



Powlett River Estuary Management Plan

FINAL
August 2015



West Gippsland
Catchment Management Authority

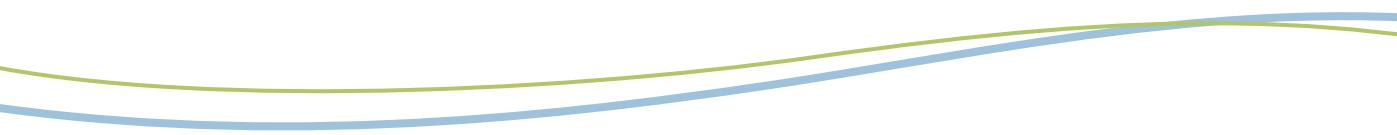


Powlett River Estuary Mouth looking north.



Contents

Preface	3
Acknowledgements	3
Acronyms	3
1 Introduction	4
1.1 Background	5
1.2 The plan	5
1.2.1 Objective	5
1.2.2 Scope	5
1.2.3 Links to the West Gippsland Regional Waterway Strategy	5
2 Development of this plan	6
2.1 Community and stakeholder engagement	6
2.2 Data sources and information collection	6
3 The powlett river estuary	7
3.1 Estuary processes	7
3.2 Condition	9
3.3 Environmental values	10
3.3.1 Plant communities and species	10
3.3.2 Fish species	14
3.3.3 Bird species	16
3.3.4 Other fauna	18
3.4 Social and economic values	18
4 Threats and management issues	19
4.1 Threats within the estuary and near coastal environment	19
4.2 Threats from the upstream catchment	22
4.3 Water quality	23
5 Current management	24
6 Management goals and targets for the powlett river estuary	27
6.1 Hierarchy of goals and targets	27
6.2 Goals	27
6.3 Management outcome targets	28



7	Development of the action plan	29
7.1	Risk assessment	29
7.2	Identifying Priority Reaches in the catchment	30
7.3	Prioritisation of actions in the estuary	30
7.4	Implementation of actions	32
8	Action plan (2015 – 2023)	33
8.1	Actions in the estuary (E)	34
	A. Focus on maintaining or improving estuarine condition and values	35
	B. Actions to mitigate the need for artificial estuary mouth openings	37
	C. Collecting information to inform estuary management	38
8.2	Actions in the catchment (C)	42
	D. Actions within the catchment to reduce upstream threats to the estuary	42
9	Monitoring, evaluation and review of the plan	45



Preface

The West Gippsland Catchment Management Authority (CMA) has developed this Estuary Management Plan (EMP) for the Powlett River to guide future strategic management directions.

The plan sets out an ambitious action plan which will improve and protect the aspects of the estuary which the community value.

The West Gippsland CMA, Bass Coast Shire Council, Parks Victoria, Bass Coast Landcare Network and other interested groups will be able to use this plan to access initiative funding from a range of sources to implement the recommended actions in this plan.

Acknowledgements

This report has been prepared by Simone Wilkie, Bron Gwyther and Greg Peters of Riverness Pty Ltd, in partnership with Thompson Berrill Landscape Design Pty Ltd.

The development of this report has involved the collective effort of a number of departments and individuals, in particular:

- **Steering Group** – Matt Khouri (West Gippsland CMA and Chair), Eleisha Keogh (West Gippsland CMA), Deirdre Griebsma and Diana Whittington (Bass Coast Shire Council), Darren Hill and Gerard Delaney (Parks Victoria), Dave Bateman (Bass Coast Landcare Network)
- **Reference Group Members** – Roz Jessop (Central Coastal Board) Brett Vurlow (SGW), Richard Allen and Adam Dunn (West Gippsland CMA), Darren Deering, Jeffrey Woodham and Chris Angwin (DEDJTR, Fisheries)
- **Community workshop participants** – Martin Fuller (West Gippsland CMA), Paul Smith (Gippsland Coastal Board), Trevor Buck (VRFish), Mike Linsell (EstuaryWatch and recreational fisherman), Ken Nethercote, Robin and Sally Lowe, Clive Hollins and Paul Spiers (landholders).
- **Boon Wurrung Foundation**

Acronyms

AVIRA	The Aquatic Values Identification and Risk Assessment
BCLN	Bass Coast Landcare Network
BCSC	Bass Coast Shire Council
CMA	Catchment Management Authority
DELWP	Department of Environment, Land, Water and Planning
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
EEMSS	Estuary Entrance Management Support System
EMP	Estuary Management Plan
EPA	Environment Protection Authority
EVC	Ecological Vegetation Class
ISC	Index of Stream Condition
MER	Monitoring, Evaluation and Reporting
RWS	West Gippsland Regional Waterway Strategy
SGW	South Gippsland Water
VRFish	Victorian Recreational Fishing Peak-Body
WGCM	West Gippsland Catchment Management Authority
WMP	Waterway Management Plan



1 Introduction

1.1 Background

The Powlett River estuary is located approximately 130km south east of Melbourne. Its headwaters are in the Strzelecki Ranges near Korumburra, and it flows generally south west towards the coast between Kilcunda and Wonthaggi, as shown in the map below. It is listed as a Nationally Important Wetland due to its extensive saltmarsh and wetland communities and heritage values. It also provides habitat for the critically endangered Orange-bellied Parrot.

The Powlett River estuary is an intermittently closed estuary with a history of management challenges associated with this.

Over the past ten years the West Gippsland Catchment Management Authority (WGCMA), Parks Victoria, Bass Coast Landcare Network, Bass Coast Shire Council, the Department of Environment, Land, Water and Planning (DELWP) and the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) (formerly known as the Department of Environment and Primary Industries), landholders and community groups have been undertaking works in the catchment to protect the river and estuary values.

A recent review of the management of the Powlett River estuary recommended that an Estuary Management Plan (EMP) be developed.



Location of the Powlett River.

1.2 The Plan

This EMP incorporates the whole of the Powlett catchment, including the nearby coastline. It focuses on maintaining or improving estuarine condition and values, collecting information to inform estuary entrance management and prioritising activities including those needed to mitigate the need for artificial estuary mouth openings.

1.2.1 Objective

The Powlett River Estuary Management Plan:

- includes a prioritised list of costed management activities for each agency/organisation to combat the local (i.e. estuarine), coastal (i.e. marine) and broader catchment (i.e. freshwater) threats to key estuarine values.
- includes a prioritised list of costed monitoring activities for each agency/organisation that will provide data to better inform future estuarine management decisions and the implementation of the EMP.
- provides a clear, concise estuary management plan, which can be used by waterway/catchment managers and community groups/organisations to attract future funding and support to maintain or improve estuary condition.

1.2.2 Scope

The focus of this estuary management plan is the protection of the values within the Powlett River estuary (the extent of the estuary is shown in dark blue on the map below). These include environmental, social, economic and cultural values. It identifies the values of, and includes actions for, both public and private land. A series of overarching goals, identified through engagement with government stakeholders, community groups, interest groups and individuals, guide the priorities for the plan.

While the focus of the plan is the values within the estuary, actions are recommended for the entire catchment to address threats to the estuary from the catchment.

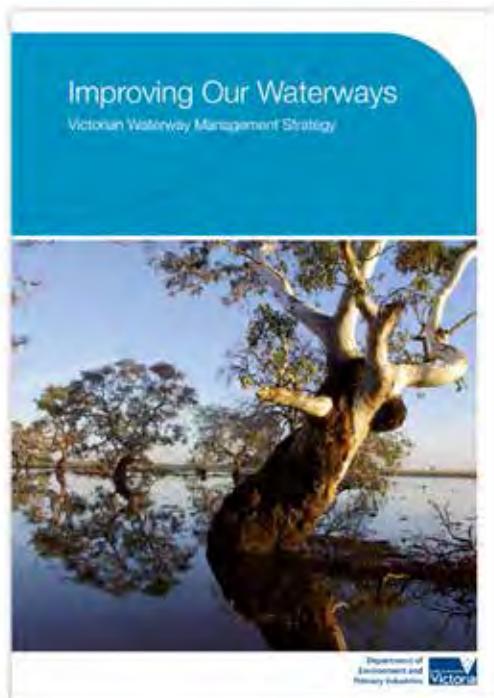
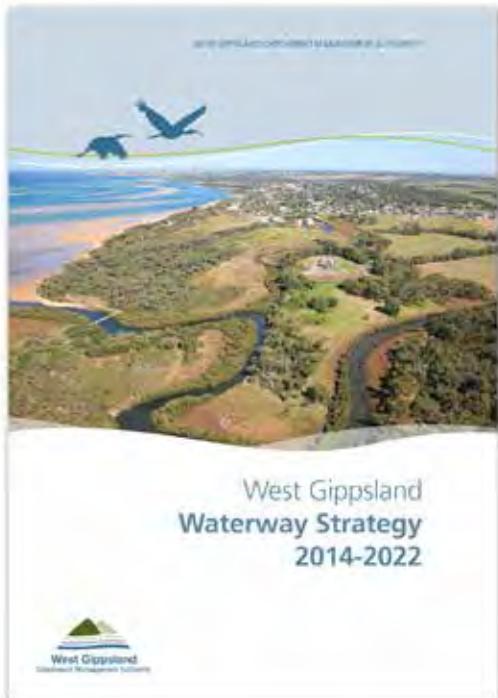


The extent of the Powlett River estuary – the focus of the plan is the values within the estuary.

1.2.3 Links to the West Gippsland Regional Waterway Strategy

The Plan has been developed to align with the West Gippsland Regional Waterway Strategy (RWS) (2014) and therefore has an eight year timeframe. Longer term goals (8+ years) have been identified for estuary condition to acknowledge that changes in environmental condition can take significant time following the implementation of on-ground works.

The development of an estuary management plan for the Powlett River is a priority action in the West Gippsland RWS. Development of an estuary management plan also aligns with policies for estuary management outlined in the Victorian Waterway Management Strategy (2013).





2 Development of this Plan

2.1 Community and stakeholder engagement

The Powlett River EMP has been developed with a high level of community and stakeholder involvement. The West Gippsland CMA has managed the development of the EMP through a steering group made up of representatives from West Gippsland CMA, Parks Victoria, Bass Coast Landcare Network and the Bass Coast Shire Council. A reference group consisting of representatives from various community groups and agencies provided input to the development of the Plan through meetings, input of technical advice and review of the draft actions.

Three key opportunities have been provided for broader community input, namely:

1. **Community Consultative Group meeting.** A community workshop was held to allow participants (i.e. those acknowledged on page 3) to review the information collated from the review of existing information and field work, identify goals for the future management of the creek and to identify management issues and threats (held on 29 January 2015).
2. **Draft for public comment.** The draft Powlett River EMP was open for public comment from 18 May to 5 June 2015.
3. **Public open house.** Agency staff and project team members were available to discuss with interested members of the community the draft Plan, the public submission process and the Powlett River estuary more generally on the 31 May 2015 at Kilcunda.

Following the closing of submissions on the draft Plan, community and stakeholder comments were considered and the Plan was amended accordingly.

2.2 Data sources and information collection

Information on the environmental values of the Powlett River estuary has been sourced from:

- DELWP Biodiversity Interactive Maps and Victorian Biodiversity Atlas. The DELWP Biodiversity Interactive Maps provide information on Victoria's land boundaries and land uses. The Victorian Biodiversity Atlas holds information on flora and fauna recorded through surveys.
- AVIRA database. The Aquatic Values Identification and Risk Assessment database was used in the development of regional waterway strategies and for local strategic planning activities. AVIRA is used to store data on the environmental, social, cultural and economic values of waterways and also has a risk assessment function. The Powlett River estuary and catchment is represented in AVIRA as four river reaches and an estuary reach.
- Field investigations. The project team undertook brief field assessments including mapping of significant features for consideration in the plan.
- Aerial photograph interpretation. Aerial photograph interpretation was undertaken to identify streamside areas of remnant vegetation, revegetation, stream channelisation and significant changes in land use and vegetation communities.
- Community and stakeholder input.

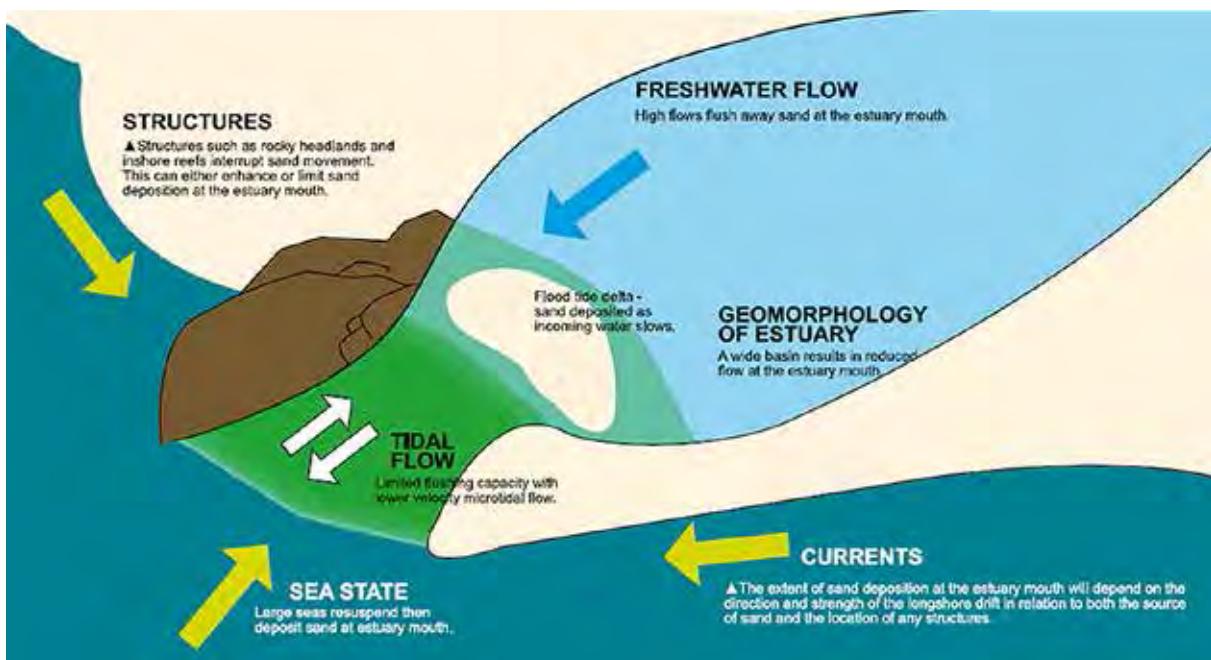


3 The Powlett River Estuary

3.1 Estuary processes

An estuary is a place where fresh and marine waters interact, providing a unique highly variable environment. In Victoria, the ocean exchange of many estuaries intermittently stops, following the formation of a sand bar at the mouth of the estuary.

The Powlett River estuary is a west facing, wave dominated estuary that intermittently closes to the sea. This is a natural seasonal process and results in increased water levels in the estuary. High water levels bring significant environmental benefits when adjoining wetlands and fringing vegetation are flooded. Ideally, natural processes prevail whereby the system breaches the sandbar naturally, before there is a major impact on surrounding land and infrastructure. Factors contributing to estuary mouth status are described below.



Factors contributing to estuary mouth status – Estuary mouth status is determined by the complex interaction of factors influencing water flow and sand deposition. All of these factors must be discussed when considering an artificial estuary mouth opening, to ensure safety, efficiency and ecosystem health. Sourced: Arundel, 2006, EEMSS manual.

Estuary mouth conditions alter seasonally. The Powlett River estuary generally forms a sandbar and closes to the sea during late summer/autumn, when freshwater flows are generally low. During estuary mouth closures, the water column stratifies, leaving a dense saline bottom layer and a top freshwater layer. Dissolved oxygen levels are gradually depleted in the bottom layer. Increases in freshwater flow into the estuary, often in late winter and early spring, flush away the sand bar and push marine water from the estuary.

Prolonged dry conditions, such as those experienced in the late 1990s – 2012, result in more frequent and longer duration estuary mouth closures.



To reduce the impact of high water levels on socio-economic assets (such as surrounding agricultural land), on occasion it is necessary to artificially open a closed estuary mouth, prior to the winter and spring flows. Artificial estuary mouth openings can carry a high risk of damage to the health of the estuary. These risks may include:

- Mass fish deaths
- Disruption of fish spawning events
- Premature drainage of wetlands – leading to long-term decline
- Exposure and oxidation of potential acid sulphate soils.



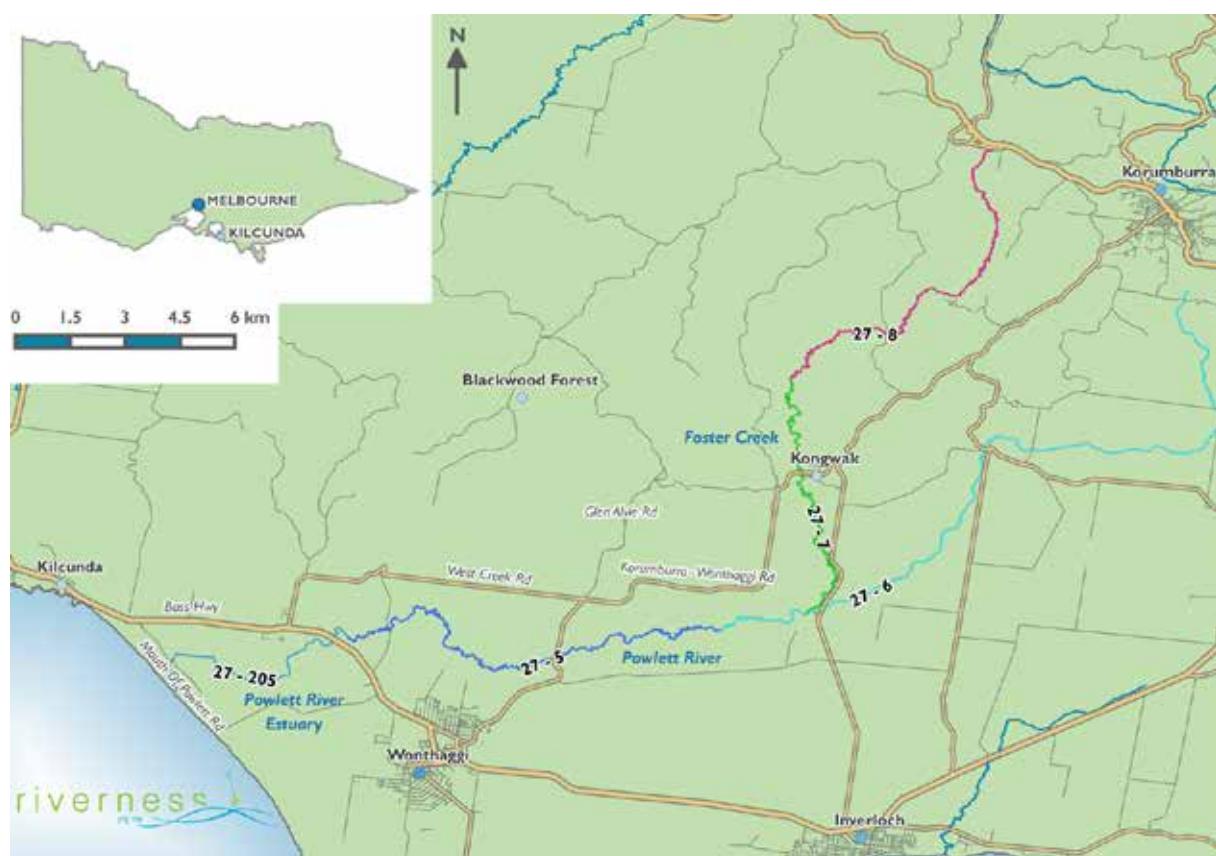
The Powlett River Estuary mouth intermittently closes its connection to the sea.

3.2 Condition

The Powlett River catchment and estuary has been divided into five reaches to assist with management planning and for assessing environmental condition. The five reaches are:

- 27-205: Powlett River estuary to Bass Highway
- 27-5: Powlett River downstream of Lance Creek to Bass Highway
- 27-6: Powlett River upstream of Lance Creek
- 27-7: Foster Creek downstream of Burndale
- 27-8: Foster Creek upstream of Burndale.

The five reaches are shown in the map below.



The Index of Stream Condition reaches in the Powlett River catchment.

The Powlett River catchment was assessed as part of the third Index of Stream Condition (ISC) completed in 2010. The Powlett River (ISC reaches 5 and 6) were assessed as being in poor condition. The Foster Creek (ISC reaches 7 and 8) was assessed as being in moderate condition.

The ISC uses five sub-indices to describe river and estuary condition. The five sub-indices are Hydrology, Physical Form, Streamside Zone, Water Quality and Aquatic Life.

- **Hydrology** – refers to the amount of water that is within the river channel and how much this would have varied from natural conditions.
- **Physical Form** – looks at the river bank condition as well as instream habitats and barriers to fish migration.
- **Streamside Zone** – measures woody vegetation along the waterway's edge.
- **Water Quality** – includes measures of phosphorus, turbidity, salinity and pH.
- **Aquatic Life** – is based on the number and type of aquatic macroinvertebrates found with the river.



The table below shows the sub-index score (out of 10) for each reach within the Powlett catchment.

Reach	Hydrology	Physical Form	Streamside Zone	Water Quality	Aquatic Life	ISC Score	Condition
27-205 Estuary	Not assessed as part of ISC						
27-5 Powlett Estuary	5	9	4	3	3	22	Poor
27-6 Powlett River	5	8	4	4	3	20	Poor
27-7 Foster Creek	6	9	6	no data	4	28	Moderate
27-8 Foster Creek	6	10	5	no data	3	25	Moderate

Despite the overall condition rankings for the Powlett indicating poor and moderate conditions, significant values remain within the estuary and near coastal environment. These values are described in the sections below.

3.3 Environmental values

The environmental values associated with the Powlett River estuary include a diverse range of bird, plant and fish communities. They are dependent on the variability of the typical estuarine characteristics such as river flow, flooding, variable salinities and salt wedge movement.

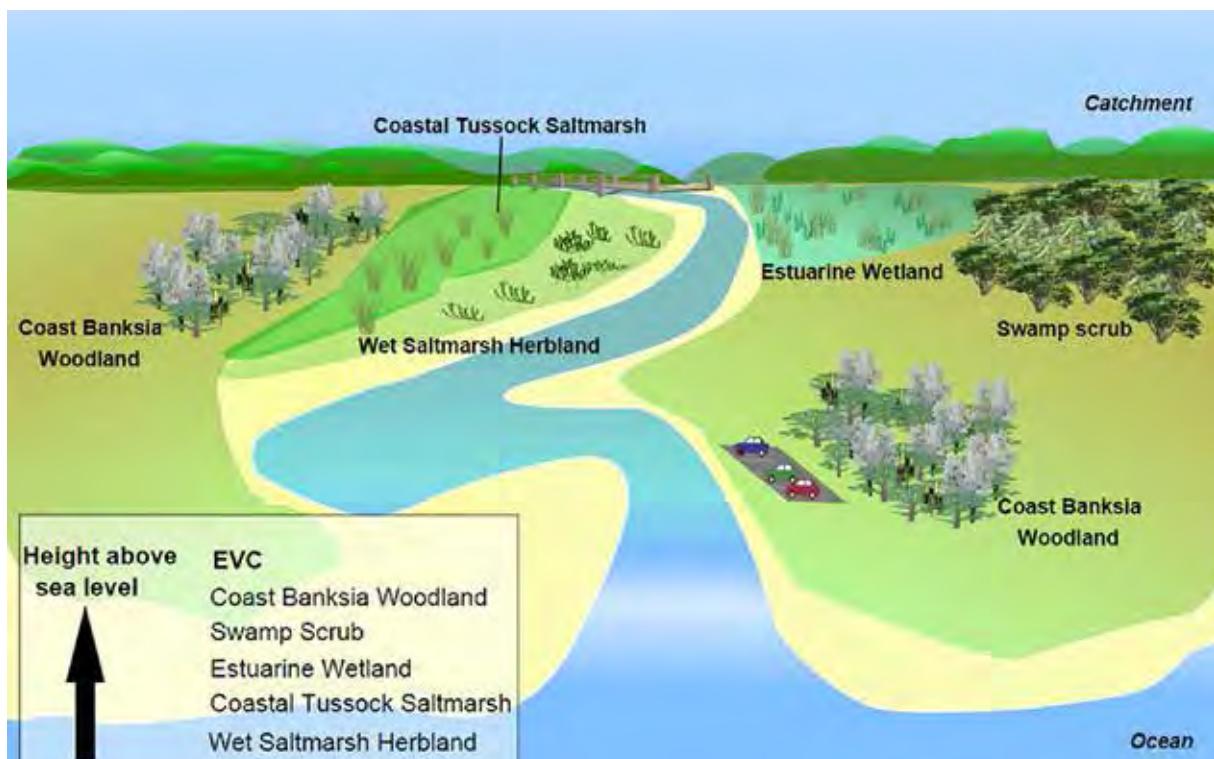
3.3.1 Plant communities and species

Vegetation communities are described in Victoria through mapping units called Ecological Vegetation Classes (EVCs). The EVCs occurring along the Powlett River estuary are listed in the table and diagram below. Coastal Saltmarsh vegetation has recently been protected under the Commonwealth government's *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)*.

Ecological Vegetation Classes (EVCs) and Bioregional Conservation Significance in Victoria	Extent in hectares (where known)
83 Swampy Riparian Woodland	Endangered
53 Swamp Scrub	Endangered
9 Coastal Saltmarsh	Least Concern
– <i>Coastal Tussock Saltmarsh*</i>	Vulnerable
– <i>Wet Saltmarsh Herland*</i>	Depleted
10 Estuarine Wetland	Depleted
2 Coast Banksia Woodland	Vulnerable

* In 2011, a report on Mangroves and coastal saltmarsh of Victoria was completed. The report recommended that the EVC 9 – Coastal Saltmarsh be refined. New Coastal Saltmarsh EVCs and associated bioregional conservation significance have been recommended, and those occurring in the Powlett River estuary have been presented above.

Ecological Vegetation Classes at the Powlett River Estuary

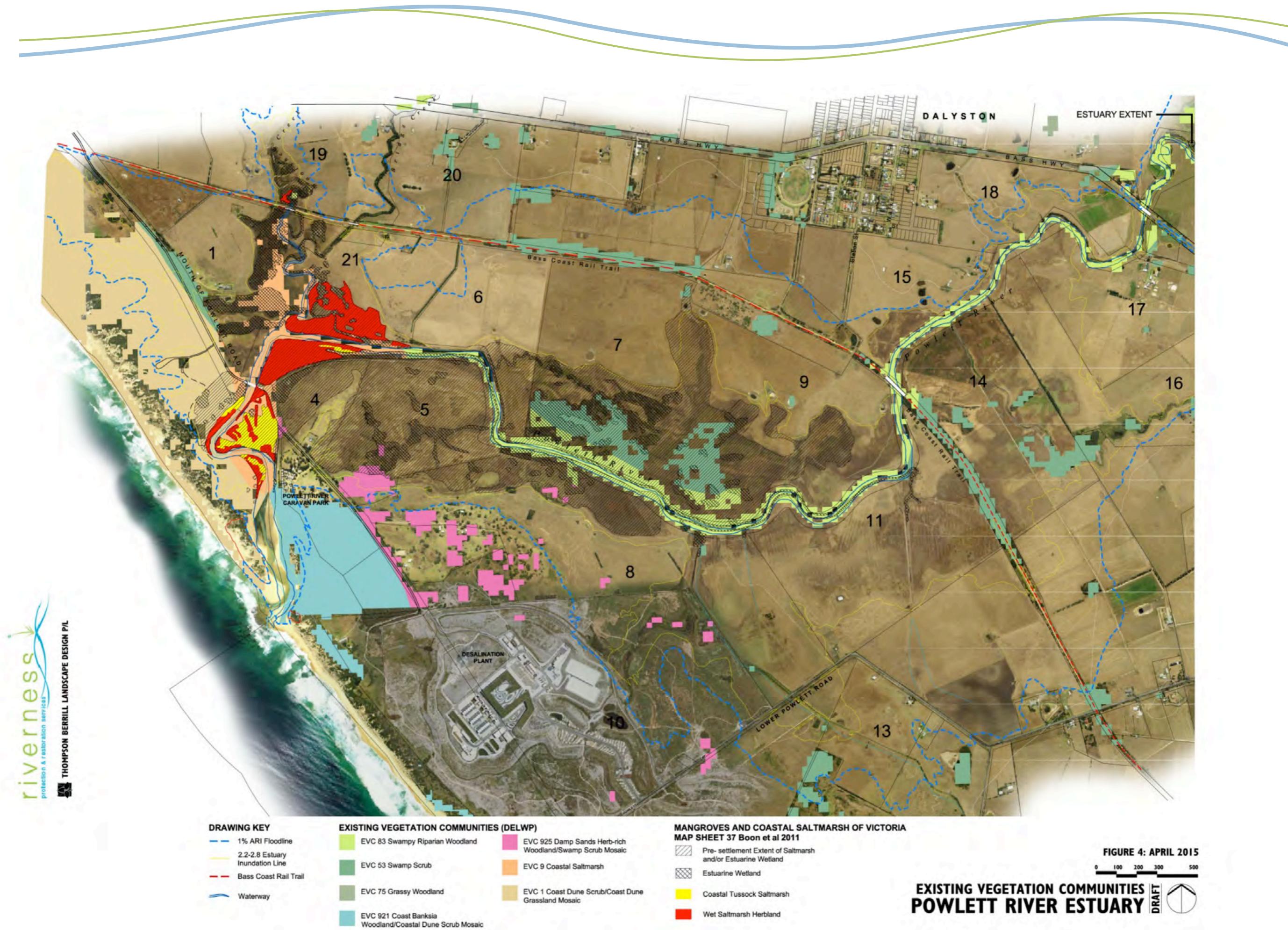


A conceptualisation of the EVCs within the Powlett River estuary. Each vegetation class is located at different levels on the floodplain, based on the water requirements and tolerances to factors such as salinity. Wet Saltmarsh Hermland is the most frequently inundated and salt tolerant vegetation class, whilst Coast Banksia Woodland is located higher up the sand dunes off the floodplain. The health of the vegetation is reliant on an appropriate salinity and water regime.



Left: Coast Banksia Woodland. Right: Coastal Saltmarsh (Coastal Tussock Saltmarsh on higher ground graduating to Wet Saltmarsh Hermland in the foreground).

The location of existing vegetation communities is shown in the map on the next page. The map also indicates the reduction in estuarine wetland and saltmarsh since European settlement.





Pictured top: Australian Grayling, photo by Tarmo A Raadik.

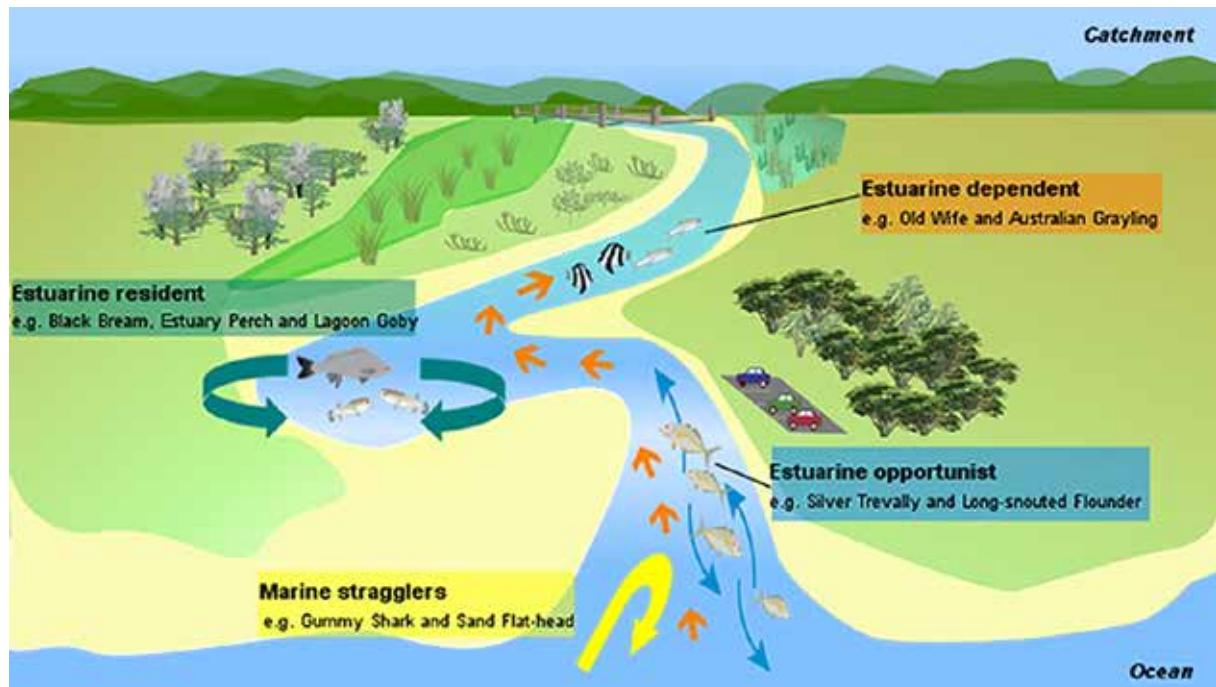
Above left: Black Bream, photo by David Stork, and East Australian Salmon (above right) are popular species targeted by recreational anglers.

3.3.2 Fish species

Twenty-two species of fish have been recorded in the Powlett estuary, as listed on page 15. Many of these species are considered estuarine residents who spend their entire lifecycle in the estuary. Estuarine resident fish include Black Bream, Estuary Perch and Lagoon Goby. Estuarine opportunists, such as Silver Trevally and Long-snouted Flounder, complete their lifecycle at sea, but may enter estuaries in large numbers to exploit the available estuarine habitats. While other species, including Old Wife and Australian Grayling, are estuarine dependents that rely on estuaries for part of their lifecycle. Marine stragglers enter estuaries irregularly and are generally found near estuary mouths where salinities remain high.

Australian Grayling are the only native fish species with conservation significance found in the Powlett River estuary. Australian Grayling spawn in the freshwater reaches of coastal rivers. The juveniles return to the freshwater reaches of rivers after roughly six months at sea and spend the rest of their lives in river habitats. The Australian Grayling is listed as threatened under the *Flora and Fauna Guarantee Act 1988*, and vulnerable under the EPBC Act.

Fish groups in the Powlett Estuary



Conceptualisation showing use of the estuary by the different groups of fish.

Fish Species		
Short-finned Eel	Black Bream	Southern Blue-spotted Goby
Spotted Galaxias	Luderick	Lagoon Goby
Common Galaxias	Old Wife	Flat-headed Gudgeon
Eastern Fortesque	Yellow-Eye Mullet	Long snouted Flounder
Estuary Perch	Tupong	Greenback Flounder
Silver Trevally	Tamar River Goby	Smooth Toadfish
Eastern Australian Salmon	Bridled Goby	Eastern Blue-spot Goby
Australian Grayling*		

*The Australian Grayling is listed as threatened under the Flora and Fauna Guarantee Act 1988, and vulnerable under the EPBC Act.

3.3.3 Bird species

Thirty-one significant bird species have been found during studies within the estuary, wetlands and coastal zone, as listed below. Of these, the Orange-bellied Parrot (OBP) is the only species considered critically endangered. The OBP uses the Coastal Saltmarsh at the Powlett estuary for feeding. Many other more common bird species will also frequent the estuary.



Pictured above left: Orange-bellied Parrot, photo by Birdlife Australia, feed in the saltmarsh and Hooded Plover, photo by Morris 2015 (above right) nest on the beach at the mouth of the Powlett River.

Species	Conservation Status Victoria		Conservation status Australia	Conservation status International
	<i>Flora and Fauna Guarantee Act 1988</i>	Advisory List of Threatened Fauna	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	International agreements
Australasian Shoveler		Vulnerable		
Black-faced Cormorant		Near threatened		
Caspian Tern	Listed	Near threatened		CAMBA, JAMBA
Clamorous Reed Warbler				Bonn Convention
Common Sandpiper		Vulnerable		Bonn Convention, CAMBA, JAMBA
Common Greenshank		Vulnerable		Bonn Convention, CAMBA, JAMBA
Double-banded Plover				Bonn Convention
Eastern Great Egret	Listed	Vulnerable		CAMBA, JAMBA
Emu		Near threatened		
Gull-billed Tern	Listed	Endangered		
Hardhead		Vulnerable		
Hooded Plover	Listed	Vulnerable		
Intermediate Egret	Listed	Endangered		

...continued from page 16

Species	Conservation Status Victoria		Conservation status Australia	Conservation status International
	<i>Flora and Fauna Guarantee Act 1988</i>	<i>Advisory List of Threatened Fauna</i>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	<i>International agreements</i>
Latham's Snipe		Near threatened		Bonn Convention, CAMBA, JAMBA
Little Egret	Listed	Endangered		
Magpie Goose	Listed	Near threatened		
Musk Duck		Vulnerable		
Orange-bellied Parrot	Listed	Critically endangered		
Pacific Golden Plover		Vulnerable		Bonn Convention, CAMBA, JAMBA
Pacific Gull		Near threatened		
Pied Cormorant		Near threatened		
Red-necked Stint				Bonn Convention, CAMBA, JAMBA
Royal Spoonbill		Near threatened		
Ruddy Turnstone		Vulnerable		Bonn Convention, CAMBA, JAMBA
Sanderling		Near threatened		Bonn Convention, CAMBA, JAMBA
Sharp-tailed Sandpiper				Bonn Convention, CAMBA, JAMBA
Short-tailed Shearwater				JAMBA, ROKAMBA
Sooty Albatross	Listed		Vulnerable	Bonn Convention
Sooty Oystercatcher		Near threatened		
White-fronted Tern		Near threatened		
White-bellied Sea-Eagle	Listed	Vulnerable		CAMBA

*Japan-Australia Migratory Bird Agreement (JAMBA); China-Australia Migratory Bird Agreement (CAMBA); Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA); Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

3.3.4 Other fauna

There are three other listed fauna species that have been found near the Powlett River estuary as shown in the table below.

Species	<i>Flora and Fauna Guarantee Act 1988</i>	<i>Advisory List of Threatened Fauna</i>	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
Southern Brown Bandicoot	Listed	Near Threatened	Endangered
Swamp Antechinus	Listed	Near Threatened	
Swamp Skink	Listed	Vulnerable	

3.4 Social and economic values

The Powlett river estuary has significant social values, particularly from the Mouth of Powlett Road bridge to the estuary mouth, this area has high scenic value. The area is commonly used for non-motor boating (kayak, canoe, etc.), picnics, BBQs, recreational fishing, sightseeing, swimming, walking and bird watching.

The coastal dunes near the mouth of the Powlett River estuary have Aboriginal cultural heritage significance with a number of coastal midden sites recorded.

The economic values of the estuary are mostly placed with the landholders along the river, with grazing common along the entire river length upstream of the Mouth of Powlett Road.

The Powlett River catchment is identified as a rural water source for irrigation and stock and for domestic supply. Water is pumped directly from the stream in the upper catchment for this purpose.

The Lance Creek Reservoir is located on Lance Creek in the upper catchment. It is 4200 ML in size. Lance Creek Reservoir supplies drinking water to the townships of Wonthaggi, Cape Paterson and Inverloch.



4 Threats and Management Issues

4.1 Threats within the estuary and near coastal environment

The Victorian Waterway Management Strategy lists a range of threats to the health of estuaries. These include:

- Growing populations
- High levels of recreational use
- Unpermitted entrance mouth openings
- Changes in water regimes
- High levels of sediment and nutrients
- Pollution events
- Habitat modification
- Land reclamation
- Invasion by weeds or pest animals
- Salinisation and acidification.

Catchment Management Authorities around Victoria collect data on the values and threats to waterways using the Aquatic Values Identification and Risk Assessment (AVIRA) methodology. Data has been collected for the Powlett River and included in AVIRA. High or very high threats identified within the Powlett River estuary are:

- Pest animals (e.g. foxes, cats, Yellowfin Goby) and plants (e.g. Sea Spurge)
- Degraded water quality
- Bank instability
- Disturbance of acid sulphate soils
- Livestock access
- Altered marine exchange.



Trampling and bank erosion associated with pedestrian access are significant threats within the estuary.

Other threats that were identified during field investigation include:

- Trampling and bank erosion associated with pedestrian access
- Litter
- Channelisation of the river channel
- Rural drainage and drain clearing.

In addition to those threats identified through AVIRA, and the fieldwork for the development of this EMP, the Victorian Coastal Saltmarsh project (2011) identified threatening processes specific to the coastal saltmarsh vegetation within the estuary and ranked the intensity of the impact. The results of this are presented in the table below:

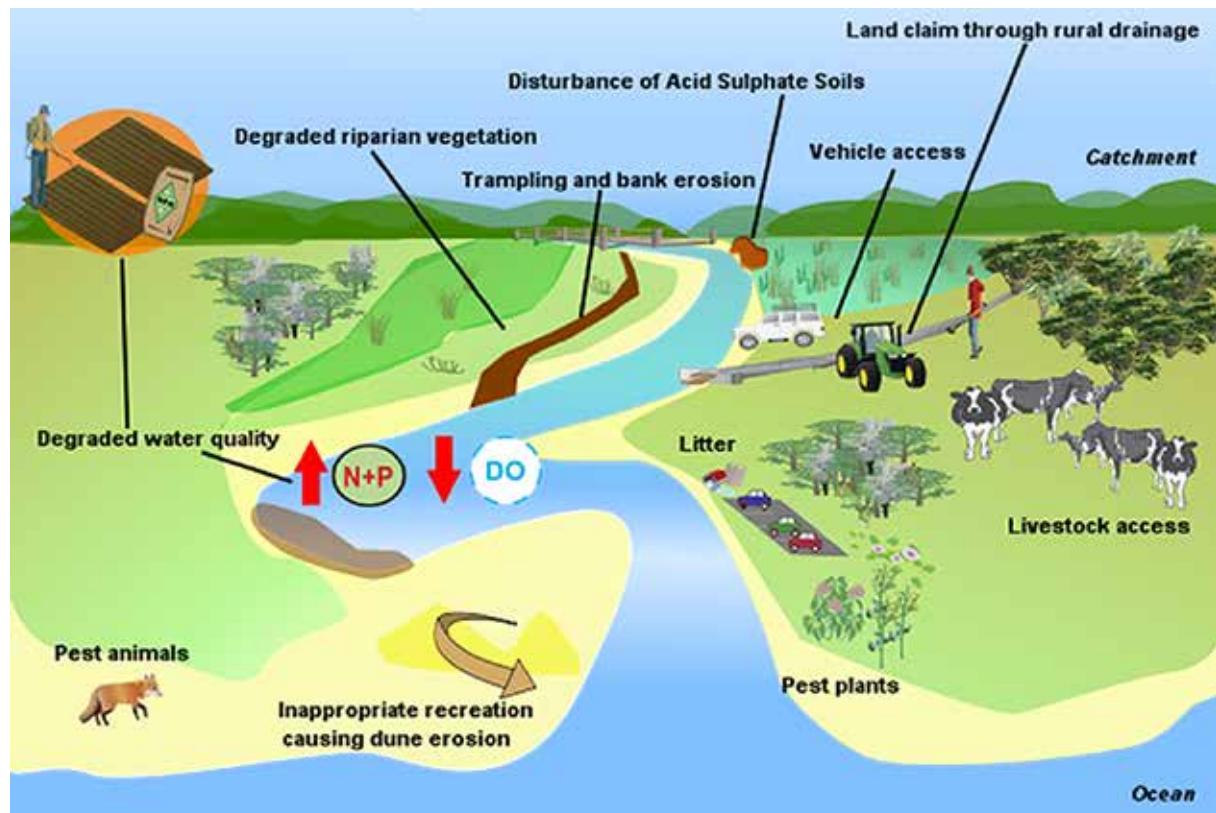
Threat	Extent of Threat	Intensity of Impact
Land-claim	Widespread	High
Vehicle Access	Locally evident	Low
Stock Grazing	Widespread	High
Weed Invasion	Locally evident	Low
Inappropriate Recreation	Locally evident	Low
Overdevelopment	Widespread	Low
Landward Barrier (artificial)	-	Low
Landward Barrier (landuse)	-	-



Land-claim through rural drainage and stock grazing are significant threats within the estuary.

Conceptualisation of threats to the Powlett River estuary values

(Please note: N = Nitrogen, P = Phosphorus and DO = Dissolved Oxygen).



The Powlett River estuary has been straightened and channelised in several sections. Historically the estuarine wetland and swamp scrub vegetation would have spread across the floodplain, without a defined channel in many sections.

4.2 Threats from the upstream catchment

In addition to addressing threats within the estuary, threats from the upstream catchment are also identified. Actions to protect the health and condition of the estuary also need to be undertaken within the catchment. The following table below identifies threats to the estuary in the Powlett River and Foster Creek catchments.



The waterways in the catchment have been channelised and riparian vegetation is lacking, barriers to fish movement exist and the steep hillslopes high in the catchment have been cleared.

Threats to the estuary in the Powlett River and Foster Creek catchments

Reach	Location	Threats
Powlett River (Lower) Reach 27 – 5	Powlett River downstream of Lance Creek to Bass Highway	<ul style="list-style-type: none"> degraded water quality degraded riparian vegetation (large trees in particular) livestock access reduced streamside vegetation width invasive fish
Powlett River (Upper) Reach 27 – 6	Powlett River upstream of Lance Creek	<ul style="list-style-type: none"> degraded water quality degraded riparian vegetation livestock access reduced streamside vegetation width barriers to fish movement*
Foster Creek (Lower) Reach 27 – 7	Foster Creek downstream of Burndale	<ul style="list-style-type: none"> degraded water quality livestock access
Foster Creek (Upper) Reach 27 – 8	Foster Creek upstream of Burndale	<ul style="list-style-type: none"> reduced streamside vegetation width

*There are two barriers to fish movement in reach 27-6. The first is the streamflow gauging station at Wattle Bank and the other is the South Gippsland Water pumping station rock structure at Wonthaggi North.

4.3 Water quality

As mentioned in the estuary condition and threats sections, the Powlett River and estuary is subject to poor water quality conditions. The Powlett River Management Review (2014) undertook an assessment of water quality data against the State Environmental Protection Policy (Waters of Victoria) guidelines. The assessment found that the Powlett River did not meet the water quality objectives for the turbidity, total nitrogen and total phosphorus parameters. Failing to meet objectives associated with these parameters has been identified as largely associated with land use practice in the catchment. Such practices include unrestricted stock access to waterways and associated impacts such as soil compaction, bank erosion, trampling and removal of vegetation and direct inputs of phosphorus and nitrogen from animal waste, dairies and fertiliser use.

Assessment of water quality in the estuary against the estuary water quality guidelines identified that dissolved oxygen levels were below the guideline values during all years. Low dissolved oxygen levels can severely impact fish and other aquatic species in the estuary.

High levels of nutrients, such as nitrogen and phosphorus entering the estuary from the catchment, are likely to trigger the growth of algal blooms in the estuary. Algal blooms produce high levels of dissolved oxygen during daylight hours when the algae is photosynthesising, however, oxygen levels can drop to critical levels overnight impacting aquatic species.



5 Current Management

Many government agencies, community groups and individuals have roles and responsibilities for managing the Powlett River estuary. These roles, responsibilities and current management activities are outlined in the table below.

Agency / Group	Responsibility
Parks Victoria	<p>Manages the parks and conservation reserves within the Powlett estuary. Parks Victoria create, manage and maintain visitor sites and manage a range of assets, including visitor facilities and access points. They also provide permits for access for activities such as horse riding.</p> <p>Applies to DELWP to undertake works on public land under <i>Section 27 Coastal Management Act 1979</i> consent for artificial estuary mouth openings.</p> <p>Undertakes maintenance and management of tracks, car parks and signage, and pest plant and animal management within the public land boundaries.</p>
Bass Coast Shire Council	<p>Involved in the management of the Powlett River estuary through its role as responsible planning authority, manager of stormwater drainage and onsite domestic wastewater systems, user of integrated water systems, land manager, emergency management, and supporter of community groups.</p> <p>Specifically with regard to the Powlett estuary, the Bass Coast Shire has the following roles and responsibilities, to:</p> <ul style="list-style-type: none">• Incorporate waterway and catchment management objectives, priorities and actions into strategic and statutory planning processes• Undertake elements of floodplain management in accordance with the renewed Victorian Floodplain Management Strategy• Develop and implement urban stormwater plans• Manage on-site domestic wastewater systems• Manage sections of waterways where formal agreements are in place• Manage rural drainage where appropriate.
West Gippsland CMA	<p>Develops and implements a Regional Waterway Strategy that accounts for community needs relating to the use and values of waterways.</p> <p>Carries out works and activities in accordance with the Regional Waterway Strategy to improve the values of waterways</p> <p>Manages the bed and banks of waterways through licensing works on waterways, and implementing works such as erosion control, fish passage and habitat enhancement.</p> <p>Is responsible for aspects of floodplain management, including flood modelling, mapping and strategy development and providing advice on development applications for land prone to flooding.</p> <p>Undertakes regional planning for native vegetation and control of invasive plants and animals. Authorities such as Bass Coast Shire Council must take account of these plans when determining applications for vegetation removal.</p> <p>Licences the opening of the Powlett River estuary mouth, maintain the Estuary Entrance Management Support System (EEMSS), provide advice on the risks associated with artificial estuary entrance management and make a final decision on the opening of the estuary mouth (refer to page 26 for more information).</p> <p>Undertakes projects throughout the catchment in partnership with landholders to fence and revegetate stream frontages.</p>

...continued from page 24

Agency / Group	Responsibility
EPA Victoria	<p>Licences discharges to the Powlett River and enforce licence conditions associated with those discharges.</p> <p>Responds to water quality incidents, fish deaths and pollution events.</p> <p>Sets water quality indicators for rivers and estuaries through the State Environment Protection Policy.</p> <p>Supports programs to implement best practice management of dairy effluent and other nutrient and pollution producing activities.</p>
Bass Coast Landcare Network	<p>Works with local landholders to seek and provide funding for waterway rehabilitation works and land health programs, including Environmental Best Management Practice on farms workshops.</p>
Boon Wurrung Foundation	<p>Represents the traditional people and custodians of the lands from the Werribee River to Wilsons Promontory and are proud members of the Kulin People – Boonwurrung and Woiwurrung.</p>
Individuals and land managers	<p>Ensure that activities on their land do not degrade or cause damage to land, soil or water resources.</p> <p>Responsible for invasive plant and animal control and litter control on their land.</p>
Crown Land Water Frontage Licence holders	<p>Responsible for managing licensed Crown Land Water Frontage in accordance with their licence conditions. This includes:</p> <ul style="list-style-type: none"> • Only undertaking activities consistent with the licence purpose, and in accordance with any specific requirements provided by DELWP. • Not limiting or discouraging public access. • Minimising risks to the public. • Maintaining the land in good order and condition. • Informing DELWP of any significant incidents or orders on the land (e.g. a pollution event). • Ensuring that rubbish does not accumulate on the frontage or nearby land. • Obtaining permission from DELWP before storing chemicals, starting a fire, removing timber, planting or removing vegetation or adding fertilisers etc. or building any structure or improvement. • Providing a stile or gate or other pedestrian access in any fence around the licensed land where it joins Crown land.

Artificial estuary mouth opening

There are two authorisations required before any estuary mouth is artificially opened.

A ‘works on waterways’ permit issued by the Catchment Management Authority (CMA) as an authority under the Water Act 1989 (section 67); and

A consent to ‘use’ or ‘develop’ coastal Crown land, issued under the Coastal Management Act 1995 (section 37). The consent is issued by the Department of Environment, Land, Water and Planning, or Parks Victoria if the land is reserved under the National Parks Act 1975 (section 27).

The Estuary Entrance Management Support System (EEMSS) is a decision support tool that guides estuary managers when making the decision whether or not to artificially open an estuary. The EEMSS ensures a consistent process is followed each time so all assets are considered and openings are safe and effective. EEMSS is a risk based system.

Populating EEMSS requires the collection of information on socio-economic, environmental and cultural assets that may be affected by artificial estuary entrance openings. The following table shows the assets considered in EEMSS.

Social-Economic Assets	Environmental Assets	Cultural Assets
<ul style="list-style-type: none">Roads and bridgesAgricultural landFishingJettiesWalking tracksBoat rampsRecreational landCampingSwimmingStormwater infrastructureSepticsHuman healthWatercraftBuilt infrastructure	<ul style="list-style-type: none">BirdsPlant communities (EVCs)Fish	<ul style="list-style-type: none">Cultural heritageIndigenous culture

West Gippsland CMA populated EEMSS for the Powlett River catchment in 2009. A number of assets have been identified as key drivers for artificially opening the Powlett River estuary mouth. These assets are:

- the Mouth of Powlett Rd, downstream of the bridge
- telephone cables located near the bridge on the Mouth of Powlett Rd
- agricultural land.

To protect the ecological values associated with the Powlett River estuary, actions to remove or alter these drivers for artificial estuary mouth opening are recommended within the EMP.

One of the actions is to investigate raising a 300 metre section of the Mouth of Powlett Road. Inundation of this section of road currently affects access to several private properties, the Powlett River Caravan Park and the visitor carpark at the estuary mouth.

Removal or alteration of the drivers of artificial openings would provide a more natural water regime that would support ecological values and processes such as:

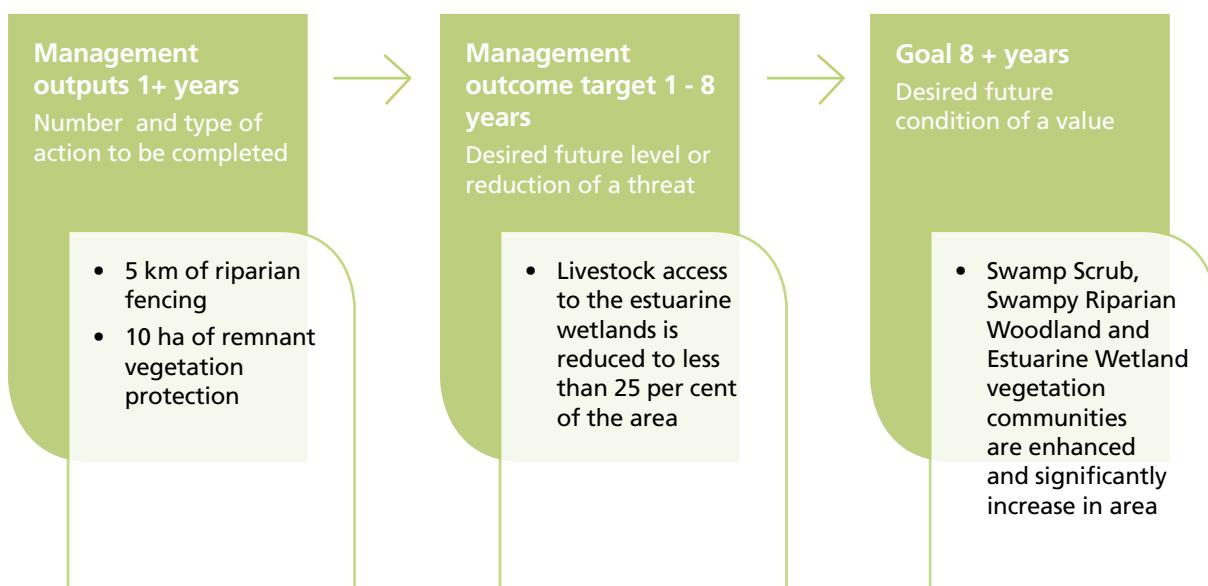
- natural water regime for saltmarsh communities
- breeding and nursery habitat for estuarine fish
- wading habitat for migratory and other water birds.

Actions to address the other drivers for artificial estuary mouth opening are also included within the EMP.



6 Management Goals and targets for the Powlett River Estuary

6.1 Hierarchy of goals and targets



6.2 Goals

Using the information gathered through community and stakeholder input, seven goals have been identified to guide the priorities and actions in the Powlett River EMP. These goals relate to the identified values of the estuary. It should be noted there may be significant time lag in achieving the goals, and it is expected that this will occur in a period greater than the 8 year timeframe of the Plan.

Through the implementation of the Powlett River EMP the following condition outcomes will be achieved:

1. Swamp Scrub, Swampy Riparian Woodland and Estuarine Wetland vegetation communities are enhanced and significantly increase in area.
2. Orange-bellied Parrot continue to use the Powlett estuary as a feeding site, as the Coastal Saltmarsh vegetation communities have been protected and enhanced.
3. All abilities access points are provided for recreational fishing and enjoyment of the estuary.
4. Continued availability of multiple recreational opportunities exists and environmental impacts are minimised.
5. Recreationally targeted and native estuarine fish communities are enhanced through a network of resilient habitat areas.
6. Hooded Plover continue to successfully breed at the mouth of the Powlett River, and significant waterbirds continue to visit the floodplain and wetlands of the Powlett estuary.
7. The Coast Banksia Woodland vegetation community is protected.

Conceptualisation of the Powlett River estuary goals



6.3 Management outcome targets

To achieve the goals, a number of management outcome targets are required to be met. Management outcome targets generally relate to reductions in the level of threats that are affecting the values and can be measured after one to eight years. For the Powlett River EMP, management outcome targets can also be developed around the community values of the estuary.

The management outcome targets for the estuary are:

- Potential and active acid sulphate soils are mapped in detail within the estuary extent and appropriate protection is in place through statutory planning mechanisms.
- Livestock access to the estuarine wetlands is reduced to less than 25 per cent of the area.
- Bank erosion in the Powlett River estuary is reduced to less than 50 per cent of the reach eroding.
- Invasive weeds (shrubs and ground layer) are reduced to less than 20 per cent of the riparian area.

Water quality is identified as a key threat to be addressed by this EMP. A management outcome target has not been set for water quality, as the timeframes required to improve water quality are longer term, and could not be achieved or measured in a 1 - 8 year timeframe. The EMP will contribute to a long term improvement in water quality in the estuary.



7 Development of the Action Plan

7.1 Risk assessment

A risk assessment was undertaken, which looked at the links between the values and the threats within the Powlett River estuary. The risk assessment process prioritised the risks that were directly linked to the goals for the EMP.

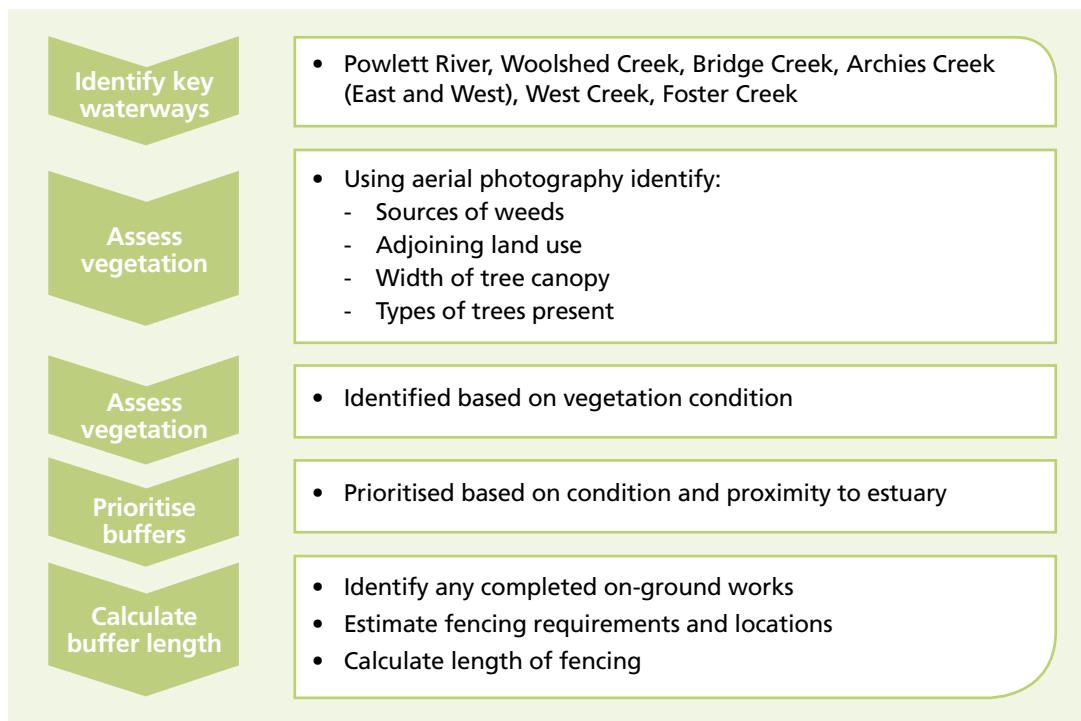
The following threats have been identified as high or very high risk to the values within the Powlett River estuary:

- Degraded water quality
- Disturbance of acid sulphate soils
- Livestock access
- Invasive fauna (terrestrial)
- Invasive flora (aquatic)
- Bank instability
- Invasive flora (riparian) – ground layer
- Invasive flora (riparian) – shrub layer
- Altered marine exchange – artificial estuary mouth opening.

7.2 Identifying priority reaches in the catchment

To specifically address the risk of degraded water quality, actions in the catchment are required. An assessment of the types and quantity of works within the catchment was undertaken as outlined below. Actions in the catchment also address other risks within the estuary.

Process for identifying priority areas for the establishment of riparian buffers in the catchment.



7.3 Prioritisation of actions in the estuary

To assist the West Gippsland CMA and other stakeholders to allocate funding to the identified actions and to seek appropriate external funding, the actions have been prioritised. The criteria for determining the priorities were, the action is:

1. Part of ongoing maintenance or an existing plan/strategy
2. Cost effective and addresses a number of goals
3. Particularly effective in addressing key community concerns
4. Technically/socially/politically feasible.

Each action is assigned high, medium or low priority. This is based on whether the action meets one or more of the criteria above. As the plan is subject to funding applications in the future, it is not appropriate to put a timeframe on the priorities or the actions. Rather, it is anticipated that funding will be sought for the high priority actions, followed by the medium and then low priority actions.

The actions are displayed on the maps accompanying the action tables in section 8.

Using riparian buffer strips to improve water quality

Vegetation within a riparian zone can slow the overland movement of water, and cause sediment and attached nutrients to be deposited on the land before they can reach the stream channel. Riparian vegetation can also take up and remove some of the nutrients being transported.

Recent studies in Australia have shown that both natural vegetation and grassy filter strips can trap around 90% of the sediment moving from upslope. These strips can be just as effective in trapping or absorbing nutrients.

To ensure that the riparian buffers improve riparian vegetation condition and filter water quality the buffers should be set a minimum of 20 metres from the stream bank with fences running parallel to flood flows rather than following the natural meander pattern of the stream.

The buffer itself should be a combination of:

- metres of grass buffer (adjacent to the fence); and
- metres of natural vegetation (adjacent to the stream).

It is important to recognise that, although riparian buffers can be effective in preventing sediment and nutrients from reaching streams, and thereby help to protect and improve water quality, they are not a substitute for good land management elsewhere in the catchment.



An excellent example of a riparian buffer strip created by fencing remnant vegetation on the lower Powlett River.

Best management practices on farms

In addition to establishing riparian buffer strips, minimising sources of nutrients and sediment is also important. Other actions for improving water quality are:

- Maintain adequate vegetation cover throughout the catchment (i.e. avoiding bare ground)
- Apply fertiliser at appropriate rates, so that it maximises the return from investment and minimises off-site losses
- Avoid fertiliser application during periods of intense run-off
- Install land class fencing
- Manage stock access to riparian lands (including gullies).

7.4 Implementation of actions

Actions have been assigned to a lead agency and partners. Many actions are recommended to be undertaken on public land, such as the land near the estuary mouth managed by Parks Victoria or on Crown land water frontage. Other actions such as fencing and revegetation of the creek frontage are recommended to be undertaken on private land.

In the Powlett catchment, fencing of the waterways occurs as part of a voluntary partnership between the West Gippsland CMA or Bass Coast Landcare Network and private landholders in priority areas. The fencing setbacks and access to water for stock through alternate mechanisms such as troughs are negotiated on an individual basis with landholders based on minimum requirements for fencing. In addition the Victorian Waterway Management Strategy includes policy to facilitate a take and use licence for stock and domestic water for landholders who fence their waterways. The policy requires licensing costs to be minimised and application fees covered by CMAs when landholders enter into agreements to protect waterway frontages. It is hoped that this policy will facilitate the protection of river frontages, by addressing one of the key concerns of landholders (i.e. loss of access to stock and domestic water from the waterway).



Fencing and revegetation along the Powlett River estuary undertaken in partnership between the West Gippsland CMA and the landholder.