



Riparian and In-stream Native Flora & Fauna

Background Paper for the Goulburn Broken Riverine Health Strategy



*Draft
August 2002*

1 Introduction

Why a Background Paper?

This Paper has been produced as a background paper to the Goulburn Broken Riverine Health Strategy and the Goulburn Broken Wetlands Strategy to ensure that all important strategic issues affecting riparian and in-stream native flora & fauna in the Goulburn Broken Catchment are addressed. It is intended to provide Goulburn Broken Catchment stakeholders with sufficient information to feel comfortable with (broad) strategic decisions affecting the region's riparian and aquatic flora and fauna.

What is riparian and instream native flora & fauna?

Rivers and their associated floodplains support a wide range of native flora and fauna, many of which are now rare or threatened. The distribution, abundance and health of these species and communities are closely associated with the condition of the riverine environment.

The Victorian River Health Strategy defines a river, stream or natural waterway as including:

- The channel
- The riparian zone, which includes the area of land that adjoins, regularly influences, or is influenced by the river.
- The regularly wetted floodplain and any associated floodplain wetlands.
- The estuary or terminal lake.

For the purposes of this discussion paper we define riparian and in-stream native flora and fauna as any flora and fauna associated with or wholly dependent on the river, stream or natural waterway environment.

It should be noted that some flora species may be found both in the riparian environment and in fully terrestrial environments (eg. River Red Gum) and some species of mobile fauna might also occupy riparian and terrestrial environments at different times (eg. Woodland birds). This background paper refers to those species and communities of both flora and fauna that spend some or all of their life cycle within the riparian environment, recognising that these species may also be considered in other strategies that focus on terrestrial environments.

2 Legislation and Policy

There are numerous federal, State and regional legislation and policies that relate to the protection and management of flora and fauna and their associated riparian and aquatic environments in Australia. The main legislation and policy are listed as follows:

Commonwealth Legislation

- *Environmental Protection and Biodiversity Conservation Act (1999)*
This Act promotes the conservation of biodiversity by providing strong protection for species, communities and protected areas. Actions that are likely to have significant impact on matters of national environmental significance are subject to a rigorous assessment and approval process. An action includes a project development, undertaking or an activity or series of activities. Matters of national environmental significance identified in the act relevant to wetlands of the Goulburn Broken include:
 - Ramsar Wetlands;
 - nationally threatened species and ecological communities; and
 - migratory species.

Victorian Legislation

- *Flora and Fauna Guarantee Act (1988) & Fisheries Act (1995)*
Provides a framework and management approach for the promotion and conservation of Victoria's biodiversity, the sustainable use of flora and fauna across the State and the management of potentially threatening processes.

Commonwealth Policies

- JAMBA (1974) and CAMBA (1986)
The Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) are bilateral agreements which expect actions from designated countries for the protection of migratory birds, birds in danger of extinction and their environments.
- Review of the National Strategy for the Conservation of Australia's Biological Diversity (2001)
The aim of this strategy is to bridge the gap between current activities and those measures necessary to ensure the effective identification, conservation and ecologically sustainable use of Australia's biological diversity. This strategy addresses conservation of biological diversity across Australia and its integration with natural resource management, through the management of threatening processes, improving existing knowledge, involving the community and ensuring linkages with international agreements.
- Convention on the Conservation of Migratory Species of Wild Animals (called the Bonn Convention).
- Asia-Pacific Migratory Waterbird Conservation Strategy (2001 – 2005)
- National Strategy for the Conservation of Australia's Biodiversity, 1996.

Basin Policy

- MDBC Draft Native Fish Strategy for the Murray-Darling Basin 2002-2012
The Draft Native Fish Strategy for the Murray-Darling Basin 2002-2012 has been released for public comment. According to the MDBC, 'this strategy seeks to initiate short, medium and long-term actions for rehabilitating native fish populations back to 60 percent of their estimated pre-European settlements levels after 50 years'.

Victorian Policies

- Victoria's Biodiversity Strategy (1987)
Outlines the importance of biodiversity in Victoria and has five main goals as follows:
 - To ensure there is a reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation leading to a net gain.
 - To ensure ecological processes and the biodiversity dependent upon terrestrial, freshwater and marine environments and maintained and where necessary restored.
 - The present diversity of species and ecological communities and their viability is maintained or improved across each bioregion.
 - There is no further preventable decline in the viability of any rare species or of any rare ecological community.
 - There is an increase in the viability of threatened species and the extent and quality of threatened ecological communities.

There are numerous other pieces of legislation and policy at regional, state and national levels that relate to the conservation of riparian and in-stream aquatic flora and fauna. Many of these relate to the management of the habitat that these species occupy and are listed in detail in the Goulburn Broken Riverine Health Strategy and the Goulburn Broken Wetlands Directions Paper.

3.1 Riparian & in-stream flora & fauna in the Goulburn Broken

A wide range of native flora and fauna that occur within the Goulburn Broken Catchment rely on aquatic habitats, either directly or indirectly. Some taxonomic groups such as fish require water throughout their life cycle, some may use aquatic areas for a specific stage of their life cycle (eg. birds or invertebrates), while others may require aquatic environments for resources such as food or as a corridor for movement. Many species of riparian and aquatic flora and fauna have declined considerably in the catchment and are recognised as threatened at the State or national level.

Figure 1 shows what proportion of the total number of Victorian Rare and Threatened Species (VROTS) that riparian and in-stream flora and fauna in the Goulburn Broken represent. Tables 1 and 2 show the number of each category of flora and fauna in the Goulburn Broken Catchment that are wholly or partly dependant on aquatic and riparian environments.

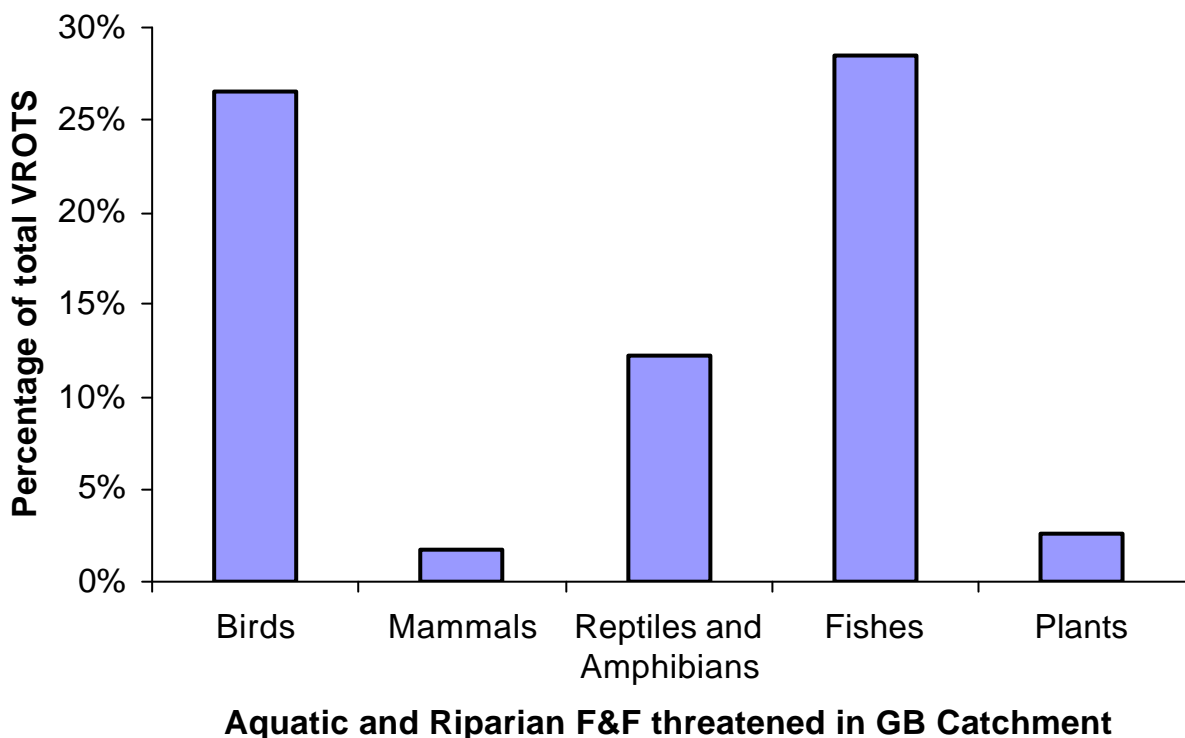


Figure 1 Proportion of VROTS that threatened riparian and in-stream flora and fauna in the Goulburn Broken represent.

Table 1. Vertebrate Fauna wholly or partly dependent on aquatic environments in the Goulburn Broken Catchment.

Fauna wholly or partly dependent on aquatic or riparian environments	Total	Threatened in Victoria	FFG / EPBC Listed	Total species in GB Catchment
Birds	85	25	6/0	281
Reptiles & Amphibians	23	7	3/2	81
Fish	18	11	8/3	18
Mammals	3 (+46 occasional)	1	0 (+7 occasional)	51
TOTAL	129 (+46)	44	17 (+7 occasional) / 5	431

Table 2 Flora found in riparian and in-stream environments in the Goulburn Broken Catchment

Habit	Number of Species	Threatened in Victoria	%
OLAC	1	1	100
OA	19	0	0
ROA	1	1	100
RWOA	1	1	100
RO	16	5	32
RWAMPH	3	2	67
RAMPH	8	4	50
AMPH	91	18	20
WAMPH	32	3	1
Alpine bog	16	4	25
TOTAL	188	39	21%

Descriptions for Habit acronyms for flora listed above:

OLAC	Obligate Lacustrine (found primarily on lakes edge)
OA	Obligate Aquatic (totally aquatic)
ROA	Riparian Obligate Aquatic
RWOA	Riparian Wetland Obligate Aquatic
RO	Riparian Obligate (always in riparian zone)
RWAMPH	Riparian Wetland Amphibious
RAMPH	Riparian Amphibious
AMPH	Amphibious (both in and out of water)
WAMPH	Wetland Amphibious
Alpine bog	May include sub-alpine bog

Birds

A total of 85 bird species which have some association with water have been recorded within the Goulburn-Broken CMA area, of which one the Mallard *Anas platyrhynchos* is introduced. Twenty-five of these species are recognised as threatened within Victoria including six which are listed under the *Flora and Fauna Guarantee Act 1988*. 89% of these birds are considered true waterbirds, with the remainder either being land birds found mainly in or near water or ones which rely heavily on aquatic habitats for resources such as food. Rivers and their banks are important habitats specifically for the Azure Kingfisher *Alcedo azurea*, the Darter *Anhinga melanogaster* and the Dusky Moorhen *Gallinula ventralis* (Richard Loyn, ARI, pers. comm.).

Fifteen species are listed on two international treaties, the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA). These include the following threatened species; Great Egret *Ardea alba*, the White-bellied Sea-eagle *Haliaeetus leucogaster*, the Glossy Ibis *Plegadis falcinellus*, Painted Snipe *Rostratula benghalensis* and the Caspian Tern *Sterna caspia*.

Reptiles and Amphibians

There are 23 species of reptiles and amphibians that are dependent upon aquatic environments within the Goulburn-Broken Catchment; the majority of which occur in both riverine and wetland environments. Seven of these species are categorised as threatened in Victoria including the Carpet Python *Morelia spilota metcalfei*, Giant Bullfrog *Limnodynastes interioris* and the Spotted Tree Frog *Litoria spenceri* which are listed under the *Flora and Fauna Guarantee Act 1988*. The Spotted Tree Frog and the Warty Bell Frog *Litoria raniformis* are also listed federally as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*.

Fish

There are 18 native and nine introduced fish species that occur within the Goulburn-Broken Catchment. Eight of the native species are protected under the *Flora and Fauna Guarantee Act 1988* including three species which are also protected federally under the *Environment Protection and Biodiversity Conservation Act 1999*.

Mammals

Only three species of mammal recorded within the Goulburn Broken Catchment are considered water dependent; the Water Rat *Hydromys chrysogaster*, Platypus *Ornithorhynchus anatinus* and Southern Myotis *Myotis macropus*. There are a further 28 species which may occasionally or regularly occur in riparian habitats. Southern Myotis, which is recognised as threatened in Victoria forages exclusively over water, preying on aquatic insects and small fish. While the species usually roosts in caves, it can use tree hollows including within large River Red Gums.

Invertebrates

There are a vast range of invertebrates that inhabit riverine environments in the Catchment and are likely to constitute the far majority of all animal species. However due to the limited number of invertebrate surveys we are unaware of the numbers of species associated with aquatic environments or in the catchment.

Flora Species

There are 188 species of native vascular plants variously dependent upon aquatic environments within the Goulburn-Broken Catchment. Thirty nine species (21%) are considered threatened. Seven of these are listed under the *Flora and Fauna Guarantee Act* 1988. Eight species (including four listed under the FFG) are also listed federally as threatened under the *Environment Protection and Biodiversity Conservation Act* 1999.

Amphibious species

Ninety one species of flora (48%) are regarded as amphibious. These species, although still dependent on water for much of their life cycle are capable of surviving dry periods. The typical substrate of amphibious species is mud. *Juncus ingens*, the rare *Rorippa eustylis* and endangered *Panicum queenslandicum* are restricted to riparian wetlands, whereas *Carex chlorantha*, *Cyperus bifax*, *C. victoriensis*, *Eulalia aurea* (all threatened) and *Cyperus difformis*, *C. pygmaeus*, *Myriophyllum papillosum* and *Schoenoplectus tabernaemontani*. occur in broader riparian habitats. Thirty two species (17%) are found only in wetlands. Representative genera include *Eleocharis*, *Marsilea* and *Ranunculus*. Twenty percent of amphibious species are threatened.

Non-amphibious species

The next largest group is those species that are found only in the aquatic environment (19 species, 10% of taxa). *Azolla*, *Lemna*, *Triglochin*, *Typha*, and *Vallisneria* are represented by more than one species. Interestingly, this is the only habit group that does not contain a threatened taxon.

Sixteen species are only found in the riparian zone. Half of these are trees and shrubs including the myrtaceous taxa *Callistemon sieberi*, *Eucalyptus crenulata* (nationally endangered), and *Leptospermum* spp., and *Acacia pendula* (endangered), *Lomatia myricoides* and *Rapanea howittiana*.

Three threatened species each had their own unique classification: *Melaleuca halmaturorum* ssp. *halmaturorum* (vulnerable) was restricted to lacustrine (lake) environments; *Hydrilla verticillata* (rare) was considered a riparian obligate aquatic, and *Brasenia schreberi* (nationally rare and endangered in Victoria) was designated as a riparian wetland obligate aquatic.

The final group of 16 species included those taxa restricted to alpine and sub-alpine bogs. *Baeckea*, *Juncus* and *Richea* are characteristic genera.

3.2 Habitat Value in the Catchment

There is approximately 10,000 km of rivers and streams and 1818 wetlands (> 1 hectare) encompassing eight bioregions in the Goulburn Broken catchment that provide habitat for riparian and in-stream native flora and fauna. Three of these rivers are classified as Heritage Rivers. The majority of our rivers are considered to be in moderate condition according to the Index of Stream Condition, 90% of our Crown Water Frontages vary from good to moderate to poor condition and we do not have a good understanding of the condition of our wetlands. Details on the habitat assets for riparian and in-stream flora and fauna are further discussed in detail in the Wetlands Directions Paper for the Goulburn Broken Catchment and the Goulburn Broken Riverine Health Strategy (in prep.).

3.3 Threats to riparian and instream native flora & fauna

The Goulburn Broken Catchment Management Strategy notes that major changes since settlement have resulted in many problems within our waterway environment. These include:

- Increased stream and gully erosion.
- Increased rate and incidence of bank erosion.
- Threats to public and private assets by stream damage.
- Decline in the quality of water.

- Loss of riparian vegetation and decline in stream frontage condition.
- Decline in the condition of aquatic and terrestrial habitat.
- Loss of connectedness between rivers and floodplains

Threatening Processes

Aquatic and riparian flora and fauna are currently influenced by a range of detrimental processes that affect habitat (both physical and biological environments) and have led to reductions in aquatic species diversity. There are numerous threatening processes that impact both directly and indirectly on the aquatic and riparian environment. The impacts of many activities can take a long time to become apparent and the ecological health of many rivers and streams may be declining as they continue to respond to past activities. A range of threatening processes has been formally recognised through State legislation (*Flora and Fauna Guarantee Act 1988*) and federally (*Environment Protection and Biodiversity Conservation Act 1999*). The major threatening activities in the Goulburn Broken are listed in Table 7. Although priority areas for some threats are easily recognisable further investigation is required to comprehensively identify priority areas for each threat within the Goulburn Broken Catchment.

Table 7. Major threatening activities that affect riparian and instream native flora & fauna

Threatening Activities	Likelihood	Consequence	Key Impacts / Consequence
Grazing Banks	H	H	- Reduced habitat value. - Fragmentation of habitat. - Reduced regeneration of flora. - Competition from weed invasion.
Landforming / Agricultural development / cultivation.	H	H	- Fragmentation of habitat. - Reduction in vegetation cover and reduced regeneration. - Weed invasion. - Poor water quality – habitat alteration.
Poor Land Management	M	M	- Salinisation of water environment. - Algal blooms leading to death. - Poor water quality altering habitat..
Recreation	M	L/M	- Loss of vegetation quality and quantity. - Impact on breeding species. - Removal of habitat (snag removal).
Timber Harvesting	M	M	- Loss of habitat (hollow bearing trees). - Altered flows changes available habitat.
Water Regulation	H	H	- Altered flow changes available habitat. - Altered temperature, cold water increases. - Barriers to species migration. - Altered habitat.
Introduced Flora & Fauna	H	H	- Loss of native species (predation and competition). - Reduced regeneration of flora. - Reduction in available habitat. - Spread of disease.

3.4 Identifying Assets and threats

There are several tools used in the catchment to identify riparian and in-stream flora and fauna assets and the threats that they face.

Bioregional Network Analysis

One of the important message that bioregions bring to CMAs is that species and communities should not always be viewed in terms of their status within a particular catchment. It must be recognised that management strategies undertaken within a catchment should always be compatible with the view of plans formulated at a bioregional level.

Within bioregions, threatened flora and fauna are divided into categories according to their bioregional status. Bioregional status for each taxon is determined via the following steps. The percentage of the Statewide population of the taxon which occurs within the bioregion is estimated, based upon distributional information on NRE flora and fauna databases. The percentage occurrence of the taxon within important land tenures in the bioregion is also estimated, based on local knowledge and expertise. A priority ranking (1, 2, 3 or 4) is allocated for each taxon on a particular land tenure. This is determined according to the importance of its contribution to the overall occurrence of the taxon within

the bioregion and the state. The occurrence of a taxon on a particular land tenure within a given bioregion is referred to as a parcel. Similarly, an estimate of risk ranking (A, B or C) is allocated to each parcel, based on the level of concern for the conservation status of the taxon on each land tenure within the bioregion and its estimated population trend.

Biodiversity Action Planning

The use of bioregional network analysis provides a useful tool for the development of priority areas for management of riparian and in-stream flora and fauna. Draft biodiversity action plans have been prepared for the Goulburn Broken Catchment, these plans collate data on key biodiversity assets and their conservation status and details in what land tenure they occur. Focal species and threatened ecosystems are used as the fundamental driver for prioritisation of areas for protection in the belief that these will act as surrogates for many of the species and biodiversity assets in an area. Part of this approach recognises that whilst specific requirements for many species of flora and fauna may be poorly understood, a tactic to deal with this is to recognise that groups of taxa are likely to have similar ecological requirements and to plan conservation activities around these.

RiVERS

The Goulburn Broken CMA are involved in developing a tool to assist in setting priorities for waterway management known as the River Values and Environmental Risk System (RiVERS). This tool stores information on environmental, social and economic assets of waterways and threats to the asset. Priority species (based on bioregional network analysis) and the threats that they face form part of this assessment tool for identifying priority areas for works. RiVERS is described in more detail in the Goulburn Broken Riverine Health Strategy.

4 Goals and targets: what do we want to achieve?

If we are going to manage riparian and in-stream native flora and fauna we need to set goals and agree to what the priorities for action are.

The overarching goal for riparian and in-stream aquatic and flora and fauna in the Goulburn Broken Catchment:

“Protect and restore aquatic habitat, ecosystem processes and the natural diversity of their native species and communities.”

Riparian and instream aquatic flora and fauna are closely associated with the health of the riverine environment. Goals for riparian and instream flora and fauna will therefore be likely to be achieved in parallel with the goals for riverine systems.

The Goulburn Broken Regional Catchment Strategy sets the context for the broader needs of the catchment through its vision and catchment standard practices. The Riverine Health Strategy will fit within the context of the Regional Catchment Strategy and reflect the broader needs of the catchment.

4.2 Biodiversity Context for Decision-making

Biodiversity Goal

The Goulburn Broken Biodiversity Committee developed the following goal (NAP "Aspirational Target") for native biota from its 1999 Mission and the Board adopted it as the catchment community's goal.

To protect and enhance ecological processes and genetic diversity to secure the future of native species of plants, animals and other organisms.

4.3 Resource Condition Targets for Riparian and Instream Native Flora and Fauna

The Goulburn Broken Riverine Health Strategy, the Goulburn Broken Wetlands Directions Paper and the Goulburn Broken Regional Native Vegetation Plan set broad resource condition targets for the catchment. No specific targets have been set for riparian and in-stream native flora and fauna as they are adequately addressed in the strategies and programs in the catchment.

4.4 Suggested management actions for riparian and in-stream flora and fauna.

In the preparation of the Native Aquatic and Riparian Flora and Fauna Resource Paper, Arthur Rylah Institute identified a series of major actions recommended for the catchment. These covered a range of management actions, both works and capacity building. Table 8 details a series of works and capacity building management activities currently underway to protect and enhance riparian and in-stream flora and fauna in the Goulburn Broken Catchment. This table includes the majority of those actions identified in ARI's Resource Paper. The four recommended actions that are not addressed under existing programs or strategies are listed at the end of this paper.

Table 8 Summary of existing programs and strategies to manage riparian and in-stream native flora and fauna in the Goulburn Broken Catchment.

Management Action	Existing program	Lead Implementation Agency	Example
Riparian			
Control grazing	<ul style="list-style-type: none"> • Crown Frontage Licences • WMIP (private land) 	<ul style="list-style-type: none"> • Land Victoria • Parks Victoria • GBCMA 	<p>Conditions on licences on timing and management of grazing.</p> <p>Fencing of water frontages to control intensity and timing of grazing.</p>
Prevent further clearing	<ul style="list-style-type: none"> • Native Vegetation Retention Controls 	<ul style="list-style-type: none"> • DNRE 	<p>Assessment of application to ensure compliance with NVR Controls ('net gain').</p>
Manage exotic flora and fauna..	<ul style="list-style-type: none"> • WMIP • Extension 	<ul style="list-style-type: none"> • GBCMA • DNRE • Landholders • DNRE 	<p>Willow removal programs.</p> <p>Fox baiting programs.</p> <p>Extension programs to educate landholders.</p>
Identify priority areas for protection of significant habitat (also applies to in-stream)	<ul style="list-style-type: none"> • WMIP • Biodiversity Action Plans 	<ul style="list-style-type: none"> • GBCMA • DNRE 	<p>Identify priority areas to waterway rehabilitation works and targeting with EMGs.</p>
Improve frontage condition	<ul style="list-style-type: none"> • WMIP • EMGs 	<ul style="list-style-type: none"> • GBCMA • DNRE 	<p>Incentives for enhancement plantings.</p>
Minimise recreational impacts.	<ul style="list-style-type: none"> • Recreation Strategy • Parks and Forests Rangers 	<ul style="list-style-type: none"> • GBCMA • DNRE & PV 	<p>Provision of designated recreational areas.</p>
In-stream			
Improve in-stream habitat	<ul style="list-style-type: none"> • WMIP 	<ul style="list-style-type: none"> • GBCMA • GMW 	<p>Construction of fishways on barriers to migration.</p> <p>Dismantling of redundant weirs.</p> <p>Resnagging.</p> <p>Revegetation where possible.</p>
Manage on-stream storages	<ul style="list-style-type: none"> • Bulk Water Entitlements Process • Environmental Flows 	<ul style="list-style-type: none"> • GMW • DNRE • DNRE? 	<p>Management of releases from major storages eg. Eildon.</p> <p>Provision of environmental water allocations.</p>
Stabilise channel	<ul style="list-style-type: none"> • WMIP 	<ul style="list-style-type: none"> • GBCMA 	<p>Bed and bank stabilisation works to reduce sediment input.</p>
Pest animal management	<ul style="list-style-type: none"> • Pest Plant and Animal Strategy 	<ul style="list-style-type: none"> • DNRE 	<p>Carp control.</p> <p>Fox eradication programs.</p>
Threatened species protection (also applies to riparian)	<ul style="list-style-type: none"> • Recovery Plans • Native Fish Management Strategy • Biodiversity Action Planning 	<ul style="list-style-type: none"> • DNRE • DNRE • GBCMA • DNRE 	<p>Specific management actions to conserve particular species eg. Trout Cod.</p> <p>Management of native species to ensure ongoing protection.</p> <p>Identification of priority species and priority sites for management.</p>
Catchment			
Improve cropping & pasture management	<ul style="list-style-type: none"> • SIRLWMP. • Dryland Salinity Management Plan. • Soil Health Strategy. 	<ul style="list-style-type: none"> • GBCMA 	<p>Management of gully erosion.</p> <p>Encouragement of EMS / WFP.</p> <p>Farm Program of SIRLWMP.</p> <p>Managing saline discharge and salt loads.</p>

Maintain natural flow paths	<ul style="list-style-type: none"> Floodplain Strategy 	<ul style="list-style-type: none"> GBCMA 	Management of levees and drainage to ensure positive impact on wetlands and riverine environment.
BMP in surface water management	<ul style="list-style-type: none"> SIRLWMP Floodplain Strategy 	<ul style="list-style-type: none"> GBCMA DNRE GMW GBCMA 	Water regime included in drain design. Retaining natural flow paths to provide watering regime.
BMP in sub-surface water management	<ul style="list-style-type: none"> SIRLWMP Dryland Salinity Plan 	<ul style="list-style-type: none"> GBCMA DNRE 	Wetland and riverine systems threatened by high water tables protected by installation of groundwater pump.
Urban stormwater management	<ul style="list-style-type: none"> Water Quality Strategy 	<ul style="list-style-type: none"> Municipalities 	Implementation of urban stormwater management plans to reduce nutrient / contaminant input into rivers and wetlands associated with urban runoff (eg. Cussens Park, Tatura)
Sewage treatment	<ul style="list-style-type: none"> Water Quality Strategy 	<ul style="list-style-type: none"> Rural Water Authorities 	Provision of habitat values in and around wastewater management facilities. Recognition of sites important for threatened species.
Intensive agriculture & local water quality management	<ul style="list-style-type: none"> Water Quality Strategy 	<ul style="list-style-type: none"> Industry EPA 	Containment of dairy / piggery effluent. Management of septic systems for containment of waste on-site.
Non-works Action Identify focal species and management actions.	<ul style="list-style-type: none"> Biodiversity Action Plans 	<ul style="list-style-type: none"> GBCMA DNRE 	Inclusion of aquatic and riparian species in biodiversity action planning process.
Management agreements	<ul style="list-style-type: none"> Native Vegetation Retention Controls. Forest Management Plans. 	<ul style="list-style-type: none"> DNRE 	Between relevant stakeholders to assign responsibility for management actions eg. maintenance of hollow bearing trees in timber harvesting activities, management conditions on Crown frontage licences.
Education.	<ul style="list-style-type: none"> Extension programs 	<ul style="list-style-type: none"> GBCMA DNRE 	Eduction on the importance of protecting and enhancing riparian and riverine environments, maintaining large woody debris, providing fish passage etc. Encourage landholder support for the protection and enhancement of water frontages. Education into the potential effects of uncontrolled recreational activities on riverine environments.
Improved knowledge (Research and Development)	<ul style="list-style-type: none"> Riverine Health Strategy. Native Vegetation Strategy. 	<ul style="list-style-type: none"> GBCMA DNRE 	Linkages with key research bodies to investigate issues and management options such as sedimentation, sand slugs, threatened species requirements, provision of artificial habitat eg. artificial macrophytes. Use of threatened EVCs, Heritage Rivers, Ecologically Healthy Rivers and ISC to develop targets for priority actions. Application of bioregional planning and focal species approach for identification and protection of priority areas.

The management actions outlined in Table 8 provide comprehensive coverage of recommended actions for the management of riparian and in-stream flora and fauna. Therefore at this stage there is no need to develop a separate strategy for protecting and managing riparian and in-stream native flora and fauna. Ongoing monitoring and evaluation is required to monitor the success of these strategies and programs.

Suggested specific actions to be incorporated into the Goulburn Broken Riverine Health strategy are as follows:

Suggested action	Key Responsibility
Investigate species specific effects of thermal pollution.	GB CMA
Identify further research areas for riparian and in-stream species.	GB CMA
Establish local management units for carp control.	GB CMA DNRE
Identify priority sites that are highly dependent on appropriate flooding regimes or specific watering requirements.	GB CMA

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