actions					
Feral cat control actions					
Application of lime		Soil threats			
Minimum tillage					
		C Impact			
Revegetation – plant natives		Habitat loss – terrestrial			
Hollows – replace with nest boxes					
Fish release		Habitat loss – in-stream			
Vertical slot fishway					
Rock ramp fishway					
Fish barrier removal					
Establish SEARs[a]					
Install water regime control structure		Habitat loss – wetlands			
Construct new wetland					

[a] Multiple benefits include environmental, social and economic.

Case Study 1: Integrated management in action

The multiple benefits approach to landholder grants, a system pioneered in Goulburn Broken Catchment in 1999, optimises environmental outcomes from grants funding. This approach has led to more works where they are most needed and the maximum benefit for taxpayer dollars.

The grants tackle a range of natural resource management issues, including declining biodiversity, salinity, water quality, and pest plant and animal management. Works funded include fencing remnant vegetation and wetlands, planting corridors, revegetation and off-stream watering points.

A partnership approach to works uses a simple system to identify priority sites. The funds available to a landholder depend on the level and array of benefits achieved by works. A project that delivers biodiversity, salinity and water quality outcomes will get more funding than another providing only salinity outcomes.

Grants are evaluated using the following criteria:

- habitat value and quality including presence of threatened species;
- width of riparian zone;
- location in priority water quality zone;
- conservation status of the vegetation;
- area of land the works will cover;
- position in the landscape in relation to other remnants;
- erosion susceptibility of the area; and
- location in a priority salinity area (recharge).

The criteria allow multiple benefits to be assessed and the grant is determined accordingly.

Before issuing a grant, officers ensure that no sites of cultural heritage are disturbed or damaged. All landholders are made aware of their pest plant and animal responsibilities and, where possible, assistance is provided, for example through the Fox-off Program. In areas which are high priority for pest plant and animal control as well as other issues, an integrated program is undertaken, e.g. weed removal and revegetation.

Continually improving our priorities

Information about environmental assets, where they are and the major threats that they face is being continually refined. This information is fed into the integrated grants process so grants are targeted and funded appropriately.

For example, Biodiversity Action Planning is a new process that involves bringing together all current information on biodiversity assets. All land managers including local landholders and groups, local government, DPI, DSE, Parks Victoria and the GB CMA then work in partnership to set priority areas for protection and enhancement of native biodiversity. These priority areas are built into the land management grants criteria.

Excellent work is already underway in the Longwood area to develop Biodiversity Action Planning with 270 high-priority biodiversity sites already identified in the 30,000 ha Pranjip Creek sub-catchment. Surveys of creeks in this area are identifying combined biodiversity, waterway health and water quality priority sites.

This trial project has also brought together Landcare groups and agencies in a joint approach to fox control and to identify priority areas for Catchment protection works.

Research is providing better information on areas of the Catchment that contribute to poor water quality. The CMA waterways team is undertaking detailed stream walks to map priority sites along streams for water quality protection. These priority sites are fed into the grants criteria, along with information about high priority zones for salinity mitigation identified through the recent review of the dryland salinity plan.

Surveying priority biodiversity sites in the Longwood area.

Fostering a partnership approach to identifying priority areas.

Capacity building, values and principles

This section describes how we go about the business of Catchment management. It outlines the principles and values that guide the we work and the capacity-building actions that are needed to enable our principles to be achieved.

Capacity building is about improving our understanding of the challenges facing the region and ensuring that the region's governance structures, partner agencies and the community are in a position to address these challenges.

Our catchment principles are underpinned by the values that the community would like to see promoted through the implementation of the Strategy. In particular, the values are:

- ***Respect of the Community***. Implementing natural resource management actions cannot occur without the support, guidance and active participation of the community.
- ***Quality***. The management actions and works actions promoted by the Strategy will be delivered to a high standard dictated by community expectations.
- ***Learning and adapting***. We must strive for excellence in our monitoring and evaluation processes. They must be transparent and invite community scrutiny, and we must achieve best practice in reviewing and adjusting our efforts to accommodate new research findings and revised community expectations.

Based on our experience over the past two decades and our review of National Standards for the NAP and other government guidelines, we have identified seven catchment principles to guide the way we do business. These are summarised in table 8.1. The principles are explained in more detail within this section and have been used to guide the development of capacity building priorities that are set out in Section 9.

Integrated Catchment Management Principles

1. Partnerships fostered.

- *Communication will be optimised.*
- *Roles will be defined.*
- *Our diverse communities and agencies actively engaged.*

2. Priorities rigorous.

- *Priorities based on the best available scientific, economic and sociological information.*
- *Causes of problems targeted in geographic areas that maximise community return on investment.*
- *Priorities for works consider risks and multiple benefits.*

3. Costs shared fairly.

- *Costs and benefits shared transparently and equitably.*
- *Triple bottom line accountability.*
- *Clear link with supporting legislation.*

4. Large scale focused on

- *Land use to change to better match land capability across broad areas.*

5. Cultural heritage included

- *Aboriginal and non-Aboriginal cultural values factored into all decisions.*

6. Accountabilities clear (strong links with standard one above)

- *Project proposals align with the priorities of the RCS.*
- *Progress reports clearly link to regional, state and national targets and needs.*

7. Adaptive Management Systems at all scales.

- *Management systems in place for individuals, sub-catchments, whole of catchment and industries.*

8.1

Strategic partnerships

The RCS is a blueprint for the future of the region. Its success depends on a supportive operating environment where the policies and programs of the GB CMA, the regional water authorities, local government and other State and Commonwealth government agencies are co-ordinated.

Co-ordination requires strong leadership and negotiation skills and recognition of the challenges facing other agencies in meeting their core objectives. The GB CMA is ideally placed to facilitate greater co-ordination of agency and community effort. It will continue to develop strategic partnerships across all relevant State agencies and local governments.

8.1.1

Community engagement

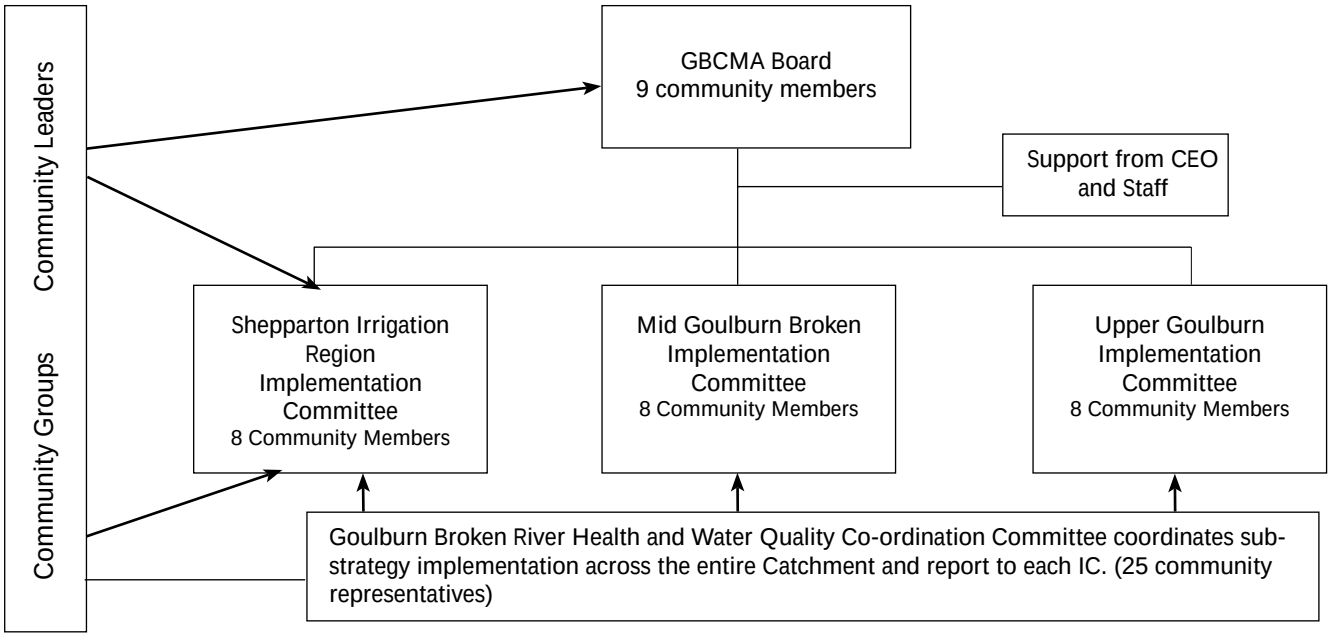
Our assessment of the challenges ahead bring the following issues to the fore:

- managing change;
- resolving conflict;
- managing institutional partnerships;
- enhancing co-ordination;
- fostering communication; and
- ensuring that data and information are shared.

Addressing these challenges requires a broad and holistic view of community capacity building. The community's capacity to achieve these difficult manoeuvres needs to be high. The GB CMA has identified three particular areas where advances can be made. These are:

- Implementation Committees and associated structures;
- Community (public) participation in discovery and decision making; and
- Joint action across institutions.

Figure 8.1: Goulburn Broken community participation structure.



CMA Implementation Committees

To ensure activities of the GB CMA reflect community views, the Board has set up three geographically and community-based Implementation Committees (ICs) (see Map 8). These committees are responsible for implementing on-ground works promoted by the Strategy, sub-strategies and associated action plans. The Committees are also a valuable link between the Board and the community.

Implementation is carried out according to a three-year business plan (also called the Regional Management Plan and associated IC Implementation Schedules). This effectively forms the works plan for the IC.

ICs have demonstrated that they are a vital mechanism for normalising environmental considerations and developing solutions to local natural resource management issues.

Sustainability and the dairy industry

The Goulburn Broken Catchment contains about 24% of the nation's dairy farms and produces about 26% of the nation's milk. The Catchment's 3,000 dairy farms are located predominantly in the SIR (City of Greater Shepparton, Moira and Campaspe Shires).

The milking herds range from less than 80 to more than 1,000 cows with the typical herd being 150-180 cows. The total herd has grown only slightly over the past five years, staying around 350,000-400,000 cows.

The industry has recognised the important contribution it can make to sustaining the region's natural resources. Murray Dairy, the region's dairy industry group, has established a strategic plan for 2001 to 2006 that recognises environmental stewardship as part of the dairy industry's core business. That plan has established the following strategies:

1. Determine best practice for environmental stewardship:
   - develop practices for the best management of effluent;
   - create understanding of the role of trees by appropriately packaging and delivering available information; and
   - develop whole-farm management strategies aimed at responsible stewardship.
2. Create awareness of the environmental impact of dairy farming and promote the adoption of best management practices:
   - improve water use efficiency on-farm;
   - improve dairy effluent management;
   - improve nutrient management;
   - develop the methodology to allow milk companies to integrate environmental management systems into quality assurance programs.
3. Identify new and innovative technology or farming practices that:
   - create positive effects on the environment;
   - develop new irrigation practices and technology to increase water use;
   - identify on- and off-farm drivers for the adoption of improved irrigation practices and technology;
   - identify alternative strategies to manage dairy effluent; and
   - identify and develop opportunities for the dairy industry through land use changes within catchments.
4. Ensure new technologies and farm practices do not conflict with responsible stewardship of the environment:
   - understand the environmental consequences of gene technology application; and
   - ensure that any new irrigation technology or farming system does not increase greenhouse gas emissions.
5. Evaluate the impacts and industry responses to new and emerging environmental issues:
   - evaluate the industry contribution to greenhouse gases and develop energy-efficient production systems; and
   - understand the influence of dairy farming on groundwater.

They are a valued component of knowledge management where sub-regions guide research, identify issues, provide advice, develop annual plans and implement local solutions.

In addition, Co-ordinating Committees have been established to ensure a consistent Catchment-wide approach to issues such as biodiversity, river health and water quality. The River Health and Water Quality Committee is responsible for overseeing the co-ordination and implementation of the Water Quality Strategy through the three ICs and key partners.

Over the next five years the GB CMA will seek to strengthen the contribution of the ICs. The skills required for membership (such as leadership, vegetation management, salinity, etc) will remain, however a matrix will be designed to ensure that demographic priorities such as gender, age range, Indigenous, generational landholder, etc, are included to ensure that membership of IC committees continues to reflect the diversity of sub-regional stakeholders. A significant effort will be made to attract interest from non-traditional participants.

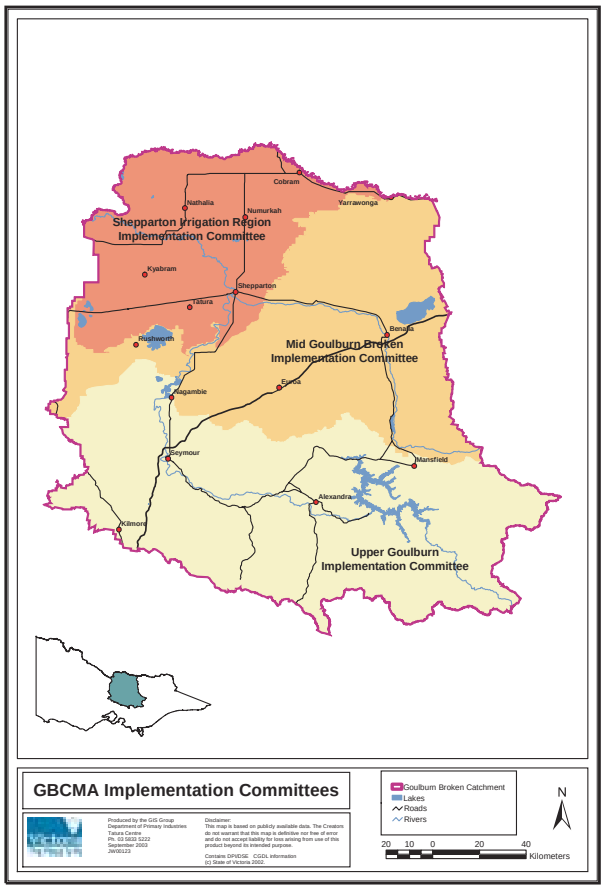
Landcare and other community groups

Landcare groups represent a major part of our community engagement efforts. Some 105 Landcare groups, involving 3,500 people, operate within the region. Actively engaging these people in Local Area Planning (LAP) and providing support to the groups are regional priority activities.

The ICs provide the focal point for Landcare and other community-based groups within the sub-Catchments.

Each IC has a Landcare support function that facilitates communication between the IC and the Landcare networks on annual priority setting for on-ground works. This process is supported by the preparation of LAPs that bring together the works programs of the relevant sub-strategies as they apply to the local area.

Map 8: Implementation Committee boundaries.



The community engagement processes and structures are critical to achieving the RCS outcomes. The CMA's investment over the past few years is now starting to deliver significant benefits in terms of a robust Landcare sector within the region.

The challenge for the next five years is to ensure that these structures are maintained and continue to evolve. A Landcare Support Strategy is being developed for the region. This strategy will address issues such as the development of leadership skills, group operating dynamics, communication and engagement and the benefits of diversity of participation.

Public participation

As well as maintaining investment in Landcare support, the GB CMA recognises the importance of ensuring that the wider regional community is engaged in discussion about the nature of substantial sustainability challenges confronting the region and the GB CMA's management efforts in meeting those challenges.

Expanding the participation of 'people in the street' in the GB CMA's programs will:

- normalise natural resource management as a regional priority so that adoption of changed practices is supported; and
- bring to the fore new ways of thinking about substantial challenges, thus enhancing the achievement of sustainable regional development.

Our community capacity-building approach facilitates sustainable regional development by valuing local knowledge and incorporating this in the learning and decision-making process.

New ways of engaging the regional community in decision-making will be explored in the Catchment. These include the use of 'deliberative forums'. This approach is used elsewhere in Australia and internationally and has the potential to effectively reduce long-term tensions over controversial issues and improve long-term community ownership of the solutions, at the same time building the capacity and willingness to identify and address future issues. 'Deliberative Forums' come in several styles such as Citizen Juries, Planning Cells and Consensus Conferences. Selection of participants in the forums is crucial to the strength of the outcome – participants should generally reflect the diversity of the community.

Priorities for Landcare support in the Catchment

1. Build the capacity of Landcare executives and group members through skills training (including leadership, group dynamics, motivation, communication, partnership/network building, and in staff employment).
2. Regional Landcare Support Officer training.
3. Further development and implementation of planning to help guide groups with their future direction and programs for their local area.
4. A Catchment-wide approach to, and implementation of, multi-directional Landcare communication, engaging all communities and agencies (including Steering Committee to manage and guide Landcare support in the Catchment).
5. Co-ordinator and facilitator training (implement training schedule).
6. Improved communication between CMA and Landcare and other agencies – DPI/DSE, local government (including Landcare co-ordinator/facilitator employment).
7. Uniformity and standard conditions of employment for all Landcare staff (including regional support officers, co-ordinators and facilitators).
8. Mechanism for Landcare involvement in work programs.
9. Landcare forum – support structure, Landcare group driven.
10. Mechanism to evaluate Landcare network structure.
11. Develop standard induction process for all Landcare staff.
12. Tools for self-evaluation of success.

Community Education

This action covers schools education, communication and adult learning processes. Over the next five years, a series of communication plans will be developed to ensure that our efforts are systematic and effective in terms of reaching target audiences. Maintaining community involvement in the highly successful Waterwatch program will be a priority.

Extension

Ensuring adoption of technical knowledge about the resource base to assist landholders to accelerate the rate and or direction of changes of management actions requires a highly skilled workforce. The Catchment has a robust network of skilled and experienced technical staff across its many natural resource management agencies. Supporting the continued professional development of these staff and maintaining and enhancing the extension network is critical to the Strategy's overall success will be a priority of the RCS.

8.2

Rigorous priorities

The priorities identified in the RCS (see Section 7) and its sub-strategies are based on the best available scientific, economic and sociological information. Our aim is to maximise the community return on investment. To do this, we need to invest in research and development, and to take appropriate steps to identify and manage risks.

8.3

Costs shared fairly

Cost-sharing is a key issue to be addressed by all sub-strategies. The region has well developed cost-sharing principles and arrangements that have been consistently applied to natural resource management programs. These principles will continue to be used to guide investment over the next five years. The principles are:

Local Area Planning – Community maps future

A community action plan (LAP) has been developed to address land and water issues in the Wyuna catchment. The Wyuna LAP was initiated by the Wyuna Landcare Group to identify and overcome land and water problems through community action.

The 20,000 ha catchment is bounded to the north by the Goulburn River extending to the boundaries of Kyabram and Merrigum and close to Echuca. There are more than 400 landholders, most of them dairy farmers.

Parliamentary Secretary to the Minister for Environment and Heritage, Dr Sharman Stone, launched the LAP at the Wyuna Reserve in July 2001. The event included a 'signing on', a symbolic gesture marking the commitment of all stakeholders to implementing the essence of the plan. Problems raised by the community that are to be addressed by the plan included dead and dying trees, rising watertables, increasing salinity, drainage, nutrient disposal, loss of native vegetation, land and soil degradation, flora and fauna protection, pest plants and animals, flooding and future economic viability.

A representative community planning group looked at these issues and outlined possible solutions and ways to overcome barriers that might stop works occurring. Proposals for future action fit in with Goulburn Broken RCS and identify the roles the community, landholders and government agencies will play.

The process identifies and engages natural resource issues and engaged the local community in developing recommendations for on-ground actions.

In the Cornella Catchment, where degradation of local waterways was identified as a major concern by the community, the GB CMA invested $400,000 in strategic waterway works to combat the decline.

The LAP process builds on the success of Landcare and fast tracks on-ground works by strengthening partnerships between the community, Goulburn Murray Landcare Network (GMLN), DPI, DSE and the GB CMA.

- **Duty of care** – natural resource users and managers have a duty of care to ensure that they do not damage the natural resource base. They are responsible for making good any damage incurred as a result of their actions.
- **Beneficiary pays** – when it is not possible to attribute damage, then primary beneficiaries should pay. Existing and future users are expected to pay for activities which provide private benefits. Contributions from secondary beneficiaries will be negotiated with the primary beneficiaries.
- **Government contributions for public benefit –** government contributes primarily for activities that produce public benefits. Governments may contribute to land and water management activities that have a private benefit, where the cumulative uptake of these activities provides significant public benefit and government support is required to facilitate this uptake.

The GB CMA has identified four groups of beneficiaries: the Federal, State and local governments (as representatives of the regional community) and the landholders. The CMA considers that the most appropriate policy is for the beneficiaries to share equally the 'Public' component of the costs. Landholders will continue to pay for the major proportion of the required farm activities.

In applying these principles, it is important that the final outcome is realistic and is administratively simple to implement.

8.4

Focus on the large scale

This is a relatively new way of thinking, evolving from the recognition that a Best Management Practices approach will not achieve the results we desire. The Key Drivers (see Section 3.1) highlight the need to take a 'big picture' approach to achieving the RCS outcomes.

8.5

Cultural heritage

In describing our social assets, it is clear that the region has a culturally diverse population. This diversity adds to the region's social assets and must be recognised in the way we do our business, including who we involve in Implementation Committees.

The GB CMA has embraced indigenous capacity building and cultural heritage issues over the past ten years.

Aboriginal Affairs Victoria (AAV) conducts cultural heritage assessments as an integral part of the surface water works program. AAV is a member of the region's Surface Water Management Working Group.

Training sessions have been held for departmental and GB CMA staff to improve the recognition of heritage sites. A locally prepared fact sheet has also been prepared containing locally relevant information about heritage sites.

The GB CMA commenced detailed negotiations with the indigenous community in 1999 and 2000 with the view to developing a Memorandum of Understanding within the SIR. Much work was carried out on the MOU, However this was unable to be finalized during the period of the Yorta Yorta Native Title Claim.

Cultural heritage and surface drainage

Construction of the region's surface drainage network pays particular attention to cultural heritage. Field surveys are undertaken as part of the program. These surveys have documented evidence of aboriginal occupation of the Goulburn and Campaspe River Basins, particularly where fresh water was readily available. A lack of adequate drainage following irrigation has lead to the deterioration of some of these heritage sites. The implementation of the surface drainage program will assist with the protection and enhancement of these archeological sites.

The GB CMA is currently exploring ways of further engaging and involving the traditional land owners in natural resource management in the catchment. A key area being investigated is the involvement of the traditional landholders in institutional arrangements for the Murray corridor. The GB CMA has made approaches to a variety of Indigenous and Koori organisations including the Koori Economic, Employment and Training Agency (KEETA); Yorta Yorta Nations, Bangerang Cultural Centre and the Taungurang Nation along with the DPI/DSE indigenous facilitators.

Funding has been made available to the GB CMA through the Victorian Catchment Management Council (VCMC) NHT Indigenous Protocols project. The GB CMA will employ this funding to initiate further discussions with the relevant indigenous groups and nations regarding engagement in land and water management at the GB CMA level.

The protocols for engagement facilitated by the VCMC and developed between the North Central CMA and Traditional Nation Groups in the North Central region are being used as a basis upon which to initiate discussions. The delivery of further financial support through the VCMC NHT project will be used to:

- Supplement travelling and meeting costs of various Indigenous groups and members at times and places convenient to them;
- Travelling and meeting with other organisations and community leaders who are actively engaging the Indigenous community to identify opportunities and investigate the most appropriate relationship between the GB CMA and the Koori Community;
- As appropriate, hold a roundtable meeting/forum to enable Traditional Owners and Indigenous community groups to express their views regarding involvement in natural resource planning, management and implementation activities across the catchment;
- As appropriate discuss the development of protocols or MOU's for engagement in NRM activities of Traditional Nations and Indigenous Communities within the Catchment.

8.6

Clear accountabilities

The Catchment governance framework has evolved over the past five years and the institutional arrangements have matured. To get the full benefit from this system the roles all stakeholders must be specified (See Table 2.1) and the information stakeholders need to make decisions must be readily available.

Accountabilities for Catchment management reach individual landholders where the community is increasingly expecting a 'duty of care' from those landholders to protect the natural resource assets.

8.7

Adaptive management systems

As we have stated earlier, many of our management actions rely on assumptions about their relationship to outcomes. Each sub-strategy will be required to make explicit the assumptions they have used, and these will be tested and modified over time.

Testing these assumptions requires a robust monitoring and evaluation framework (see Section 4) and the ability to undertake research and development to analyse and understand the trends identified by the monitoring.

8.7.1

Monitoring

The region has a good biophysical monitoring network, but this network requires constant review and refinement. As our understanding of the region's natural resource management challenges improves we must modify and expand the network where appropriate. Details of the monitoring requirements for each sub-strategy are contained within those sub-strategies (see Section 9). In some instances we will need to establish the monitoring framework, for example a monitoring framework for Biodiversity Assets in the catchment.

In other instances we will need to expand existing networks. The region is committed to meeting the reporting requirements of the NAP National Framework for Salinity and Water Quality and the MDBMC end of valley targets. To do this we require on-going reviews of the region's surface and groundwater monitoring network. The last review undertaken by SKM (2002) found:

- **Salinity** The sites at Goulburn weir and Casey's weir are suitable for monitoring End Of Valley salt loads required by the Murray Darling Basin Commission. The analysis of trends at Goulburn will be supported by results from stream salinity monitoring at Trawool.

- **Surface water** Stream salinity monitoring in the Catchment is adequate to describe the overall condition of the Catchment. There will be a need from time to time to enhance the network as our understanding of the salt accession processes improves.

- **Groundwater** A review of groundwater monitoring was carried out by Centre for Land Protection Research.* The recommendations of that review have been implemented. It will be important to improve the network in the vicinity of the Plains Upland interface to allow us to understand more clearly what is happening in this area and how the problem of dryland salinity is likely to express itself.

Over 2003, the CMA will coordinate the development of a Monitoring and Evaluation Strategy that will support the implementation of the RCS.

8.7.2

Research and development

A key theme emerging from the review and renewal of the Catchment strategy is the need for better information about the natural resource management challenges and better options for addressing these challenges. Detailed research and development needs have been identified in the sub-strategies.

We need to better understand the human systems that are integral to creating and managing these changes, in particular to understand and develop appropriate drivers for change, to develop appropriate policy mechanisms and institutional arrangements to support the change objectives, and to understand the impact of change management programs on land managers and communities.

We will continue to research the concept of 'ecosystem resilience' to help plan land use change. This includes consideration of future greenhouse impacts.

** Cheng 1999.*

What we will achieve: goals, targets and actions

The Strategy so far has described the types of works actions, capacity-building actions and decision-making processes needed to make the vision a reality.

But what levels of works action are needed? Our understanding of 'how much is enough' is far from complete and varies from issue to issue depending on the maturity of programs dealing with those issues. This RCS sets out the 'blueprint' for achieving the vision.

This section summarises the targets and lists examples of major actions of the sub-strategies. We have grouped the information according to the major regional assets of Water, Land and Biodiversity. This grouping is intended to standardise the format of the Goulburn Broken Regional Catchment Strategy to enable comparison with other regional catchment strategies.

But we must emphasise that a range of sub-strategies, investment plans and reports underpin the Regional Strategy. It is in these documents that the details of our programs can be found (see Table 9.1). These documents are located on the GB CMA's website (www.gbcma.vic.gov.au)

Our stand alone sub-strategies address either the threat, such as salinity and pest plants, or the asset that we want to protect, such as rivers and biodiversity (see Section 4 for discussion on asset based sub-strategies). They have their origins in long-standing natural resource management programs operating within the region. Sub-strategies are important because they help us to isolate issues in order to facilitate understanding and communication with the community.

Integrated Catchment management comes later, when the various approaches promoted by the issue-based documents are combined to ensure they are implemented efficiently and in a way that trade-offs and opportunities are identified to maximise the 'triple bottom line' from our investment.

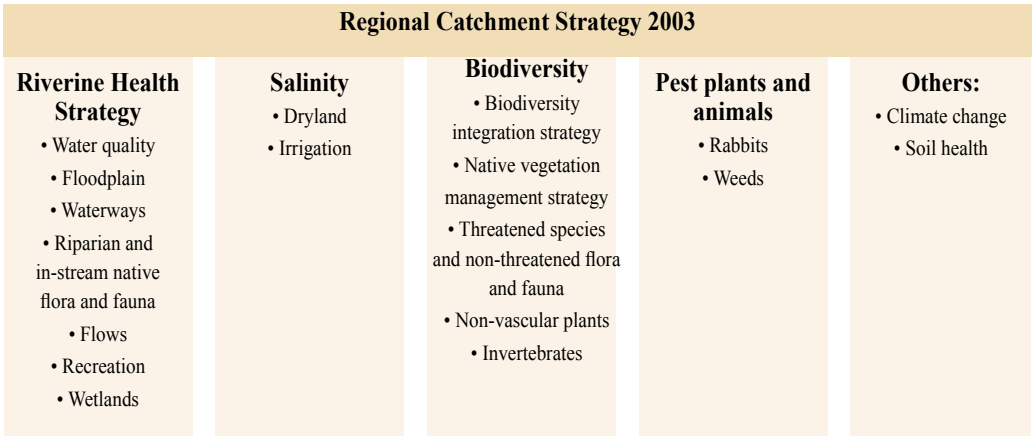
This section describes the region's:

- Aspirational or long-term resource condition target.
- Medium-term resource condition targets we are aiming to achieve over the next 10 to 30 years.
- Management actions (works and capacity building actions) that will be implemented over the next five to ten years to achieve the resource condition targets.

Preparing this section presented a number of challenges:

- The region is fortunate to have a strong and diverse background in natural resource management and is able to draw on much of the previous work to compile this Section. The plans and sub-strategies however cover different time periods. With irrigation salinity management for example, we are half-way through a 20-year implementation program while with biodiversity and riverine health we

Figure 9.1: Supporting sub-strategies and plans.

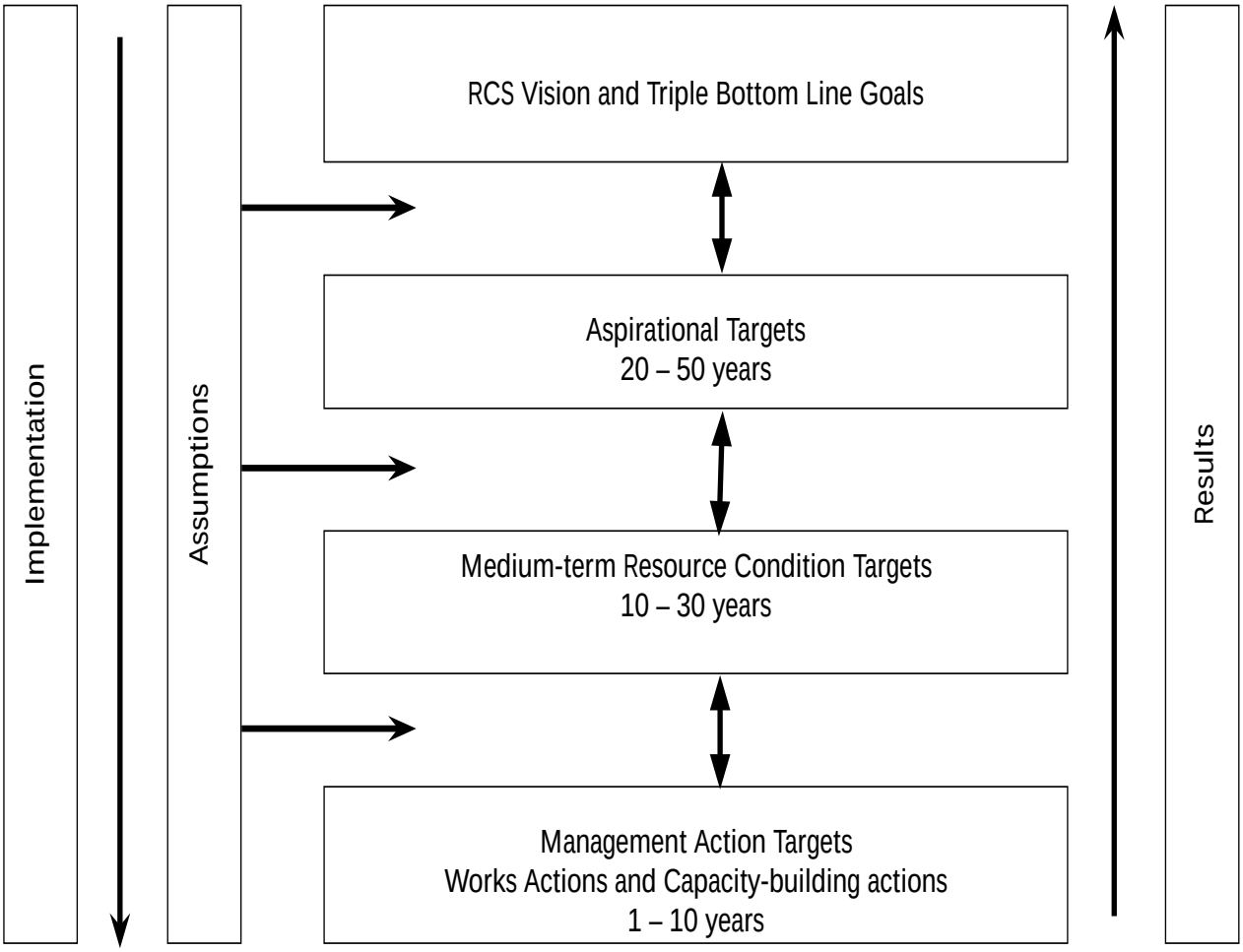


are just completing major sub-strategies. Consequently many of the major targets and actions of component documents outlined in this section have different contexts, terminology and time lines.

- While Section 8 lists general capacity building actions that apply to all issues, this section also contain capacity building actions that relate to specific resource condition targets.
- As we have emphasised throughout this RCS investment in many management actions produce benefits for both land, water and biodiversity assets (for example revegetation helps assist with biodiversity, land and water asset protection). Similarly addressing a particular threat (for example dryland salinity or pest plants and animals provides benefits for all assets). So allocating sub-strategies to the assets of land, water and biodiversity is problematic.
- The region has recognised this issue and has adopted a 'multiple-benefits' approach to planning and implementation at all scales. Investment levels are guided by the total benefits generated by a management action.

We will continue to refine our approach to integrated Catchment management with a greater emphasis over the next few years on Asset protection rather than threat abatement. Local Area Planning will continue to be a major tool for achieving community engagement drawing on local solutions to local issues. Other priority areas for action, that will have benefits to all assets, include: landscape and land use change; EPBC Act and what it means for the region; cultural and multicultural issues; environmental management systems; water rights and the farm dams legislation.

Figure 9.2: Targets hierarchy.



9.1

Water

The Goulburn Broken Riverine Health Strategy will be finalised in 2003. This is the first regional attempt to combine all elements of river management under one umbrella document. It considers water quality, flow, floodplain management, wetlands, instream and riparian flora and fauna, waterway management and implementation, fisheries and recreation. There have been different levels of investment in preparing targets for each of these issues and it is expected that several of them will change over the next few years.

A Vision for 'Healthy Rivers, Healthy Communities' was developed in 2003 by the community-based Goulburn Broken River Health and Water Quality Committee:

> 'Healthy rivers, streams, wetlands, floodplains and adjacent land that support a vibrant range and abundance of natural environments, provides water for human use, sustains our native flora and fauna and provides for our social, economic and cultural values.'

The Aspirational Targets will also be confirmed while developing the Riverine Health Strategy.

Notes for Table 9.1

* All Water Targets are Interim only and are expected to be finalised during development of the Goulburn Broken Riverine Health Strategy in 2003.

** Management of riparian vegetation contributes to broader native vegetation targets listed in Table 9.3.

*** Targets have not been set for nitrogen because preliminary investigations showed that nitrogen levels were not a major factor in triggering algal blooms. This will be reviewed by 2005. Turbidity and suspended particulate matter in aquatic environments are being investigated and targets will be developed by 2005.

**** Assume 1ML removed from a drain removes 0.6kg of phosphorous

^ Assumes land based use on tertiary treatment plants

Table 9.1 Water Targets

Aspirational Target	Resource Condition Target	Management Action Target
Maintain the condition of all reaches (benchmark 2003) of rivers and streams rated as 'good' or 'excellent'. Improve the overall condition (benchmark 2003) of rivers and streams rated as 'marginal', 'poor' and 'very poor' by 2050.	**In-stream and Riparian (see Riverine Health Strategy)** • Maintain condition of 1,400 km of streams at 2003 levels, as measured by ISC (riparian and channel form sub-indices). • Improve condition of 1,200 km of streams on 2003 levels by one ISC rating (riparian zone and channel form sub-indices) by 2013. • Improve 50 km of instream diversity and habitat values by 2013, as measured using ISC for improving habitat features. • Increase length of river accessible to native fish by 200 km by 2013. **Ecologically Healthy Rivers (see Riverine Health Strategy)** Maintain condition of Ecologically Healthy Rivers until at least 2013, as measured by ISC Improve condition of 6 rivers to ecologically health status by 2013, as measured by ISC. **Representative Rivers (see Riverine Health Strategy)** Maintain Representative River in Ecologically Healthy Condition until at least 2013, as measured by ISC. **Heritage Rivers (see Riverine Health Strategy)** Maintain condition of all Heritage Rivers (Goulburn, Big and Howqua) until at least 2013, as measured by ISC. **Rivers of Regional Significance - High Community Value River** Maintain condition of 10 km of high valued community rivers, as measured by ISC. **Public Frontages (see Riverine Health Strategy)** Improve quality of 40 km of Public Frontages by one category (using Vegetation Quality Assessment manual) by 2013.	• Manage stock grazing on 5,200 km of stream frontage by 2013 through protection of 2,800 km (fence) and protection/enhancment of 2.400 km (fence & plant). 2,600 km to be completed by 2007. • Manage 250 km of in-stream (waterway) and near stream (gully) erosion by 2012 with 125 km managed by 2007. • Manage 460 km of weed invasions in riparian and instream areas by 2013 with 150 km managed by 2007. • Improve river flows of 20 flow-stressed high value rivers and 5 other rivers by 2013 with 5 high value rivers and 1 other river completed by 2007. • Address terrestrial riparian habit loss by planting 2,000,000 native plants and revegetating 2400 km (1,200 ha) by 2013 with 600,000 plants planted by 2007 • Address in-stream habitat loss through modification of 45 fish barriers and establishing 100 km of Significantly • Enhanced Aquatic Refugia by 2013 with 30 km established by 2007. • Improve management arrangements on 40 km of stream and 120 sites of public land frontage. • Consolidate all riverine health issues through preparing Riverine Health Strategy. This includes aligning the target setting process with the National Framework and integrating the Wetland Strategy. • Develop 5 plans for riverine areas of high or significant social value. • Develop management plans for Representative Rivers. • Support investigations into institutional arrangements for the management of the River Murray corridor with an emphasis on involvement of indigenous peoples. • Negotiate caps and environmental flows for all rivers. • Determine the appropriateness of all major water storages, especially taking into account impacts on natural assets. • Increase number of people participating in river management programs by 20%. • Negotiate caps and environmental flows for all rivers. •Determine the appropriateness of all major water storages, especially taking into account impacts on natural assets.

Table 9.1 Water Targets (contd.)

Aspirational Target	Resource Condition Target	Management Action Target
	Wetlands (see Wetlands Strategy) Manage extent of all wetland types at 2003 levels where the extent (area and number) has declined since European settlement. Improve the condition of 70% of wetlands by 2030 using 2003 as the benchmark for condition.	Address wetland habitat loss by reestablishing 35 km of waterway floodplain linkages by 2013 with 1 wetland completed by 2007.
	Recreation (see Riverine Health Strategy) Riverine health will be maintained and enhanced when managing for recreation purposes.	Specific targets will be developed in 2003/04 as part of the completion of the Riverine Health Strategy. These targets will draw on the work of the *Upper Goulburn Catchment Recreational Waterway Strategy.*
	Flood control infrastructure (see Regional Floodplain Management Strategy) Generally assets will be maintained and enhanced when managing for flooding by preventing inappropriate flooding and capitalising on opportunities.	• Implement all programs outlined in the Region's Floodplain Management Strategy (July 2002) to ensure that the risk of damage to the region's assets are reduced. • Provide 1 in 20 year flood protection for 30 high value public assets such as bridges by 2013.
Improve and maintain water quality at optimum levels within and downstream of the Catchment for native ecosystems, recreation, human and animal consumption, agriculture and industry.	**Water Quality*** (see Water Quality Strategy)** Reduce potential phosphorus loads by 65% by 2016 by reducing phosphorus loads from: ♦ irrigation drains by 50%· **** (84.5 tonnes); ♦ dryland and diffuse sources by 20%· (22 tonne); ♦ wastewater management facilities by 80%; ♦ urban stormwater (9.84 tonnes); ♦ intensive agricultural industries and local water quality issues (3.5 tonnes).	• Manage nutrient rich and turbid water through 20 urban stormwater projects to be undertaken by 2016. 5 projects will be completed by 2007. • Investigate further waste water management projects to be undertaken. • Work with DPI and DSE to establish a framework for prioritising wetlands. • Continue to demonstrate how effective surface and sub-surface water management actions are in managing water quality. • Develop Best Management Practices for urban stormwater management. • Develop Best Management Practices for intensive agriculture & local water quality management. • Develop cost effective management practices to maintain water quality in streams to better understand nutrient cycling, particularly nitrogen and phosphorous in farming systems, and the processes by which these nutrients enter streams, become available to support algal growth and affect stream health. • Develop a model to understand nutrient movement at a catchment scale and link land management practices with end of valley targets for water quality. • Evaluate long-term sustainability of disposal of waste products from urban/industrial and irrigation drainage, particularly in relation to shallow watertable areas and nutrient/salinity loadings.

9.2

Land

The region's land resources are under threat from irrigation and dryland salinity, pest plants and animals and a decline in soil health.

Salinity represents the major threat. Target-setting for salinity is relatively well understood, reflecting the maturity of the salinity program including its multi-state, multi-institutional and project-oriented history. The refining of these targets is ongoing and there is currently considerable debate about the setting of End of Valley targets for the dryland areas.

We have listed our salinity targets under the Land asset group. However, this is problematic because resource condition targets are based on protecting two major assets from salinity: water (for consumptive and environmental benefits within the Catchment and downstream) and land (for habitat and other benefits, especially agriculture).

We are almost halfway through the irrigation and dryland salinity plans and progress has been excellent. In irrigation areas, we are largely on track but face major challenges over the next five years in dealing with salt disposal and addressing those areas where land protection options are limited. In dryland areas we now appreciate the challenge is even greater than first thought and we are re-adjusting our programs to conform to the expectations of the Murray Darling Basin Ministerial Council. Over the next five years we will improve our understanding of trade-offs required between protection of regional assets from salinity impacts and the Ministerial Council's aspiration for protection of downstream assets.

Attempts are being made to set extremely refined targets based on sub-Catchments or Ends of Valleys across the MDB. In this way the Murray Darling Basin Ministerial Council is establishing salinity targets for all the Catchments that make up the MDB. These targets have become necessary as new research has shown that the salinity contribution from dryland Catchments is much greater than initially thought.

The Ministerial Council uses Morgan in South Australia as the benchmark for salinity levels in the Murray River. To maintain future salinity levels at or below the World Health Organisation standard for salinity (800 EC), the Goulburn Broken Catchment needs to manage the projected increase in salt loads coming from the dryland areas. There is ongoing discussion about the appropriateness and feasibility of the targets set for our Catchment and the trade-offs required within the Catchment to meet these targets. The Ministerial Council will address this issue during 2003-04. Regardless of the outcome, it is clear that the region will need to significantly restrict salt export from the dryland areas.

Salinity levels flowing from the Catchment will be reduced to limits agreed by the community and the MDBC.

Under the terms of the MDB Salinity and Drainage Strategy, controlled salinity discharge from the Basin's irrigation areas is allowed in order to protect the land resource. The Shepparton Irrigation Region's community has developed its salinity management program within the constraints of salt disposal.

The region will continue to work with the Victorian Government to identify other salinity mitigation works that will enable an increase in the area of land protected within the irrigation area.

Salinity management plans are simple in their basic concept. There are only two primary activities – managing saline discharge and salt loads, and living with the consequences of not doing this with 100% efficiency. The first activity has historically attracted community support through Government investment and was the focus of the first 10 years of implementation of the *Goulburn Broken Dryland Salinity Management Plan 1990*.

The community refused to recognise the need to live with salt and was intent on implementing the Plan to control discharge through recharge management. The passing of time and, with it, improved knowledge have made it clear that we cannot reduce salt loads with 100% efficiency. 'Living with salt' is inevitable for large areas of the Catchment. Targets therefore must be built on deciding how much salt can be prevented from reaching the land and streams, based on what level of degradation the community is prepared to accept.

Major directions for salinity action include

- Accelerate Irrigation Region works program by 10%. (The estimated annual benefit of implementing the SIRCS is $92 million.)
- Increase dryland salinity works activities by 15% per year for 15 years. Increased private investment in partnership with plantation companies and their investors will be a major component of this increase.

Table 9.2 summarises the actions we will take over the next five years to enable us to achieve Land outcomes. These actions are examples of those expected to make the greatest difference. More specific information such as priorities and time frames for such actions are included in sub-strategies and/or annual business plans.

The text box below provides an illustration of the importance of assumptions in determining the management actions and the resource condition outcomes that we might expect. Details of assumptions used can be found in the sub-strategies.

Salt Disposal - an example of how Assumptions are Used to develop Management Action Targets

The Draft SIR Salinity Plan 1990 for disposal to achieve protection of assets within the SIR was 31.92 ECs. Since then changes in approach in the form of reuse of groundwater within the SIR and redesigning surface water management systems (shallower) has reduced this need by 13.52 EC and 1.7 EC respectively to 17.0 EC. The indicative allocation from the Victorian Government is 10.8 EC and agreement has yet to be reached on how the difference will be met. The confirmed allocations to 2002 is 4.9 EC. In calculating the salt disposal requirements we have made the following assumptions:

- We assume that saltloads are 6,000 tonnes/EC; depends on timing and salinity of water (derived from MDBC flow model).
- We estimate that Primary drains contribution is - 0.0022 x 362 km = 0.7964 EC; and community drains - 0.00024 x 2,102 km = 0.50488 EC.
- We estimate that Reuse System estimate that 5,600 systems x 10 ML x 10 uses = 566,600 ML/year @ 250 EC = 84,920 t/year = 14.1 EC.
- With respect to groundwater pumping we anticipate some water will be reused within regional channel and drain network or on individual farms. (Private use of new pumps 44,000 ML. 45,000 ML pre-existing pumped. Public use figure is 16,875 ML. (375 pumps pumping 4 months at 1 ML/day; 375 x 120 = 45,000 ML; 37.5% reused is 16,875 ML).
- Assumption: 64,000 ML @ 500 EC = 19,200 t/year = 3.2 EC (includes additional low flow and high flow diversion; still being assessed).
- Assumption: 60 pumps x 1 ML/day x 120 days x 6,000 ML/yr x 15,000 EC = 54,000 t/year = 9 EC.
- Surface water management removes excess rainfall run-off from irrigated lands. We assume 1 km of surface water management scheme protects 100 ha of land.
- Sub-surface management we estimate that 1 ML groundwater pumped protects 1 ha (applies to all specific actions listed except low capacity pumps and tile drains).
- In dryland areas we assume that 1 ha treated, on average, reduces saltloads by 0.23 tonnes.

Table 9.2 Land Targets

Aspirational Target	Resource Condition Target	Management Action Target
SHEPPARTON IRRIGATION REGION		
The natural resources of the SIR are being managed sustainably for current and future generations: • with abundant and well maintained environmental assets delivering a range of ecosystem services. • recognised locally and internationally for its high quality produce and • with enthusiastic and progressive community the is actively engaged in care of its natural resources. This requires protection of threatened assets within the 519,240 ha of SIR by reducing ground water accession, soil salinisation and waterlogging by 2020. This means protecting 286,000 ha[r] of land from surface water accessions by 2020.	Maintain increases to salinity levels of the River Murray at Morgan from the Shepparton Irrigation Region at or below 17.0 ECs by 2020.	• By 2007 complete regional surface water management of 2,102 km (2020 target 2.,464 km) Contribution to goal: 0.71 EC added by 2007 (1.3 EC by 2020) Program to comprise: ♦ Primary surface water management system: 251km by 2007 (362 km by 2020). ♦ Community surface water management system: 668 km by 2007 (2,102 km by 2020). • Develop a better understanding of the requirements for longer-term sustainability of groundwater pumping from shallow aquifers to mitigate deterioration of aquifer quality and soil health from increasing levels of salinity and sodicity. • Develop innovative and economic systems to manage saline drainage effluents without disposal to surface water systems. (Increasingly stringent requirements for maintenance of river health and restriction on Salt Disposal Entitlements place a high priority on this). • Identify spatial soil hydraulic properties to enable matching of irrigation to land capability.
	This means maintaining net saltloads below 102,000 tonnes/year from Shepparton Irrigation Region by 2020.	Water efficiency management comprising: • Regional channel distribution network (quantification in progress). • Adopt farm irrigation system 264,000 by 2007 (300,000ha by 2020). • Install farm resuse system: 4,980 systems by 2007 (5,660 systems by 2020): ♦ Contribution to goal: 12.4 ECs reduced by 2007 and 8.86 ECs by 2020. • Use groundwater : 74,575ML by 2007 (105,875ML by 2020): ♦ Contribution to goal: 3.47 EC reduced by 2007 (8.86 ECs reduced by 2020). • Divert drain water: 64,000ML by 2007: ♦ Contribution to goal: 3.2 ECs reduced by 2007.
		Evaporation basin disposal (rather than via regional surface water management system): 5,000 tonnes/year by 2007 (54,000 tonnes/year by 2020): ♦ Contribution to goal: 0.9 EC reduced by 2007 (9.0EC reduced by 2020).
	Salinity concentrations of River Murray resulting from groundwater disposal to be kept within acceptable limits by only disposing when flows are sufficiently high.	• Groundwater management, • Groundwater disposed via (regional surface water management systems): ♦ Contribution to goal 5.9 ECs added by 2007 (15.7 ECs by 2020).

Table 9.2 Land Targets (contd.)

Aspirational Target	Resource Condition Target	Management Action Target
	This also means keeping groundwater below 2m and remove saline water by consistently pumping groundwater over 216,000 ha of land.	Groundwater management: 91,234 ML/year by 2007 (216,000 ML/year by 2020): Contribution to goal: 91,234ha by 2007 (216,000 ha by 2020) • Operate existing pumps 45,000 ha • Install groundwater pumps - private 26,000 ha by 2007 (44,000 ha by 2020) • Install groundwater pumps - public 17,000 ha by 2007 (85,000 ha by 2020) • Install low capacity pumps and tile drains 3,234ha by 2007 (46,000 ha by 2020)
GOULBURN BROKEN DRYLAND		
The long term targets our our revised dryland salinity management plan are to: • deliver an integrated program to protect and enhance natural resources within the catchment. • develop a high level of community responsibility and accountability. • control land degradation and protect important terrestrial and aquatic assets. • maintain water quality for all beneficial uses, including agricultural, environmental, urban, industrial and recreational.	Maintain increase to salinity levels of the River Murray at Morgan from the Goulburn Broken Dryland at or below 1.3ECs by 2050. This means reducing saltloads by 34,000 tonnes per year by 2050 (below projected increase). Reduces increase in salinisation of dryland areas where possible. This means reducing area of dryland that would otherwise be salinised (in foothills and river valleys of highland areas): 1,500 ha by 2050. Manage salinised land and land with high watertables in the riverine plain ("Live with Salt"). This means managing salinised land in the riverine plain: 30,000 ha by 2100 and managing land with high watertables in the riverine plain 120,000ha by 2100.	Specific five year targets will be established during 2003-04 following completion of the Dryland Salinity sub-strategy. The targets will be based on: • Revegetation - establish high density trees or their equivalent over 148,000ha by 2050. • Identify key recharge areas in the dryland and understand the recharge mechanism at work as a basis for effective management approaches to control recharge and targeting sub-Catchments generating large salt loads. • Explore alternative salinity management measures to revegetation, in particular cost effective engineering approaches with appropriate management of the drainage waters. • Develop tools to aid integrated Catchment management planning across core issues of managing dryland salinity, preserving biodiversity, improving water quality and managing pest plants and animals. • Explore potential of Genetically Modified Organisms (GMOs) to improve the effectiveness of agronomic options and help develop plants that are productive, have high water-using characteristics and are acid tolerant. • Identify or develop high water using plants of agronomic potential. adapted to the acid soil conditions of much of the Catchment to develop dryland farming systems that use more water and reduce groundwater recharge. • Identify management actions for the foothills and river valleys of highland areas. • Develop and implement Local Area Plans in the riverine plains. • Adapt farming systems to changed conditions. • Develop high water using farming systems to slow onset of high watertable and salinisation across riverine plains.

Table 9.2 Land Targets (contd.)

Aspirational Target	Resource Condition Target	Management Action Target
SOIL HEALTH		
We will seek to maintain the capacity of region's soils to support human health and habitation and to contribute to enhanced water and air quality.	The focus on soil health over the next five years will be to manage Soil salinity (EC) and sodicity in irrigated regions, and Acidity (pH) soil structure and erosion in dryland regions. We will also seek to improve our understanding of soil biodiversity and its contribution to developing more resilient soils.	• Establish a monitoring program to identify the priority areas in the Catchment where erosion losses are greatest. • Incorporate soil native biodiversity into above-ground habitat restoration programs by using the variety of existing techniques for measuring activity in the soil. • Plan for land use change on sloped land that is currently cropped. • Investigate soil macro and microflora found in different soil types under a range of vegetation classes to develop a clearer understanding of biological processes that provide the dynamic nature of nutrient availability and structural stability to the soil. • Investigate new technologies to reduce the removal of vegetation cover in the form of stubble residues prior to sowing. • Develop a better understanding of the forgotten 'flora and fauna' (non-vascular plants, invertebrates and micro-organisms) including the relationship between above and below round native biodiversity.
PEST PLANTS AND ANIMALS		
Landowners will take responsibility for pest plant and animal management on their own land and prevent impact on neighbouring properties. Pest plants and animal populations will be decreased to levels acceptable to the community.	100% infestations of State Prohibited Weeds treated annually until eradicated. 100% known infestations of New and Emerging Weeds treated annually for containment/eradication 100% known satellite infestations of Regional Priority Weeds treated for containment or where possible, eradication. 95% infestations of Regional Priority Weeds in priority project areas treated for containment or where possible, eradication. 100% increase in area of the catchment declared "Rabbit Free" Reduction in impact of foxes and wild dogs on livestock industries and native fauna.	• Increase the level of Catchment Community responsibility for weed and rabbit control. • Develop a partnership approach to weed and rabbit management. • Ensure weed, rabbit, fox and wild dogs management works integrate with other natural resource management programs. • Align information from bioregional planning with pest plants and animals planning at a local area scale. • Use investment analysis and other tools to review the list of declared weeds. • Monitor and evaluate the effectiveness of weed and rabbit management in the region.

9.3

Biodiversity

Achieving our Biodiversity outcomes requires the successful implementation of not only biodiversity programs but also programs that support Land and Water outcomes. Salinity in the irrigation and dryland areas is a specific example of this. Salinity represents a major threat to terrestrial and aquatic biodiversity values.

The region has responded to this challenge by preparing the *Goulburn Broken Biodiversity Integration Strategy* (to be completed in 2003). This Strategy will contain targets for many components of biodiversity.

We have already taken major steps toward setting targets and monitoring progress for biodiversity. These are based on:

- The *Goulburn Broken Native Vegetation Strategy 2000* provides a details of what we need to achieve with respect to native vegetation for biodiversity purposes.
- Biodiversity Action Planning has commenced in the region and will dramatically improve priority setting for various biodiversity parameters over the next few years.
- A Biodiversity Mission Statement was developed in 1999 by the community-based Vegetation Plan Steering Committee. This Statement also serves as the Catchment's overarching long-term resource condition (aspirational) target (see Table 9.3).

Contributions to biodiversity targets come from many sources and we have only just begun to develop systems that can measure them. Sources include state and federal government funding for biodiversity and salinity, philanthropic funding, trusts, utilities and private landholders volunteering. The Biodiversity Integration Strategy and Annual Investment Plan will provide more details.

Table 9.3 describes our Biodiversity targets.

Table 9.3 Biodiversity Targets

Aspirational Target	Resource Condition	Management Action
'The community will work in partnership with Federal and State Governments and other agencies to protect and enhance ecological processes and genetic diversity to secure the future of native species of plants, animals and other organisms in the Catchment".	Native Vegetation Maintain extent of all native vegetation types at 1999 levels in keeping with the goal of 'net gain' listed in Victoria's Biodiversity Strategy 1997.	By 2007 maintain all of the 715,000 ha of 1999 native vegetation and 8,000 (162,000 by 2030) of 'new' (see third target) native vegetation.
	Improve the quality of 90% of existing (2003) native vegetation by 10% by 2030.	By 2007 protect 6,000 ha (118,00 ha by 2030) of remnant vegetation on private land.
	Increase the cover of all endangered and applicable vulnerable EVCs to at least 15% of their pre- European vegetation cover by 2030.	By 2007 plant, direct seed or naturally regenerate 8,000 ha (162,000 ha by 2030) of native vegetation.
	Threatened Species Increase 2002 conservation status of 80% threatened flora and 60% threatened fauna by 2030.	Implement relevant Action Statements and Recovery Plans.
		In addition to these specific management action targets the Biodiversity Intergation Strategy will be completed by the end of 2003 and will detail the range of management actions to achieve our biodiversity outcomes. The actions will include the following: • Refine the Native Vegetation Management Strategy's Nature Conservation Priority Action Zone map to include other biodiversity assets (as well as native vegetation), and the potential threat to those assets of rising watertables in the dryland. • Develop processes that ensures proponents manage risks to native biodiversity from intensification of agriculture to ensure 'net gain', consistent with 'Victoria's native vegetation management - a framework for action'. This could partly be achieved by educating landholders about the native biodiversity on their farm and the services provided. A suitable vehicle for this is Environmental Management Systems. • Identify and map extent of native grasses in the Catchment. • Capture opportunities for protecting and enhancing native biodiversity as land use continues to change from agricultural enterprises to less intensive uses over large areas, especially in the dryland. • Develop a better understanding of the forgotten 'flora and fauna' (non-vascular plants, invertebrates and micro-organisms) including the relationship between above and below ground native biodiversity. (contd.)

Table 9.3 Biodiversity Targets (contd.)

Aspirational Target	Resource Condition	Management Action
		• Encourage biodiversity to be included in Environmental Management Systems approaches that are being developed. • Expand coverage of Biodiversity Action Planning information so that it is available for decision-making at the farm, local and sub-catchment levels. • Include biodiversity information in Municipal Strategic Statements. • Assess opportunities for private industry, philanthropic trusts and other organisations such as 'Wetland Care Australia', Threatened Species Network, Field & Game Association to invest in the Catchment's biodiversity management priorities. • Develop and promote priorities derived from biodiversity action planning information in holistic local landscape plans such as Local Area Plans. • Develop a better understanding of the value of biodiversity assets so that market mechanisms can be used as a tool for delivering biodiversity outcomes.

9.4

Climate change

The region has opportunities to contribute to meeting Australia's greenhouse gas emission targets by investing in practices that reduce greenhouse emissions from our industries and by promoting the value of revegetation programs in providing carbon sequestration opportunities.

Table 9.4 Climate change (Air) Targets

Aspirational Target	Resource Condition Target	Management Action Target
Greenhouse emissions from the Catchment will be limited to nationally agreed levels.	Regional and sub-regional goals and targets will be determined.	• Identify and initiate programs to respond to the challenges presented by the increase in greenhouse gases and global warming. • Develop an understanding of the implications of climate change for Catchment's native biodiversity. • Build opportunities for enhancing native habitat into greenhouse gas abatement programs. • Identify the processes by which greenhouse gases are generated from irrigated production systems in the Catchment and evaluate the effectiveness of current recommended practices to mitigate the emissions.

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Mid-Goulburn Implementation Committee

- Goulburn Broken Dryland Salinity Management Plan 1990
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- Mid Goulburn and Broken Riverine Implementation Plan – July 1997
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Shepparton Irrigation Region Implementation Committee

- Shepparton Irrigation Region Land and Water Salinity Management Plan – Draft 1989
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- Shepparton Irrigation Region 2002 Farm Program Review
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Upper Goulburn Implementation Committee

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- Goulburn Broken Dryland Action Plan 1998-99 River and Water Quality Action Plan – 1998
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What the Catchment Community has achieved since 1997

The region's first RCS was completed in 1997. It identified the range of separate but inter-related natural resource management programs operating in the region and sought to add value by seeking integrated solutions that provided environmental as well as economic and social benefits.

The CMA commissioned a review of the implementation of the Strategy over the past five years. The details of that review can be found in the Goulburn Broken Regional Catchment Strategy 1997–2001 Achievement report.

A1.1

Goulburn Broken Irrigation Program

- Preparation of Whole Farm Plans is an indicator of progress by irrigators in adopting farm water use efficiency measures. Progress with Whole Farm Plan targets is ahead of schedule. Associated investment by irrigators in infrastructure to improve their irrigation efficiency is occurring at a similar rate.
- Surface and Sub-Surface Water Management Programs are critical to the future prosperity of the region. The Sub-Surface Water Management Program is now progressing ahead of schedule, but the Surface Water Management Program has dropped behind schedule.
- Government investment has been less than originally proposed. Sub-surface targets have been maintained by concentrating on the private pumping program. The surface program has constructed 173 km of primary and 317 km of community surface water management schemes to protect 45,000 ha and provide outfall for many future schemes.

Figure A1.1: Surface drainage progress.

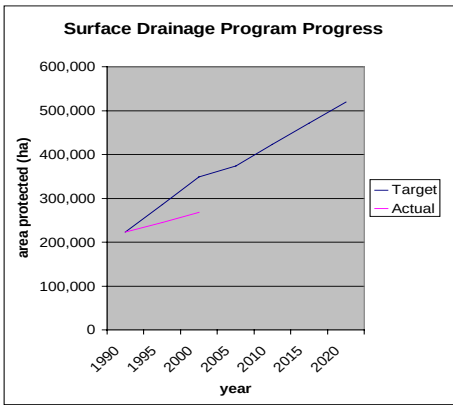


Figure A1.2: Whole farm plans.

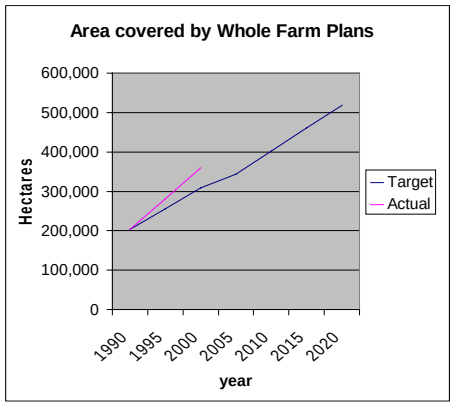


Figure A1.3: Sub-surface drainage.

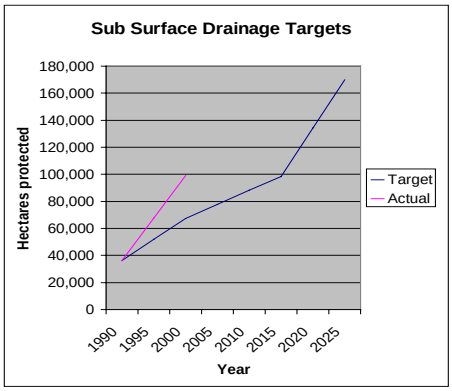
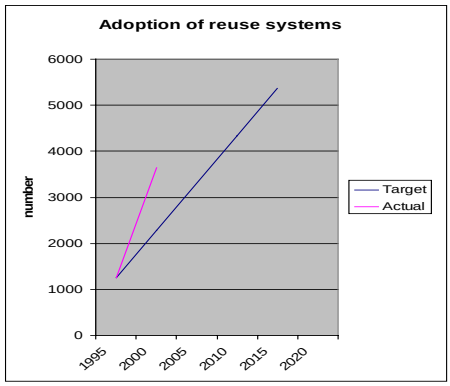


Figure A1.4: Adoption of reuse systems.

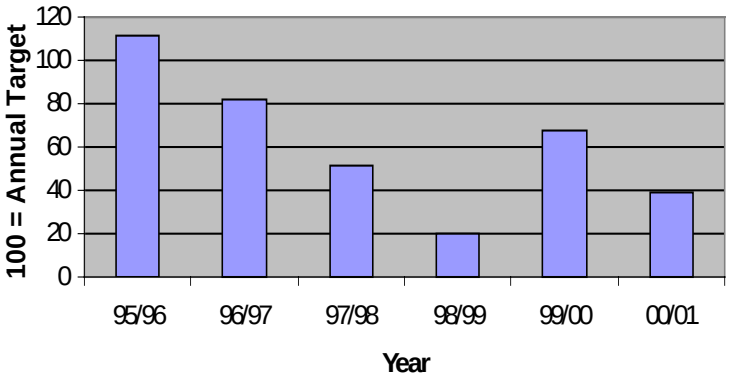


A1.2

Goulburn Broken Dryland Program

- Targets set by the Goulburn Broken Salinity Management Plan have driven the Dryland Program.
- That Plan calls for 1200 ha a year, over 50 years, to be addressed by increased revegetation, perennial pasture management or recharge control activities.
- Annual targets were met once in the past five years. Climatic factors have been a major influence on the rate of progress.
- The Implementation Committees have reviewed the process for allocating incentives to landholders and have developed an integrated Environmental Management Grants approach. There is emerging evidence that landholder demand has increased significantly, this is expected to be reflected in the 2001/02 figures.

Figure A1.5: Dryland Salinity Plan targets.



A1.3

River health and water quality

- Major gains in river management have been made since the CMA was set up in 1997. The bringing together of 'land' and 'water' organisations under one umbrella is resulting in works that have water quality, bed stabilisation and biodiversity benefits. The challenge of improving integration of programs at the strategic level remains.
- Water quality targets are being achieved. The rate of uptake of reuse systems in irrigation areas is ahead of schedule. The impact of this uptake is now being seen in the biophysical monitoring data showing a decline in the total P and N leaving the Catchment.
- Waterway Management Plans were developed for the lower Goulburn River in 1997 and a River Health Strategy for the Western Catchment in 2000. Local waterway management strategies for the Broken Creek, Boosey Creek and tributaries have been prepared and are being implemented.
- Implementation of the Mid Goulburn Broken Riverine Implementation Plan and Upper Goulburn Waterway Plan commenced.
- A Waterway Recreation Strategy has been prepared for the upper Goulburn Catchment.
- Major gains in integrating floodplain management needs into regional programs have been made. Decentralisation of floodplain management from Melbourne following the establishment of the CMA and significant advances in technology have helped make this possible. Flood monitoring, warning and emergency response systems have been improved and many flood studies, levee audits and flood protection schemes have been completed.

A1.4

Climate change

- Improved understanding of global warming and greenhouse processes has increased interest in revegetation programs providing carbon sequestration as well as biodiversity and salinity recharge benefits.

A1.5

Biodiversity

- The region prepared the Goulburn Broken Native Vegetation Management Strategy (2000) that identified regional native vegetation priorities in terms of Ecological Vegetation Classes (EVCs). This was first regional vegetation strategy to prepared in Victoria with resources made available by the State Government and the Land and Water Resources Research and Development Corporation.
- Achievement of the Strategy priorities has been driven by the resources made available under the Natural Heritage Trust (NHT) and by adjusting the revegetation actions promoted by the salinity management and water quality plans. A companion volume – Native Vegetation Retention Controls Draft Regional Guidelines, has also been prepared to ensure a more consistent approach to applying native vegetation retention controls by NRE and local government within the Catchment.
- The CMA partnered with VicRoads and the NRE during 1999-2000 in preparing Victoria's first approach to applying the principle of 'net gain' to projects involving removal of native vegetation.
- In 2000, the CMA adopted an Environmental Management Grants Framework as the basis for cost-sharing for revegetation and vegetation protection across all of its plans and programs. This innovative process allows for priority to be given to works that provide the greatest level of environmental, social and economic benefit. We are now recording all grants on the statewide Regional DataNet.
- In 2001, the Goulburn Broken Indigenous Seedbank was opened at the Dookie Campus of the University of Melbourne and a Goulburn Broken Revegetation Guide was produced.

Goulburn Broken Catchment Awards

- 2000 winner of the National Riverprize.
- 1995 SIR IC – BP Landcare Catchment Award for Victoria.
- 1998 Department of Natural Resources and Environment staff working on the program were runners up in the NRE Daniel McAlpine Award.
- SIR IC – Finalist in the community group section of the Banksia Awards.
- The Prime Minister Environment Award 2000 Community Leadership to Shepparton Implementation Committee.
- Banksia Land Bush and Waterways Management Category 2000.
- Superb Parrot Project 1999 Banksia Community Award.
- NRE Salinity Team staff SIR won Inaugural NRE 2001 Achievement Award for 'Diversity' for leading role in serving needs of multicultural communities in the region.
- Finalist in the Prime Minister's Environment Award in 2002 for rehabilitation of the Broken Creek System.

A1.6

Policy developments

The region has established a strong reputation for its influence over natural resource management policy development over the past five years.

A1.6.1

Focusing on assets

- The CMA has fostered – and in many cases pioneered – a shift towards focusing on assets in establishing priorities and works programs. This emphasis is demonstrated in the Goulburn Broken Weed Action Plan (2001) which lists environmental values as the number one criteria for prioritising areas. Major efforts have been made to develop sophisticated understanding of the effects of various threats and management options on assets through the Ecosystem Services Project (see previous section on 'Natural Assets'). The principles evolving from this project are flowing through all prioritisation processes.

A1.6.1

Water

- The Murray Darling Basin Ministerial Council introduced a cap on further diversions within the Murray Darling Basin. This is implemented in the region through bulk water entitlements for Goulburn-Murray Water and urban water authorities. In developing the bulk entitlement order, environmental needs of a number of the region's rivers were defined. The bulk entitlement process addressed these needs, either by making a specific environmental allocation, or by adjusting the operating rules associated with the bulk entitlement order.
- A program of four priority streamflow management plans was started in 1998/99. Consultative

Trout Cod project success

Works on the Sevens Creek near Euroa to support a population of the nationally endangered Trout Cod are nearing completion.

Representatives from the Threatened Species Network (TSN), which funds the project, recently visited the Goulburn Broken Catchment to see restoration works first hand.

One of the visitors, Julie Kirkwood, said members of the team were impressed with the quality of the habitat works and the knowledge and commitment of those involved in the project.

The TSN project, Aquatic habitat restoration for Trout Cod in the Sevens Creek, is co-ordinated by the Goulburn Broken CMA. The work, which will continue beyond the life of the TSN grant, involves enhancing, restoring and establishing preferred Trout Cod habitat conditions both in the waterway and riparian zone of the Sevens Creek, including working closely with adjacent land managers.

The creek contains one of the two remaining breeding populations of the Trout Cod (Maccullochella macquariensis). The other population is in the Murray River downstream of the Yarrawonga weir.

The Sevens Creeks works have been conducted at a stretch between Polly McQuinn's Reservoir and Gall's Gap Road, at Euroa. Snags, boulders, deep holes and undercut banks with overhanging vegetation are essential habitat features for Trout Cod, providing spawning sites, protection from predators and resting places.

Works undertaken in the Sevens Creek include placement of half logs to imitate snags and large boulders to encourage formation of scour pools; beaching (the placing of rocks in the stream bank to prevent erosion), lunker creation (wooden structures designed to imitate overhanging rocks or undercut banks) and the use of logs to maintain a narrow stream channel with deeper flow in the creek are also helping to recreate Trout Cod habitat.

The CMA has been working closely with the National Trout Cod Recovery Team in the design and development of the project. It has also been consulting with adjacent land managers to gain their support.

As part of the ongoing grant scheme funded by the CMA, land managers are encouraged to participate in protection of creek frontage through fencing, revegetation and the creation of off creek watering points.

Committees have now been established on the King Parrot Creek and Yea River and draft plans have been prepared. These plans are currently in the consultation phase.

- Stream Flow Management Plans are under way on Seven Creeks and the Delatite River.
- The region's bulk entitlement to water is coming under pressure from increased awareness of the environmental flow needs of the Murray River and the Snowy River.
- Water trading and the water market has steadily matured with volumes traded on the Northern Victorian Water Exchange reaching 60,000 ML in 2001/02. Following the run of dry years affecting the Goulburn system, sales on the temporary market reached a record of $250/ML in August 2002.
- A Groundwater Management Plan for the Shepparton Irrigation Region Groundwater Supply Protection Area was completed in 1997. The development of a Groundwater Management Plan for the Katunga Groundwater Supply Protection program is close to completion following the release of a draft report in March 2001.

A1.6.3

Pest management

The Region has been a key supporter of State Government pest plant and animal initiatives over the past five years.

The recently released Victorian Pest Management Framework provides clear policy and planning direction for current and future pest plant and animal strategies within Victoria. Within the framework, individual management strategies for weeds, rabbits and foxes have been developed. These strategies align closely with regional action plans.

- In 2001, the Goulburn Broken Region Weed Action Plan 2001–2005 was released to provide a more strategic approach to weed management across the Catchment. This plan clearly identifies the principles, priorities and objectives for weed management in the region over the next five years and supports a community approach to weed management, involving both private and public land managers. The plan focuses on weed management in the context of being one component of an integrated approach to total Catchment management that protects the region's economic, environmental and social assets.
- The release of the Rabbit Calicivirus Disease (RCD) into Victoria in 1997 provided the catalyst for a major increase in rabbit management programs. The disease has significantly reduced rabbit numbers across the Goulburn Broken Catchment, with the greatest impact in drier areas. To capitalise on the release of the RCD, the region has developed a detailed action plan for rabbit management (Rabbit Management Action Plan 2000 – 2005 – The Goulburn Broken Region).
- Regional action plans for foxes and wild dogs will also be developed over the next 12 months in the Goulburn Broken region to provide regional direction and priorities for the management of these pest animals.

A1.6.4

Landcare and community engagement

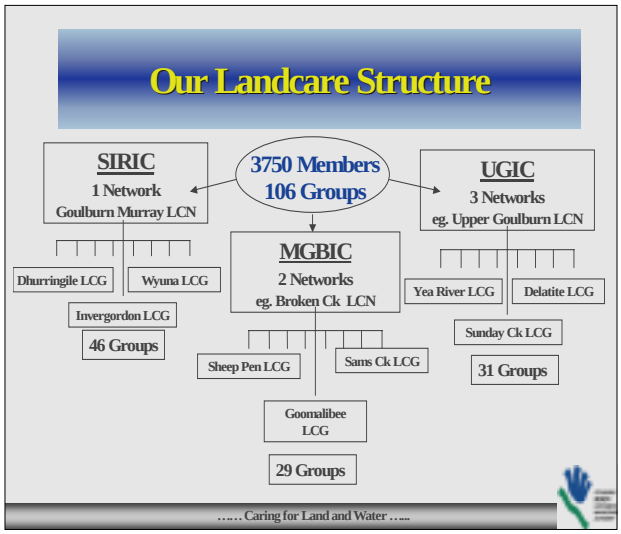
- The region was one of the first in Victoria to recognise the value of a regional approach to Landcare support. Six Landcare networks and 106 Landcare groups operate within the Catchment. Some 3,750 people are involved with Landcare groups. The CMA has worked towards reducing the administrative burden on Landcare groups. In 2000, the CMA piloted the development of a large integrated Natural Heritage Trust (NHT) bid for the region in place of the many smaller NHT applications prepared by individual groups.
- The region has pioneered the development of strong links between Landcare groups and networks and the establishment of regional priorities. Each of the CMA's Implementation Committees consults regularly with Landcare groups in its area on annual funding priorities.

A1.6.5

Integrated Catchment Management

- The CMA Board has established robust natural resource management planning and administrative processes. Underpinning this process were efforts by the Authority and ICs to develop integrated solutions that generate a wide range of social, economic and environmental benefits.
- For example, in the Irrigation Program nutrient and salinity management are closely integrated with biodiversity and economic outcomes. In the Dryland Program – native vegetation management, salinity management and water quality actions are integrated through the works and Environment and Waterway Management Grants Programs.
- The CMA and ICs have embraced an adaptive management approach and adjusted polices and programs to address new issues, technologies, changes in government funding and climatic factors.

Figure A1.1: Goulburn Broken Landcare Structure.



Developing the RCS – who we consulted

The review of the RCS and its sub-strategies commenced in 2000. Each sub-strategy developed specific consultation programs to ensure that relevant stakeholders were engaged. Twenty-five public meetings were held across the Catchment, with drafts of the sub-strategies being widely distributed.

In relation to this document, public consultation involved:

- three issues of the GBRCS newsletter circulated to more than 300 people;
- regional Stakeholder workshop to develop the Vision (March 2002);
- regional Local Government Workshop (August 2002);
- advertising the availability the draft RCS in all regional newspapers;
- three public meetings during the consultation phase;
- production of RCS summary brochure (distributed to over and consultation response form; and
- draft RCS and supporting sub-strategies being available on the CMA website (about 1,100 site visits during public consultation period)

The draft RCS was on public display from 1 September to 30 October. During this period, written responses were received from the following people and organisations:

Senator Lyn Allison, Australian Democrats
John Avard, Individual
Robert Boyack, Individual
Philip Clancy, Individual
Lesley Dalziel, Individual
Mary Donovan, Individual
Ann Fagan, NRE
Stephen Feiss, Individual
Brian Feldtmann, Individual
Denis Flett, Goulburn Murray Water
Megan Hawkes, NRE
Elita Humphries, EPA
Julie Kirkwood, Threatened Species Network
Gerard Mchugh, Individual
Hugh Meggitt, Victorian Trout Association
Mike Morris, NRE
Ray Nias, WWF
Menon Parameswanan, Individual
Matt Parsons, Murrindindi Shire
Phil Pearce, Shire Of Campaspe
Erin Reid, Goulburn Valley Environment Group Inc
Kevin Ritchie, NRE
Ann Roberts, NRE
Nick Roberts, Individual
Doug Robinson, Trust For Nature
Bill Slattery, NRE
Phil Stevenson, Mid Goulburn Implementation Committee
Richard Strates, Mitchell Shire Council
Craig Tuhan, Goulburn Murray Landcare Network
Faye Ure, Individual
Unnamed, Individual
Greg Wood, NRE

Description of some works actions

The list of works actions to be used to record progress and set targets will be decided in consultation with Catchment staff and funding bodies. The list presented here therefore does not represent all works actions and does not align exactly with the list presented in the section on actions. However, it does provide some useful information.

Stock grazing management. Fencing of rivers, streams, wetlands and remnant vegetation provides multiple benefits. Fencing controls stock access, allowing native vegetation to be regenerated and preventing erosion of riverbanks.

Local native revegetation. Planting of native vegetation, direct seeding or natural regeneration of trees shrubs or grasses helps control salinity, erosion and water quality as well as enhancing biodiversity assets.

Non-local species revegetation. Plantings of vegetation that is not indigenous to the local area also assists with salinity, erosion control and water quality outcomes, although the biodiversity benefits are often reduced. Plantings on a commercial scale provides regional development benefits.

Cropping and pasture management. Liming, minimum tillage, improved pasture management reduce recharge and help meet salinity and soil health objectives. These actions will be promoted through extension action and, if the level of public benefits from the works is significant, by providing financial incentives.

In-stream habitat management. Re-snagging rivers and constructing fish ways will significantly enhance aquatic biodiversity and riverine health goals. Our works program will involve the construction of 18 fish ladders by 2010.

Sediment stabilisation (waterways). This includes on-ground works that prevent soil erosion and sedimentation of streams. Creation of buffer strips, gully erosion control and other works lead to a reduction in sedimentation loads. These works will be promoted through extension and through the Environmental Management Grants.

Floodplain Management. Floodplain management involves a range of specific management activities that seek to levee and floodplain management. These activities involve levee maintenance, flood studies, advice to local government on land use on floodplains, emergency response planning, flood monitoring and community education.

Surface water management. The Surface Water Management program enables the removal of excess rainfall run-off from irrigated lands, provide and outfall for groundwater pumps, facilitate management and reduction of nutrients and create the opportunity to preserve and enhance wetlands and native vegetation. The program involves the construction of arterial and community drains. Construction of reuse systems is a central element of the salinity management and riverine health sub-strategies. Reuse systems collect surface run-off from irrigation bays and enable this water to be reused for irrigation. This reduces the salinity and nutrient loads in drainage water.

Sub-surface water management. The overall objective of the Sub-surface water management is to protect and reclaim land and water resources from salinisation where possible and justified. This is done predominantly in the irrigation areas through public and private groundwater pumping. There is scope to expand this program in the dryland areas.

Salt disposal. Salt interception schemes within the region will become an important tool for meeting the salt disposal limits set by the Murray Darling Basin Ministerial Council (through the Salinity and Drainage Strategy for the irrigation areas and the End of Valley targets for the dryland areas).

Weed control. Controlling weeds requires a combination of activities including spraying and other farm

management efforts. Emphasis will shift to controlling those pest plants that will have a significant impact on the region's assets if not controlled.

Pest animal control. Pest animals can also have a significant impact on the region's assets. Priority will be given to addressing those pest animals in locations where the impact is greatest.

Urban stormwater management. Development and implementation of urban stormwater plans has been a major activity by local government across the Catchment. The EPA and the CMA have supported this work. By 2007 all local governments will have stormwater management plans.

Sewage treatment. Development by urban water authorities of tertiary stage processing capacity of sewage has made a significant contribution to achieving the region's water quality goals. This program is nearing completion.

Water storage management. In the context of these management actions, 'water storage' relates to regulating water flow in rivers and streams for the numerous benefits provided, including water for consumptive uses and the environment. It is the responsibility of Goulburn-Murray Water to manage large storages, such as Lakes Hume, Eildon, Nillahcootie and Mokoan. It is becoming clear that benefits and risks vary considerably between storages. The viability of some storages, such as Lake Mokoan, is being closely looked at.

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Acknowledgements

Front cover painting "The River" by Rebecca Atkinson. Rebecca says: "The painting is about the bush, particularly the animals that live there. The story behind the painting is my interpretation of the way I see the bush."

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