





# 2

## Protecting our Rivers and Aquifers

This chapter outlines the Government's action plan to protect and improve the health of rivers, estuaries and aquifers. The initiatives apply to the whole Central Region. Local actions are outlined in Chapter 4.

In protecting and improving the health of the region's rivers, it is essential to:

- preserve the environment's existing share of water
- use this existing water for the environment more efficiently
- increase the amount of water for the environment where it is not sufficient
- undertake complementary works (such as revegetation of the streamside zone) to maximise the river health benefits of increasing environmental flows
- manage the impacts of low inflows and climate change.

### Protecting our rivers

The Government is committed to improving the health of Victoria's rivers, floodplains and estuaries. These natural assets support industry, tourism and recreation, and are highly valued by people who live and work around them.

Protecting the health of our rivers ensures that the drinking water we extract from them is of a high quality.

Rivers are also highly significant ecosystems in their own right. They support a large number of native plant and animal species (many of which are threatened or endangered) and provide a range of ecosystem services (eg. purifying water by natural processes) that are only now starting to be recognised and valued.

There are many Aboriginal and other sites of significance associated with rivers and creeks. Aboriginal people have a strong social, cultural and spiritual connection to the land and water. This Strategy, together with the Regional River Health Strategies, will assist in ensuring that rich Aboriginal heritage values will be protected and interpreted to allow others to understand the Aboriginal communities' significant cultural connection between land and water. The Regional River Health Strategies, which are updated every four years, will be a key input into the Strategy reviews.

**Who:** Dept. of Sustainability and Environment  
**Timeframe:** Ongoing

### Action 2.1

In developing Regional River Health Strategies, the Government will engage Aboriginal communities to ensure that the strategies incorporate indigenous social, spiritual and customary objectives.



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**Figure 2.1 Importance of the pattern of flow to the health of a river**

Rivers have naturally variable flow regimes reflecting the rainfall and run-off within their catchments. This includes low flows during summer with small freshening flows occurring periodically and higher winter flows including bank-full flows and floods of adjacent land. Each of these components of the flow regime plays an important role in the ecology of the river. For example, high flows

stimulate fish breeding and maintain estuary openings. Similarly, groundwater can provide base flows in summer to maintain fish refuges. Floods in spring regenerate floodplains and wetlands, and replenish the river channel. Water extraction and diversions can change these crucial flow components with negative effects on the ecology of the system.



**Freshes**

Helps maintain or improve water quality



**Bankfull**

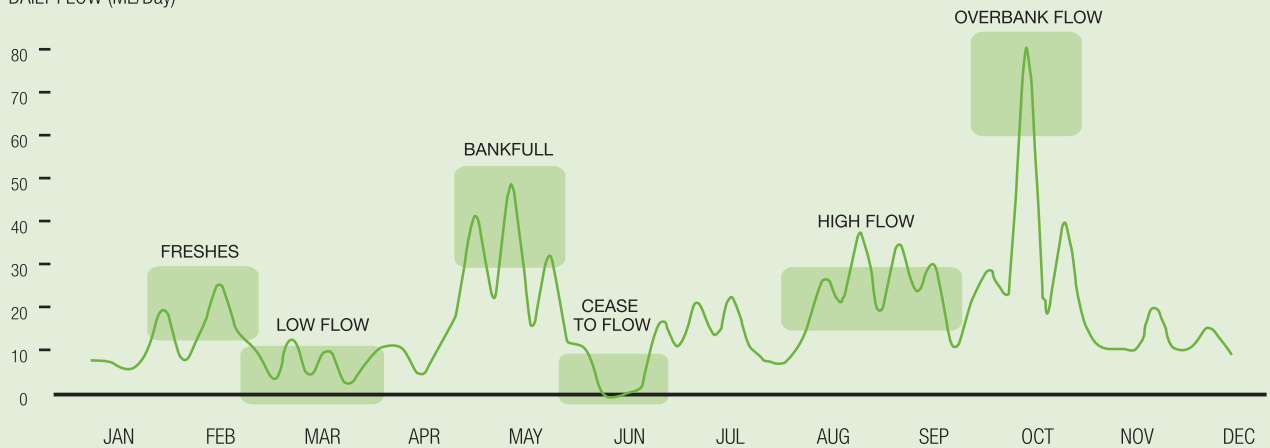
Helps with sediment movement and channel maintenance



**Overbank Flow**

Maintains floodplain and wetland connectivity

DAILY FLOW (ML/Day)



**Low Flow**

Connects in-stream habitats



**Cease to Flow**

Dries out habitats – important for some ecological processes



**High Flow**

Allows for fish migration





## Preserve existing water for the environment

In the past, there was no legal obligation to provide water to the environment. This has now changed. As foreshadowed in *Our Water Our Future*, the Government has introduced legislation that creates the environmental water reserve.

Water set aside in the environmental water reserve will:

- maintain the environmental values of the water system and the other water services that depend on environmental condition
- sustain biodiversity, ecological functioning and water quality
- have legal status and be held by the Crown.

The initial and increased environmental water reserve for each of the major rivers in the Central Region is outlined in Table 2.1. The remainder of the water in each of the rivers is extracted for consumptive purposes – for use by people, industry and agriculture.

Who: Dept. of Sustainability and Environment  
Timeframe: Ongoing

## Action 2.2

The Government has established the environmental water reserve for each river in the Central Region.

The amount of environmental water reserve for each river is set out in columns B and C of Table 2.1. It is expressed as a long-term average calculated by benchmark computer models held by the Government. These estimates may change as the computer models are refined.

Protocols will be established for amending the benchmark models and recalculating the estimate of the environmental water reserve.

**Table 2.1 Summary of the initial and enhanced environmental water reserves (EWR)<sup>(1, 6 & 7)</sup>**

	A	B	C	D	E	F	G	H	I
River	Total resource (ML/year)	EWR (ML/year)	EWR (% of total resource)	Addition to EWR (ML/year)	Total EWR (ML/year)	Total EWR (% of total resource)	Estimated addition to EWR required to meet scientific study recommendations (ML/year)	Estimated EWR required to meet scientific recommendations (ML/year)	Estimated EWR required to meet scientific study recommendations (% of total resource)
			B/A		B + D	E / A		B + G	H / A
Yarra	1,054,000	577,000	55%	20,000	597,000	57%	20,000	597,000	57%
Werribee	102,000	59,000	58%	6,000	65,000	64%	14,500	73,500	72%
Maribyrnong	113,000	95,000	84%	3,000	98,000	87%	6,900	101,900	90%
Bunyip/Tarago	148,000	112,000	76%	3,000	115,000	78%	To be determined	–	–
Latrobe <sup>3</sup>	875,000	639,000	73%	10,000	649,000	74%	To be confirmed	–	–
Thomson/Macalister	873,000	440,000	50%	15,000	455,000	52%	47,000	487,000	56%
Barwon/Leigh	360,000	305,000	85%	4,700	309,700	86%	4,700	309,700	86%
Moorabool	97,000	54,000	56%	6,000	60,000	62%	20,000	74,000	76%
Gellibrand <sup>5</sup>	295,000	266,000	90%	–	266,000	90%	–	266,000	90%
Total	3,917,000	2,546,000	65%	66,000 <sup>4</sup>	2,612,000	67%	113,000	2,659,000	68%

<sup>1</sup> These estimates are on the basis of the full use of entitlements and are long-term average flows.

<sup>2</sup> Approximation only assuming current operating and harvesting rules remain unchanged. It is subject to further refinement over time as our understanding of delivering EWR improves.

<sup>3</sup> To be confirmed on completion of 7-year detailed study.

<sup>4</sup> The total has been adjusted to avoid double counting of flows which benefit both the Barwon/Leigh and Moorabool systems.

<sup>5</sup> Interim EWR to be confirmed as part of government decision on the possible development of the Newlingrook groundwater resource including possible surface water interactions.

<sup>6</sup> Flows over the last 10 years have been significantly less than long-term averages. Under these circumstances the environment gets a smaller proportion. In some systems, the volume available is less than that recommended in Column G.

<sup>7</sup> The difference between Column A and Column E is the long-term average volume of water that is allocated for consumptive use. In dry years only a portion of this volume is available.

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**Who:** Dept. of Sustainability and Environment  
**Timeframe:** Ongoing

## Action 2.3

The Government will undertake annual compliance reporting of the volume and percentage of flow for the environmental water reserves through the State Water Report.

To protect the flows of the region's rivers, the Government will issue new entitlements or licences to extract additional water from rivers only if river health is protected. The results of the scientific flow studies will be used to inform these decisions. This will ensure that rivers such as the Gellibrand River remain in good condition.

**Who:** Dept. of Sustainability and Environment  
**Timeframe:** Ongoing

## Action 2.4

The Government will issue new entitlements or licences to extract additional water from rivers only if river health is protected.

**Who:** Dept. of Sustainability and Environment  
**Timeframe:** Ongoing

## Action 2.5

The Government will undertake further work on documenting the volume and use, and understanding the impacts and ways of mitigating impacts of small catchment dams. This is a priority for the Maribyrnong, Barwon and Moorabool catchments. This work will be completed in consultation with affected communities.

In order to avoid and mitigate the adverse impacts of land use change on river flows, the Government has introduced amendments to the *Water Act 1989* to enable a 15-year review process, which will include a review of the impacts of land use change on water users and the environment. Disproportionate impacts of these activities on water users and the environment can be adjusted through this process.

As discussed in Chapter 1, increases in the number of small catchment dams could have a considerable impact on water resources. Small catchment dams include dams for aesthetic or stock and domestic purposes, which are not subject to licensing. In most areas of Victoria the volume able to be captured in these dams is relatively small compared with other consumptive users. However, this is not the case in the Maribyrnong and Barwon systems, where these dams account for about half the water for consumption, and to a lesser degree in the Moorabool system. This affects all other users and the environment. With climate change, this impact worsens, particularly for the environment.

As rainfall is reduced and the total amount of water available decreases as a result of climate change, small catchment dams will divert a progressively larger proportion of this water by capturing run-off before it flows into rivers. The Government considers it of great importance to avoid and mitigate the potential adverse impacts of these small catchment dams and other land use changes.

The Government currently does not propose any changes to the *Water Act 1989* in relation to the existing Statewide controls on catchment dams.



### Use existing environmental water efficiently

The health of rivers depends on the pattern of water flow, not just the volume of water. Rules for operating reservoirs and harvesting from rivers have been developed and refined over many years to meet people's needs. There is scope to ensure these rules also meet environmental needs by using water available to the environment more efficiently – perhaps by releasing it in a pattern that better meets environmental needs.

**Who:** Dept. of Sustainability and Environment, water authorities and catchment management authorities

**Timeframe:** Until 2015

### Action 2.6

To use the environmental water reserve more efficiently, current operating rules and harvesting rules will be reviewed to store and release environmental water in a pattern that better meets the needs of the environment without significantly affecting other users.

### Increase the environmental water reserve

It is important that rivers have sufficient flow to sustain plant, fish and animal populations and to help flush out pollutants and maintain water quality.

Scientific studies have been completed for all key rivers in the Central Region, except the Tarago River and Gellibrand River, which will be completed by late 2006. The flows required to maintain and, where necessary, improve environmental values have been determined by independent scientists. Table 2.1 (on page 22) provides estimates of the environmental water shortfall (Column G) and the additional water provided through this Strategy (Column D) to help in meeting the environmental flow recommendations for each river. These have been calculated assuming full use of consumptive entitlements and current operating and water harvesting rules.

**Who:** Dept. of Sustainability and Environment

**Timeframe:** Ongoing

### Action 2.7

The Government will increase the environmental water reserves of rivers in the Central Region by a total of 66,000 ML by 2015 (as set out in column D of Table 2.1).

The health of all rivers in the Central Region will be monitored to determine whether key environmental values are sustained and whether further action is needed.

Given the high level of consumptive use in the Central Region, the Government does not believe it is practically possible to return these river systems to a pristine condition. Instead, it will begin a long-term plan to return enough water to meet river health targets for each system. Environmental flows will be improved as much as possible now, in order to sustain key ecological values while minimising impact on existing users. Further water will be returned if needed over time as it becomes available through the uptake of new water efficient technology and consistent with community expectations during future reviews of this Sustainable Water Strategy.

Figure 2.2 summarises the volume and actions to increase the environmental flows for major rivers in the Central Region by 2015. Details are also provided in Chapter 4.

It is very difficult to return water to over-allocated rivers without significantly affecting existing users. In response to these difficulties, the Victorian Water Trust has developed, and allocated \$2 million to a Water Swap pilot program. Through Water Swap, the Government will provide up-front funding for initiatives such as works to improve on-farm efficiency, in return for the landholder providing a volume of saved water to the environment. This pilot program provides a significant pathway for providing additional flows in over-allocated river systems.

**Who:** Dept. of Sustainability and Environment

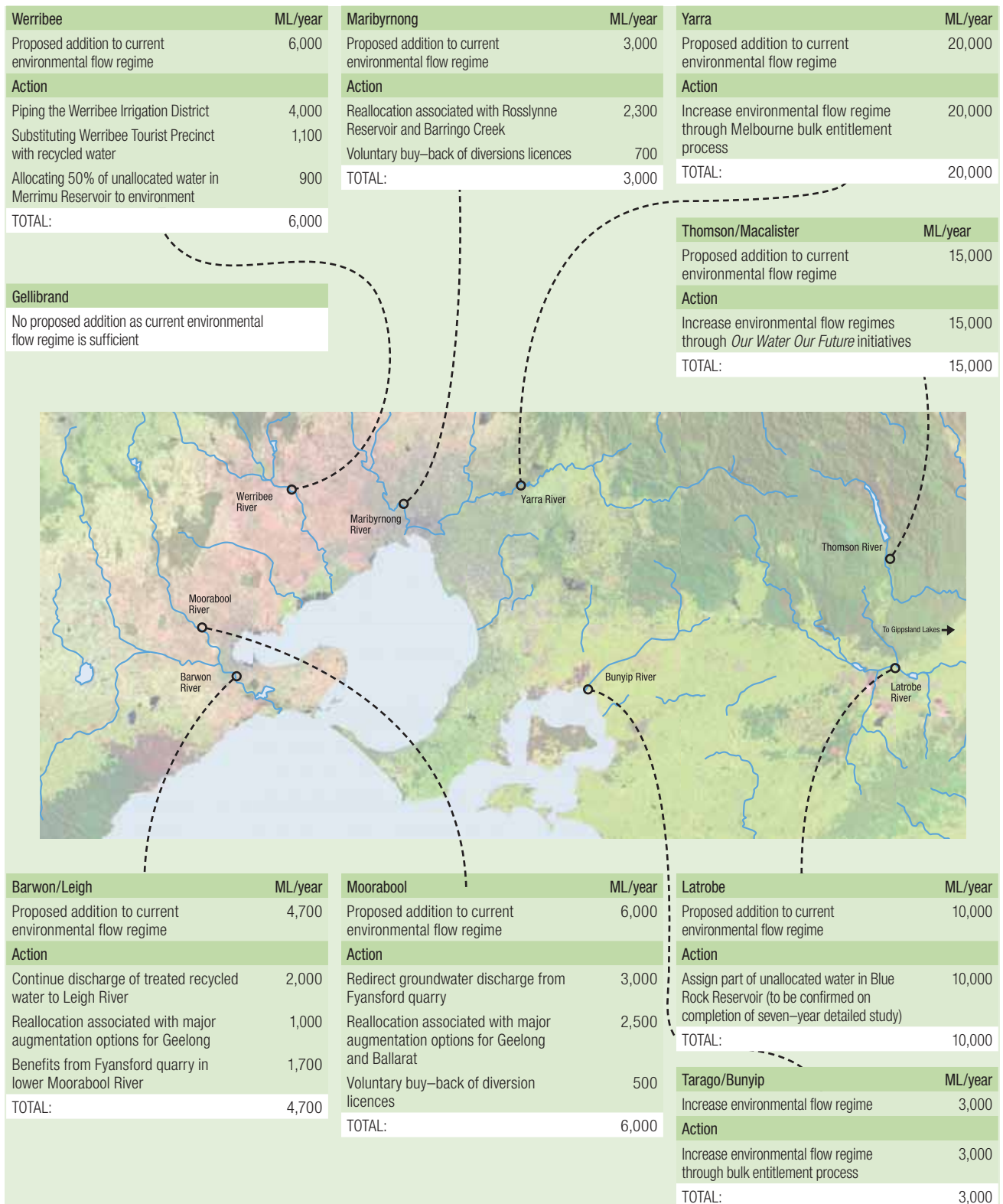
**Timeframe:** 2007 – 2009

### Action 2.8

The Government will pilot the Water Swap program where upfront funding is provided to improve on-farm efficiencies in return for landholders providing a volume of saved water to the environment.

# 2

Figure 2.2 Map of needs and additions to environmental water reserves by 2015 for major rivers in the Central Region





## Long-term water recovery options for the environment

There are a number of rivers where it was not possible to meet the scientific flow recommendations in this iteration of the Strategy. During the seven-year life of the Strategy, further water recovery options will

be investigated to enable the Government to meet the environmental flow requirements of all rivers of the Central Region in subsequent Sustainable Water Strategies. These are outlined in Table 2.2.

**Table 2.2 Possible future water recovery options for the environment**

RIVER AND OPTIONS	VOLUME
<b>Moorabool River</b>	
Further transfer to the environment of part of the entitlements of Barwon Water and/or Central Highlands Water in the west and lower Moorabool catchments (assumes Geelong and/or Ballarat have suitable replacement supplies, for example from the Newlingbrook or Waranga connections)	5,000 ML
Transfer to the environment of part of Barwon Water's entitlement in the west and lower Moorabool catchments (assumes Geelong has suitable replacement supplies via augmentation of supply from Jan Juc aquifer)	2,500 ML
Transfer to the environment of part of Central Highlands Water's entitlement in the west and lower Moorabool catchments (assumes Ballarat has suitable replacement supplies due to the substitution of river water with treated recycled water from the Ballarat South Treatment Plant)	4,500 ML
Transfer part of Barwon Water's water entitlement in the west and lower Moorabool catchments to the environment (assumes Geelong has suitable replacement supplies due to the substitution of river water with treated recycled water from the Black Rock Treatment Plant)	2,000 ML
<b>Werribee River</b>	
Transfer of water currently used in the Bacchus Marsh Irrigation District to the Werribee River (assumes Bacchus Marsh irrigators have suitable replacement supplies which are of sufficient quality and cost to enable the substitution of river water with recycled water)	4,000 ML
Transfer of water currently used in the Werribee Irrigation District to the Werribee River (assumes Werribee irrigators have suitable replacement supplies due to the substitution of river water with treated recycled water from the Western Treatment Plant)	8,000 ML
Voluntary buy-back scheme for regulated diversion licences and transfer of the water as an environmental entitlement for the Werribee River	1,000 ML
<b>Maribyrnong River</b>	
Voluntary buy-back scheme for regulated diversion licences and transfer of the water as an environmental entitlement for the Maribyrnong River	500 ML
Transfer of Keilor irrigator entitlements (assumes substitution with urban stormwater or recycled water for irrigation)	800 ML
Further transfer of Western Water entitlement (assumes additional water secured from the Melbourne system for Western Water to pump to Sunbury)	2600 ML
<b>Latrobe River</b>	
Transfer of some or all of the unallocated entitlement in Blue Rock Reservoir as an environmental entitlement for the Latrobe River (assumes sufficient urban supplies provided by the Eastern Water Recycling Proposal)	31,000 ML
<b>Thomson/Macalister</b>	
Further transfer of water from the Macalister Irrigation District to the Thomson/Macalister rivers (assumes further water efficiency savings created in the MID through channel automation technology)	22,000 ML
Voluntary buy-back scheme for regulated diversion licences and transfer the water to an environmental entitlement for the Thomson/Macalister Rivers	1,000 ML
Transfer of water freed up by the substitution of river water with recycled water from the Eastern Water Recycling Proposal (or alternative recycling initiative from the Eastern Treatment Plant)	10,000 ML



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## Complementary environmental works

Providing adequate environmental flows for rivers is a key requirement for maintaining their health. Others include protecting or restoring habitat and water quality. Complementary works to protect these and other aspects of river health maximise the benefits of the environmental flow regime.

Amongst the most significant complementary works that can be undertaken is the management of stream frontages. The catchment management authorities' and Melbourne Water's stream frontage management programs provide funding for landowners to protect rural riverbanks by fencing out cattle, removing weeds and revegetating with native plants. Programs such as these have significant river health benefits, and they will be very important in meeting the needs of rivers over the next 50 years.

**Who:** Dept. of Sustainability and Environment, Melbourne Water and catchment management authorities

**Timeframe:** 2007 – 2008

### Action 2.9

The Government will evaluate the effectiveness of Victoria's stream frontage programs and assess options to accelerate their implementation in priority catchments across the Central Region.

Catchment management authorities and Melbourne Water will continue to implement complementary instream and streamside works consistent with priorities contained in Regional River Health Strategies. These works are supported by funding through the Environmental Contribution. The Government's existing commitment of Statewide expenditure of \$25 million per year will continue until 2008. These funds (\$100 million over four years) contribute to the implementation of the Regional River Health Strategies. The Government will extend the Environmental Contributions and continue significant investment in river health (see Chapter 5 for further details).

Table 2.3 outlines some of the complementary works currently occurring in catchments throughout the Central Region. Investment in complementary works for the Yarra River are described on pages 27 and 28.





**Table 2.3 Complementary works in the Central Region – as outlined in the Regional River Health Strategies**

River System	State Government Investment (\$000's)		Key investment activities
	2005/06	2006/07	
Barwon	1584	937	Urban river management, sediment control, riparian revegetation, fencing mangrove and saltmarsh protection in high traffic areas. Yarra pygmy perch protection, remnant vegetation protection, weeds and sediment control.
Moorabool	64	64	Water supply catchment protection, fencing etc.
Maribyrnong	225	271	Melbourne Water direct expenditure on Healthy rivers Program covering capital river improvement projects, wetland projects, river health projects, river health grants and river maintenance. covering capital river improvement projects, wetland projects, river health grants and river maintenance.
Werribee	454	204	Melbourne Water direct expenditure on Healthy Rivers Program covering capital river improvement projects, wetland projects, river health grants and river maintenance.
Bunyip/Tarago	99	204	Melbourne Water direct expenditure on Healthy Rivers Program covering capital river improvement projects, wetland projects, river health grants and river maintenance
Thomson	1008	612	Stream restoration, fish passage investigations and designs for Cowwarr Weir, environmental flow monitoring and assessment
Macalister	538	699	Stream restoration (exotic vegetation removal, revegetation, off-stream watering, fencing), environmental flow monitoring and assessment.
Latrobe	1275	1722	Stream restoration (exotic vegetation removal, revegetation, off-stream watering, fencing), meander reinstatement..
TOTAL	5,247	4,713	

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## Improving the health of the Yarra River

The Yarra River has played a key role in the way Melbourne has developed and grown. It supports industry and tourism, and is highly valued by the people who live and work there.

Our attitudes and expectations for this natural icon have changed significantly over the years. The river is no longer the dumping ground for industrial and domestic waste as it once was and water quality is vastly better than in the days of 'Marvellous Smellbourne'.

As part of the Central Region Sustainable Water Strategy, the Government has committed to:

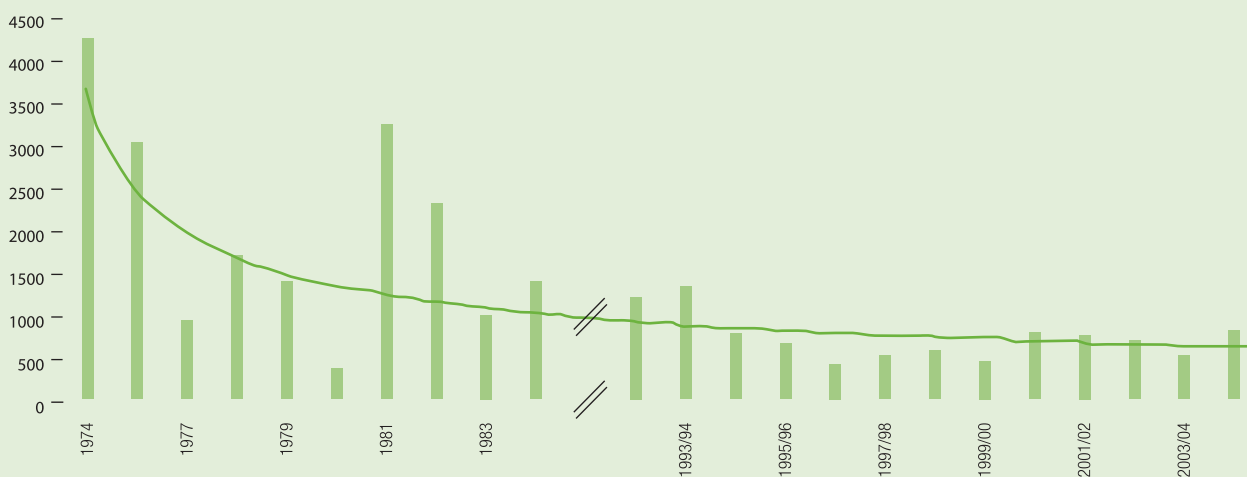
- meet the scientific flow recommendations in the Yarra River by 2007 – by reducing the cap on entitlements from 420,000 ML to 400,000 ML. This will include 17,000 ML established as an environmental entitlement. The benefits of the increased environmental flows will be monitored and assessed to determine whether further enhancements are required (refer to Action 4.39)
- work with Melbourne Water to investigate alternative options to provide water to wetlands where it is not possible to provide overbank flows. (refer to Action 4.40).

Water quality in the Yarra has improved significantly since the 1970s and 1980s, mainly because of massive investment in infrastructure projects, such as diversion of industrial waste away from stormwater drains into the sewerage system and large scale sewerage of Melbourne's suburbs. Water quality is excellent in the upper forested reaches, declining downstream in the more urban areas. Water quality is temporarily reduced after heavy rain.

Water quality at most sites in rural areas has generally met current standards for all forms of recreation, including swimming. At most sites in urban areas, *E. coli* levels have met the standards for water sports such as boating, canoeing and kayaking (except following heavy rain), but not for swimming. Figure 2.3 shows *E. coli* levels in the Yarra River (at Princes Bridge) over the past 30 years.

Figure 2.3 Annual geometric means of *E. coli* counts (per 0.1 litres) at Princes Bridge (Yarra River)

ANNUAL GEOMETRIC MEANS OF *E. COLI* COUNTS (PER 100ML) AT PRINCES BRIDGE





The Yarra River is also home to a number of native animals such as frogs, platypus and fish, including many endangered species such as the growling grass frog and fish such as grayling, Macquarie perch and Murray cod. The increasing numbers of platypus and fish species is evidence of improving river health in the Yarra.

More recent water quality initiatives have included additional sewerage system upgrades, better management of stormwater pollution and partnerships between farmers, community groups and water authorities in a range of Yarra River improvement programs.

The Government is committed to further improve the health of the Yarra River to increase numbers of native fish, platypus and plants and ensure the Yarra is suitable for a wide range of recreational activities.

In January 2006, the Government released the *Yarra River Action Plan*. The plan features a package of significant projects totalling around \$600 million that build on the vast amount of work carried out by the Government, community and individuals over many years. The priority projects include:

- about \$300 million over six years for the Northern Sewerage Project to virtually eliminate sewer spills in two key Yarra tributaries
  - about \$250 million over the next 20 years to accelerate the replacement of about 18,500 septic tanks with a reticulated sewerage system
  - \$20 million to tackle stormwater pollution by implementing local government stormwater management programs
  - \$4.3 million to reduce litter
  - \$930,000 over three years to track down key sources of faecal pollution, such as illegal connections of sewers to drains
  - work with local government and retail water companies to improve the management of septic tanks to minimise their impact on the Yarra
  - \$1 million to develop a Regional Water Quality Improvement Plan for Port Phillip and Westernport catchments. This includes \$450,000 funding from the Australian Government's Coastal Catchments Initiative
  - evaluate the effectiveness of different agricultural best management practices in reducing nutrient and sediment runoff from agricultural areas to rivers, creeks and bays
- provide the community with access to clear and accurate information on water quality in the Yarra
  - undertake more monitoring and research to improve our understanding of the impact of pollution on aquatic life and any restrictions on the suitability of fish for human consumption
  - \$3.8 million over three years to encourage community support and involvement in caring for the Yarra catchment, including around \$140,000 over two years for a Yarra Riverkeeper boat that will monitor activity on the river and promote community care and appreciation of the river through river-based community awareness and education programs.

In addition to the *Yarra River Action Plan*, other important complementary initiatives underway for the Yarra River are:

- river improvement works that include removing weeds and revegetation with native plants. Some of this work will be undertaken by Melbourne Water, while some of it will be undertaken by landowners with the support of Melbourne Water's stream frontage management programs that provide funding for rural landowners to protect rural riverbanks
- manage the allocation of irrigation water to protect environmental flows in tributaries of the Yarra as part of the streamflow management program.

Through *Our Environment Our Future*, the Sustainability Action Statement released by the Government in July 2006, a further commitment of \$4.5 million was made for a dedicated EPA Victoria strikeforce to track the source of pollution and fine those responsible. This extra funding will allow the EPA to track pollution sources (including faecal pollution, heavy metals and organic contaminants) and carry out enforcement. The team will have a dedicated boat to pinpoint pollution and conduct focused blitzes.

The Yarra Watch website has also been enhanced so that the community can quickly and easily access the latest condition reports (updated weekly) and news on Yarra hotspots.

# 2

## Managing the impacts of low flows and climate change

Historically, waterway management has recognised that dry periods are a part of normal climate variability. However, with the threat of the continuation of low inflows, catchment management authorities need to develop drought response plans for the environment (just as water authorities do for urban supplies) to protect the environmental values of our rivers.

The approaches outlined earlier (protecting and enhancing environmental flows, using environmental flows more efficiently and complementary works) are not only important for protecting existing environmental values, but also improving the resilience of our rivers to manage short term drought and climate change.

Fish and other animals survive dry periods, and potentially the effects of climate change in the future, by residing in refuges – deep pools in streams that are protected from filling up with sediment and are shaded by adjacent streamside vegetation. The Government wants to ensure such refuges are protected and enhanced.

**Who:** Dept. of Sustainability and Environment, catchment management authorities and Melbourne Water  
**Timeframe:** 2006–2007

### Action 2.10

The Government will work with catchment management authorities and Melbourne Water to develop environmental drought response plans that:

- identify key drought refuges
- ensure key drought refuges are maintained in good condition
- actively manage refuges during droughts to ensure the survival of fish and other animals.

**Who:** Dept. of Sustainability and Environment, catchment management authorities and Melbourne Water  
**Timeframe:** Ongoing

### Action 2.11

The Government will take the following approach in managing the potential impacts of climate change on the environmental health of rivers:

- without impacting existing commitments, reduce summer extractions wherever possible
- undertake studies on the possible impact of the various climate change outlooks on the environmental values of rivers to identify key areas at risk from climate change and mitigation actions
- undertake complementary restoration activities to improve ecosystem resilience and the capacity of river systems to recover
- improve our knowledge of the impact of climate change through monitoring to enable a higher level of adaptive management.

## Protecting our groundwater

Groundwater provides about 8 per cent of the water used in the Central Region, primarily for farms and irrigation but also a little for urban use. Groundwater is found in aquifers, which are porous layers of sand, gravel or rock. As water seeps into the ground, it fills these porous layers – large volumes of water can be stored in this way. This groundwater can be pumped back to the surface using bores.

The amount of groundwater that can be used is determined by how much water seeps into, or recharges the aquifers, and how much is discharged to streams, wetlands and the sea. It is important to ensure groundwater use does not exceed the long-term recharge rates.

### Preserve existing groundwater resources

Legislation introduced by the Government to create the environmental water reserve applies to aquifers as well as rivers. Environmental water reserves for groundwater are to be established for all areas where groundwater is found in reasonable quality and quantity. The environmental water reserve aims to protect the environmental values dependent on groundwater (eg. wetlands, springs, and base flows in rivers) as well as the quality and quantity of the groundwater resource itself.

Groundwater management areas consisting of a single aquifer or a group of inter-related aquifers have previously been defined. Figure 2.3 shows the groundwater management areas in the Central Region. The amount of water that can be used from each groundwater management area is defined by its permissible consumptive volume (PCV). Groundwater levels and use in each management area are monitored.

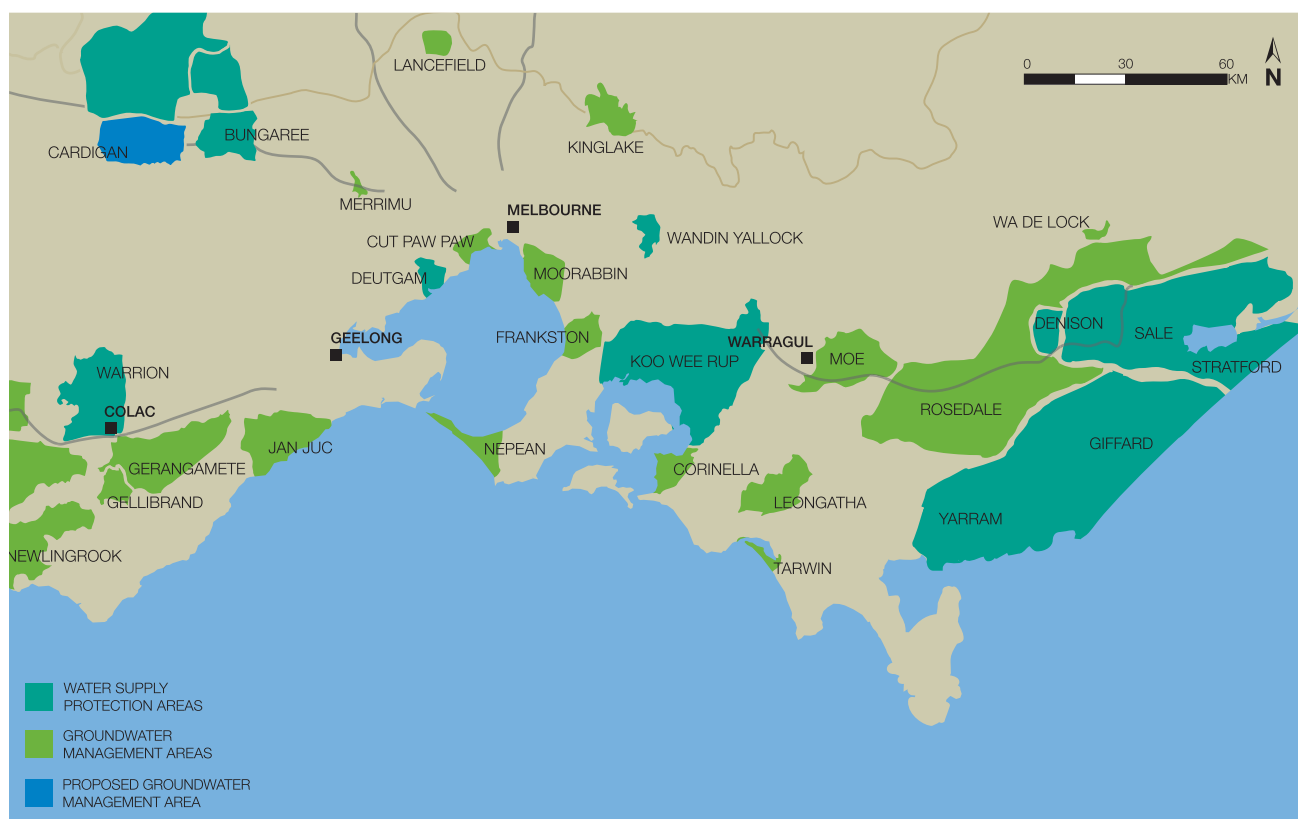
**Who:** Dept. of Sustainability and Environment  
**Timeframe:** Ongoing

### Action 2.12

The Government will establish environmental water reserves for all areas where groundwater is found in reasonable quality and quantity.



Figure 2.4 Map of groundwater management areas in the Central Region



The PCV limits the amount of groundwater that can be extracted for consumptive uses like irrigation or town supplies. This approach is designed to prevent over-allocation of groundwater that would cause long term decline in groundwater levels and potentially salt water intrusions. PCVs are estimated using the best available information and the current licensed allocation.

The PCV for each groundwater management area in the Central Region is outlined in Table 2.4. The Government will issue new entitlements or licences to extract additional groundwater only within the permissible consumptive volumes after existing commitments are met and if dependent ecosystems and aquifer health are protected.

The PCVs for the Jan Juc and Newlingrook aquifers reflect the current volume of licensed entitlements rather than estimated sustainable yield from these aquifers. The PCVs will be revised to reflect the sustainable yields which will be determined as part of the detailed investigations to determine how much water can be safely extracted from each aquifer (see Action 4.14 and 4.15).

Who: Dept. of Sustainability and Environment  
Timeframe: Ongoing

## Action 2.13

The Government has established permissible consumptive volumes (as set out in Table 2.4) for each groundwater management area in the Central Region.

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**Table 2.4 Permissible consumptive volume for each groundwater management area in the Central Region**

Sub-region	Groundwater Management Unit (GMA) <sup>1</sup>	Permissible Consumptive Volume <sup>2</sup>
Ballarat	Bungaree GMA (a declared water supply protection area)	5,273 ML/yr
	Cardigan GMA	2,667 ML/yr <sup>3</sup>
Geelong	Gellibrand GMA	0 ML/yr <sup>9</sup>
	Gerangamete GMA	20,000 ML/yr 80,000 over 10 years 400,000 over 100 years
	Jan Juc GMA	4,250 ML/yr <sup>4</sup>
	Newlingrook GMA	1,977 ML/yr <sup>5</sup>
Inner West	Deutgam GMA (a declared water supply protection area)	5,100 ML/yr
	Lancefield GMA	1,485 ML/yr
	Merrimu GMA	450 ML/yr
Melbourne	Cut Paw Paw GMA	3,650 ML/yr
	Frankston GMA	3,200 ML/yr
	Kinglake GMA	2,015 ML/yr
	Moorabbin GMA	2,700 ML/yr
	Nepean GMA	6,013 ML/yr
	Wandin Yallock GMA (a declared water supply protection area)	2,924 ML/yr
Gippsland	Denison GMA (a declared water supply protection area)	17,743 ML/yr <sup>6</sup>
	Leongatha GMA	6,500 ML/yr
	Moe GMA	8,200 ML/yr
	Rosedale GMA	22,313 ML/yr
	Sale GMA (a declared water supply protection area)	21,212 ML/yr
	Stratford GMA <sup>8</sup>	27,643 ML/yr
	Wa De Lock GMA <sup>8</sup>	Zone 1 – 11,884 ML/yr <sup>7</sup> Zone 2 – 17,000 ML/yr Zone 3 – 1,200 ML/yr
Westport	Corinella GMA	2,550 ML/yr
	Tarwin GMA	1,300 ML/yr
	Koo Wee Rup GMA (a declared water supply protection area)	12,915 ML/yr

<sup>1</sup> Licensable allocation only <sup>2</sup> See Glossary on page 115 for definition of terms <sup>3</sup> Includes current licensed entitlements, plus applications currently under consideration by Southern Rural Water (including Central Highlands Water's application for 1,700 ML/yr) <sup>4</sup> Reflects current licensed entitlement. The PCV will be revised to take into account the proposed Bulk Entitlement for Barwon Water to supply Geelong <sup>5</sup> Depth boundary has been amended. Reflects current licensed entitlement. The PCV will be revised for potential additional resource (up to 47,000ML/yr) proposed for Barwon Water to supply Geelong, and Wannon Water to supply the south west region <sup>6</sup> Includes 4,677 ML licensed entitlement for salinity dewatering <sup>7</sup> Includes 510ML licensed entitlement for salinity dewatering <sup>8</sup> While these aquifers are not strictly within the boundaries of the Central Region, they have been included as they are used by industries located in the Central Region. <sup>9</sup> The PCV for Gellibrand is being investigated to understand the extent of interaction with surface water.

Note: The PCV figures above reflect best available data and may be subject to change.



Within 12 months, all licensed extractions for consumptive purposes over 20 ML per annum will be metered. In addition, all new licensed extractions are required to be metered. This information on groundwater use, together with monitoring of groundwater levels in aquifers, will be reported annually in the State Water Report. It will enable a review of permissible consumptive volumes or the declaration of new water supply protection areas if over-use is apparent.

Who: Dept. of Sustainability and Environment  
Timeframe: Ongoing

## Action 2.14

The Government will undertake annual compliance reporting of the use and recharge of aquifers through the State Water Report

Small amounts of groundwater may occur outside the groundwater management areas. These are called unincorporated areas. Generally this groundwater does not come from well defined aquifers, the volumes available are small, the flow rates at which water can be extracted are low and/or water quality is not suitable for consumptive use. For these reasons, over allocation is unlikely. Groundwater extractions in unincorporated areas are managed by the existing licensing provisions of the *Water Act 1989*. They will also be subject to the metering requirements outlined above.

### Managing over-allocated groundwater resources

Some groundwater management areas are already over-allocated. In these cases “water supply protection areas” are declared according to provisions in the *Water Act 1989* and management plans are developed to reduce over-use in these areas. In the Central Region there are six declared water supply protection areas with management plans currently being developed (see Table 2.4).

### Increasing use of groundwater resources

The shallow groundwater resources in the Central Region are generally already fully developed. However, there are opportunities to develop deeper groundwater resources. For example, the Jan Juc and Newlingrook aquifers have been identified in this Strategy for potential development. Further investigations are needed to identify if there are other potential groundwater resources to be developed. In developing these groundwater resources, it will be important to ensure the long term sustainability of aquifers is protected.

### Managing the impacts of low flows and climate change

The dry conditions of the past ten years which have reduced streamflows will also have reduced recharge of the aquifers in the Central Region. Similarly the amount of groundwater stored in the aquifers will also have declined, just as levels in our reservoirs have declined.

Groundwater management plans will be developed to protect against the depletion of groundwater resources in the event that low flow conditions continue.

Who: Dept. of Sustainability and Environment  
Timeframe: Ongoing

## Action 2.15

The Government will take the following actions to ensure aquifers are sustainably managed:

- where there is an existing management plan in place and the resource is being managed to sustainable groundwater levels, it will be continued, with regular monitoring and review
- where groundwater is being over-used, a management plan will be prepared under the Water Supply Protection Area process
- where the resource is being used to generate significant economic benefit through mining, off-shore oil and gas extraction or dewatering of open cut brown coal mines, special arrangements are proposed to allow temporary groundwater decline provided it can be demonstrated to be reversible
- where groundwater is close to the surface and causing salinity problems, the benefits of controlling salinity will be considered when determining how much groundwater can be used
- where groundwater is not being overused, no management plan will be required but management rules will be established to prevent future overuse
- where groundwater has strong interconnections with stressed river systems, the impact of groundwater extraction on rivers and wetlands in the region will be monitored and groundwater management plans developed.

Who: Dept. of Sustainability and Environment, water authorities  
Timeframe: Ongoing

## Action 2.16

The Government will work with water authorities to identify and develop underutilised groundwater resources and explore aquifer recharge opportunities.

Who: Dept. of Sustainability and Environment,  
Timeframe: Ongoing

## Action 2.17

The Government will, subject to the long term sustainability of aquifers and protecting groundwater dependent ecosystems, issue new entitlements or licences to extract additional water from aquifers.