

Campaspe River Resource Guide



NORTH CENTRAL
Catchment Management Authority
Connecting Rivers, Landscapes, People



**Department of
Environment and
Primary Industries**



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Introduction

The Campaspe River Resource Guide provides easy access to information, the history and relevant natural resource management publications relating to the Campaspe River.

The Guide is an initiative of the 'Caring for the Campaspe' project funded through the Victorian Government. This four-year project (2012-16) aims to protect and enhance 400ha of the river's important riparian vegetation through the delivery of fencing, weed control and revegetation incentives to private and public land managers. Managed by the North Central CMA, the project is guided by a Reference Group containing representatives of the community, Indigenous groups, local government and Goulburn-Murray Water. Community engagement activities aim to further increase awareness and appreciation of this river system, identified as a priority in the Regional Waterway Strategy (RWS) (2014-22).

Acknowledging that current available funding alone will not achieve the long-term resource conditions targets identified in the RWS, this Resource Guide aims to provide the information to support the community and partner agencies to seek further investment in improving the health of the Campaspe River.



Photo: Campaspe River, McColl Road Strathallan (SKM, 2013)



Campaspe catchment

The Campaspe catchment extends from the Great Dividing Range in the south, to the Murray River in the north, and covers a total area of approximately 4,000 square kilometres (km) [approximately 17% of the North Central region]. The catchment is approximately 150 km long and has an average width of approximately 25 km (North Central CMA, 2005).

The Campaspe River is the major waterway in the catchment flowing over 220km north from its headwaters near Woodend to its confluence with the Murray River at Echuca. The Campaspe River flows through urban, peri-urban and rural townships including Kyneton, Elmore, Rochester and Echuca. The Campaspe's major tributary is the Coliban River which flows from Trentham, through the three Coliban Water storages (Upper Coliban, Lauriston and Malmsbury reservoirs) before reaching Lake Eppalock. Other significant tributaries include the Axe, McIvor, Mount Pleasant, Wild Duck and Pipers creeks.

Since 1836, when explorer Major Thomas Mitchell named the Campaspe River, the landscape has undergone significant change. The cumulative effects of the gold rush, the building of reservoirs and water supply systems, native vegetation clearing, farming systems and urban development are clearly reflected in the current condition of the waterway (North Central CMA, 2005). Results from the 2010 ISC survey (Refer to Figure 1) reveal that only 7% of streams in the Campaspe catchment are in good condition, 39% are in moderate condition and 54% are in a poor to very poor condition.

The Campaspe River has high environmental values due to its connection to the Murray River, its iconic River Red Gum communities and native fish population, including Murray Cod and Golden Perch. It also supports a range of social values along its length, including camping, fishing, canoeing/kayaking, swimming, waterskiing, bird watching, walking and picnicking.

There are no recognised significant wetlands systems within the Campaspe catchment, although the water storages of Lake Eppalock, Upper Coliban, Lauriston and Malmsbury reservoirs all support aquatic values and provide drought refuge.

Resource Links

DEPI (2013) Third Index of Stream Condition

<http://www.depi.vic.gov.au/water/water-resource-reporting/Third-Index-of-Stream-Condition-report>

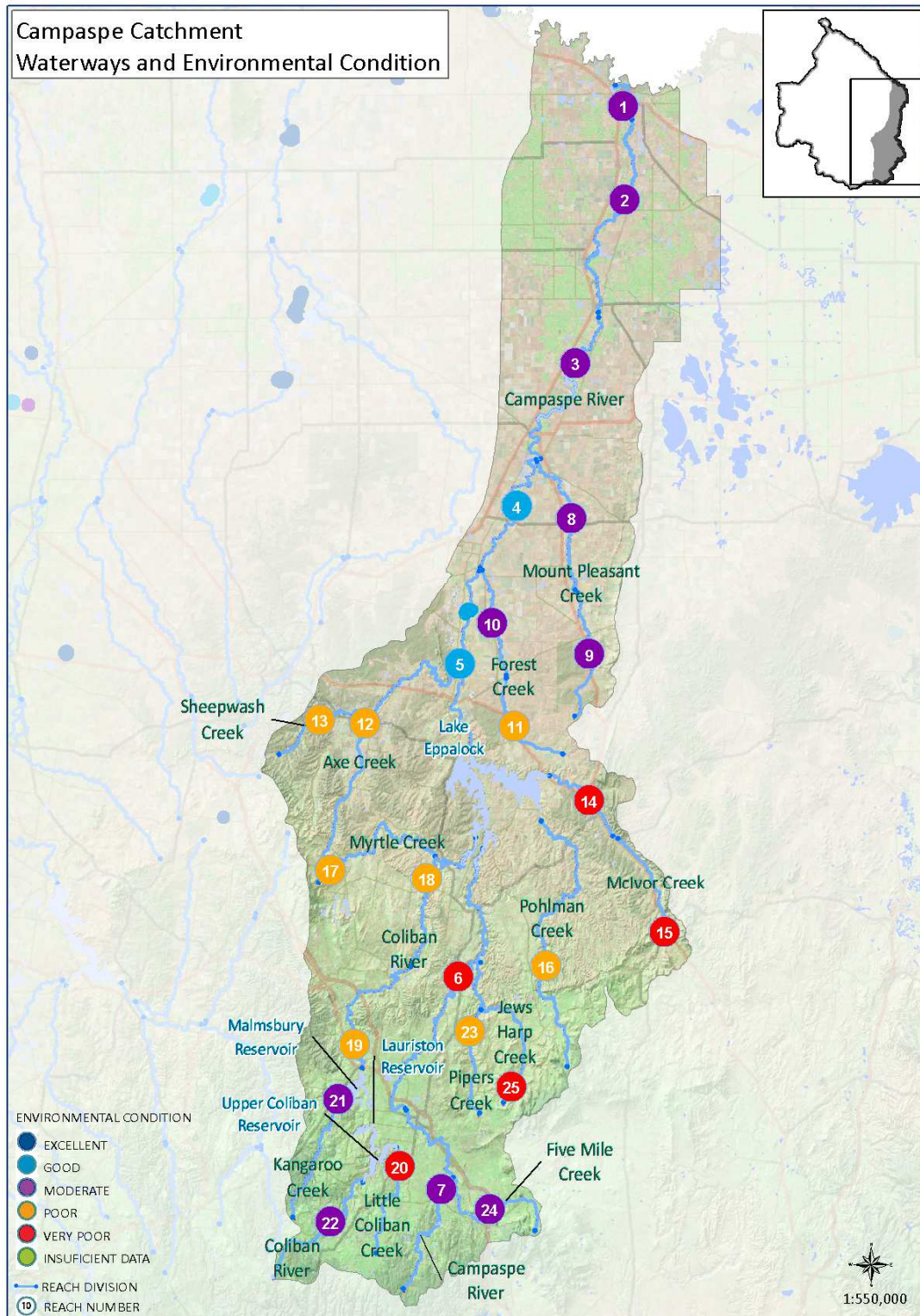
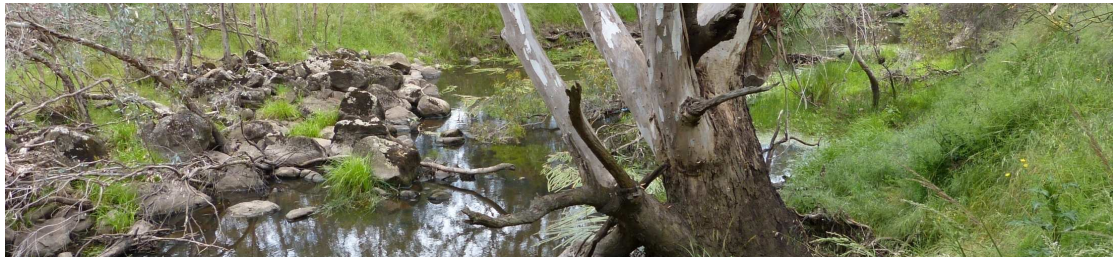


Figure 1: Map of Campaspe catchment waterways



Regional Waterway Strategy (2014-22)

The vision for the 2014-2022 North Central Regional Waterway Strategy (RWS) is:

‘Waterways and floodplains will be managed sustainably to protect and enhance their diversity and ecological function while also supporting the regional community’s economic, recreational and amenity use’.

The draft 2014-22 North Central Regional Waterway Strategy (RWS) provides a framework for the North Central Catchment Management Authority in partnership with other agencies, stakeholders, traditional owners and the regional community to manage the rivers and wetlands with the community over the next eight years. It delivers key elements of the state-wide approach outlined in the Victorian Waterway Management Strategy.

The purpose of the RWS is to ensure that the future management of our waterways keeps providing these important environmental, social, cultural and economic values. The strategy builds on the North Central Regional River Health Strategy (2005), but has a broader scope, now including the management of floodplains and wetlands as well as rivers.

The draft RWS identified the following long-term (8+ years) Resource Condition Targets for the Campaspe River, divided into the Upper (above Lake Eppalock) and Lower (below Lake Eppalock) Campaspe.

Upper Campaspe Resource Condition Targets

1. Improve the condition of the Campaspe River Reach 6 & 7 from very poor and moderate to good (based on Index of Stream Condition) by 2050.
2. Improve the condition of the riparian zone of the Campaspe River Reach 6 & 7 by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC.
3. Removal of willows along the Upper Campaspe River by 2030.

Lower Campaspe Resource Condition Targets

1. Improve the condition of the Lower Campaspe River from moderate to good (based on the Index of Stream Condition) by 2050.
2. Improve the condition of the riparian zone of the Lower Campaspe River by 2021 with a measured increase of one point in the streamside zone sub-index of the ISC.
3. The delivery of environmental flows are maximised contributing to increased hydrology and aquatic life ISC scores by 2021.



To work toward achieving these long-term Resource Condition Targets, the draft RWS sets out specific 1-8 year Management Outcome Targets and the associated activities/outputs required to achieve these. All actions outlined in the draft RWS are subject to available funding. The North Central CMA will work with partner agencies and the community to seek investment to implement the North Central RWS.

Resource Links

Draft North Central Regional Waterway
Management Strategy
North Central CMA
http://www.nccma.vic.gov.au//Publications/StrategiesPlans/index.aspx?itemDetails=7271&objectType=kms&searchfields=cs_ItemName

Victorian Waterway Management Strategy
Department of Environment and Primary
Industries
<http://www.depi.vic.gov.au/water/rivers-estuaries-and-wetlands/strategy-and-planning>

Aboriginal cultural heritage

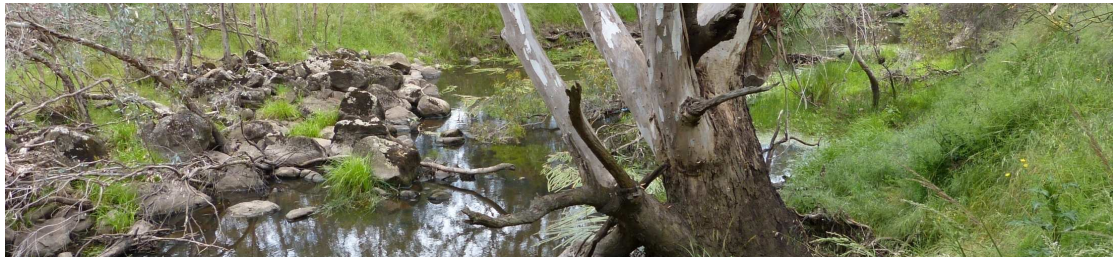
European invasion of Australia resulted in profound changes to the Traditional Owners and their landscape. Land clearing and occupation by the settlers, particularly along watercourses, displaced the Aboriginal people from their traditional land and deprived them access to many of their most abundant food, camp and water resources.

The Campaspe catchment is the Country of three Traditional Owner groups: Dja Dja Wurrung Clans Aboriginal Corporation west of the river to Rochester, Taungurung Clans Aboriginal Corporation east of the river to Rochester and Yorta Yorta Nations Aboriginal Corporation north of Rochester.

The riverine environment of the Campaspe River would have provided a rich diversity of food sources. Plant foods were the mainstay of the indigenous people, with hundreds of plants, such as the Myrnong, Cumbungi and Nardoo being utilised.

Aboriginal cultural heritage sites and areas are protected by legislation under the *Aboriginal Heritage Act 2006* and the *Aboriginal Heritage Regulations 2007*. As Indigenous heritage sites and places are at the core of Indigenous people's physical, spiritual and cultural existence and identity, Aboriginal Affairs Victoria must be consulted regarding their identification, protection and enhancement.

The North Central CMA has good relationships with Traditional Owners working on Country and is committed to supporting and developing partnerships in natural resource management. Our Indigenous Facilitator is invaluable in helping to ensure cultural heritage protection and Traditional Owner relationships are maintained and enhanced.



Resource Links

Yorta Yorta Nations Aboriginal Corporation
www.yynac.com.au

Dja Dja Wurrung Clans Aboriginal Corporation
 and Enterprises
www.djadjawurrung.com.au

Registered Aboriginal Parties map
http://www.dpc.vic.gov.au/images/documents/Aboriginal_Affairs/Statewide_Appointed_RAP_Dec_2013.pdf

European history of the Campaspe River

Major Thomas Mitchell's diary records his passing of the Campaspe River on 5 October 1836, about 3km south of the present site of Redesdale:

'...we descended into a grassy ravine, in which we found another river flowing northward; ...which I now named the Campaspe. It was difficult to find in this stream any fordable place where the banks could be approached by the carts, one side or the other proving too steep; but at length we succeeded'

The Campaspe River was named by Major Mitchell after a concubine of Alexander the Great whose portrait he had seen— he thought the river was so beautiful he was reminded of her.

In 1839, overlanders Joseph Hawdon and Charles Bonney described the lower reaches of the Campaspe River, near the Murray River confluence as:
"a very deep creek with deep stretches of water in it" (Priestly, 1965)

Hawdon recorded:

"We proceeded two miles further up the creek, where we had to cut away the bank with pick-axes before we could get the drays over, and even then were obliged to unload and carry up the goods by hand" (Coulson, 1979)

Heritage Victoria has listed the following historical sites along the Campaspe River on the Victorian Heritage Register:

- Windmill Bridge, Kyneton
- Degraes Campsite Mill (former)
- Adelaide Vale Homestead
- Mia Mia Bridge



Photo: Mia Mia Bridge, Redesdale



The following sites are listed under the Victorian Heritage Inventory:

- Mia Mia Mine
- Campaspe River Adit
- Campaspe River 'Italian' diggings
- Fergusons Bridge, Goornong
- Rogersons Bridge and Ford
- Carlsruhe Bridge Abutment 1
- Timber Bases, Lake Eppalock
- Former Elmore Water Tower



Photo: Fergusons Bridge, Goornong

Your local historical society houses original images, documents and articles relating to the early history of the Campaspe River and is well worth a visit.

Resource Links

Origin of the name Campaspe

<http://en.wikipedia.org/wiki/Campaspe>

Bendigo Historical Society

<http://www.bendigohistory.com/index.shtml>

Trentham & District Historical Society

<http://www.trentham.org.au/historical-society/>

Echuca Historical Society

<http://www.echucahistoricalociety.org.au/>

Kyneton Historical Society

<http://home.vicnet.net.au/~kyhist/>

Victorian Heritage database

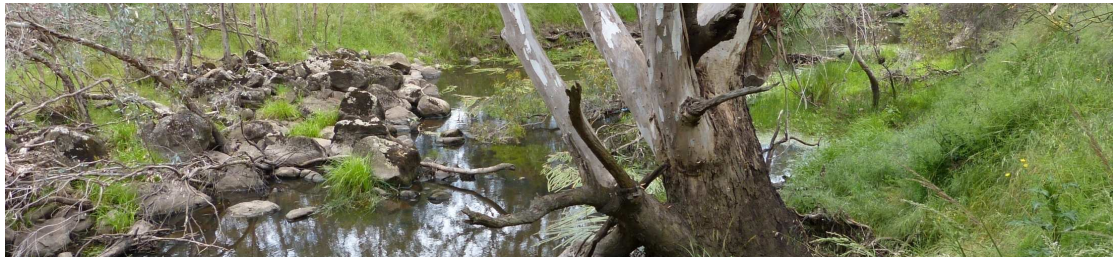
<http://vhd.heritage.vic.gov.au/vhd/heritagevic>

Early pastoralists

Mitchell reported '*lush pastures and fertile plains*' north of the Great Dividing Range. These enticing words enticed many settlers to trek overland from Sydney and north from Melbourne through the Black Forest into the Campaspe catchment.

By 1840 many farmers came north, mainly from the early-established Kyneton district and took up blocks. These early blocks were those near the river, but the later arrivals had to be content with land further away (resulting in the need to frequently cart water long distances during the dry season).

Downstream at Barnadown, Mr Henry Grey Bennett was the area's first squatter occupying the Barnadown Run in 1841. *"The first wool from the Barnadown Run was washed in the shallow crossing (on the Campaspe) opposite Mr Bennetts log hut. As the sheep were driven through, shepherds stood near the spots that were either deep enough or had been dug out to a depth to allow the sheep to be submerged when pushed under by the shepherds"*.



Downstream, at Burnewang the fine timber attracted Jeffrey Bros., millers from Kyneton since 1844, and they bought the “right of station” at Burnewang in 1853. Long straight props were carted to Bendigo, where box props were in demand for the mines.

The selectors, and those attempting to hasten their arrival in the area, spoke proudly of the richness of the soil. *“From about Goornong, and through the Runnymede and Rochester country, the land, almost without exception, is admirably adapted for farming. The soil is of uniform character for miles together, of great depth, and of excellent quality”*.

The early settlers used the Rocky Crossing at Barnadown as a stock route. *“Huge drays were driven over the Rocky Crossing before huge contracts were let for removing gravel banked up there in the river bed”* (Shay, 1966).

In 1860 Burke and Wills on their epic expedition, camped at Barnadown by the Campaspe River. Camels, horses, wagons and men crossed the river on the punt.

Andrew O’Keefe was the district’s biggest landowner in the late 19th century. A travelling companion, named Macartney described the area at the Axe Creek confluence in 1882, and wrote: *“The drive from Adelaide Vale to Kimbolton is a most interesting one. It is chiefly through the valley of the Campaspe, where the Axe Creek falls into the Campaspe, forming a natural delta and deep gorge, with high surrounding cliffs. Here, very little engineering skill and very little money would be required to form a large reservoir, by which a great extent of country down to the Terricks could be irrigated”*.

In 1894 Henry Goldsmith, a Kyneton lawyer and writer, wrote the following passage describing the river of contrasts. The river in December *“...was only a small creek, murmuring and eddying through the swaying rushes and the tufted grass roots...though in the winter flood time it could be fierce and boisterous...”*

In 1904 James Smith described the upper Campaspe catchment as: *“...a superb prospect of the country to the north, with Kyneton in the far distance. Numerous homesteads, neighboured by stockyard and environment by squares of yellowing corn, paddocks of brown fallow, dark green breadths of potatoes and pastures flecked by sheep or dotted with cattle. Fields bordered by hedgerows of blackberries, with here and there a country road margined by trees, an occasional charcoal-burner’s hut and all else is nature unadorned”*.

Beginning with the early squatters of the 1840s, many waterways of the Campaspe catchment were exposed to stock grazing, watering and sheep washing (prior to



shearing). This resulted in increased erosion rates, altered floristics due to preferential grazing, invasion of exotic weeds, increased stream turbidity, and increased input of nutrients and bacteria into the waterways.

Gold mining

The gold rush in the 1850s brought a massive influx of thousands of gold miners en route to the goldfields of the Campaspe catchment. This led to the settlement of many towns to service the flow of gold seeking travellers, including Woodend, Kyneton, Axedale and Barnadown.

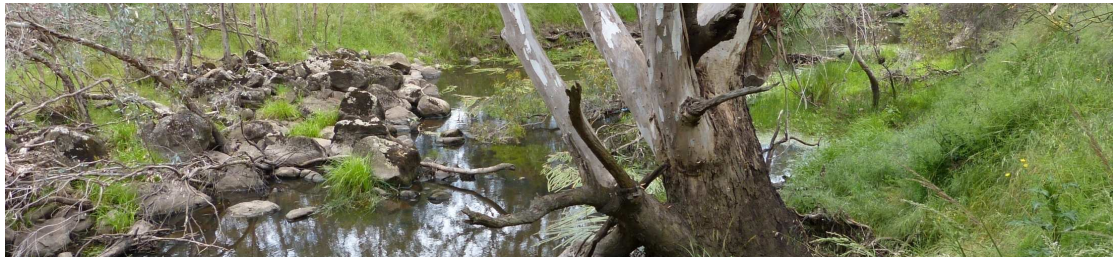
In 1857 a bridge was built over the Campaspe River at Axedale to replace the ford, which was impossible to cross during the floods of January 1856. *“At Axedale, the normally small and peaceful stream was wide and deep...People in scores of horse-drawn drays, spring carts, wagonettes, buggies and jinkers travelling and trading goods between the gold diggings of Bendigo and Heathcote were camped on either bank, waiting for the unseasonal torrent to subside”.*

The discovery of gold at Heathcote, Toolleen, Fosterville and Taradale contributed to their settlement. *“Heathcote was subjected to a great influx of people in 1853, following the discovery of gold in December of the previous year. Within a few weeks, 40 000 people were camped along the McIvor Creek where the town of Heathcote now stands”.*

The discovery of gold created a huge demand for timber, resulting in the wide-scale clearance of native bush. The gold miners needed timber to reinforce the underground tunnels and shafts, and fuel to drive the steam engines. The farmers wanted the trees cleared to allow the grass to grow, and logs for fences and farmyard buildings. Everyone needed firewood for cooking and heating. Quite rapidly whole areas were denuded of trees, and the remaining forests were harvested intermittently after that.

The rich alluvial deposits of gold were soon exhausted and while the population declined many gold miners remained in the region and took up land for agriculture or started businesses.

In the 1850s, the Axe Creek area began to fill up with former diggers who were obliged to return to such pre-rush pursuits as farming, horticulture, fruit growing and blacksmithing. Along the banks of Sheepwash Creek were vegetable gardens and a dairy to service the Bendigo goldfields.



Large scale clearing of the landscape resulted in a vastly altered catchment. ‘Opening up’ of the land for primary production and the subsequent development of broad-scale agricultural techniques has placed significant pressure on the riparian vegetation on both a local and catchment-wide scale. In most cases the fragmented areas of native vegetation that remain have reduced biodiversity and resulted in significant salinity and erosion problems.

European settlers caused profound changes to the landscape, imposing European and British ideals on the Australian land, especially around rivers and creeks. Land clearing, channelisation, draining and desnagging were all common practice and encouraged as part of ‘river improvement’ projects.

The effects of these practices are still very evident across our landscape today, particularly in central Victoria where the effects of the gold rush fundamentally changed the landscape through denuding forests and woodlands of vegetation and altering the course and condition of waterways.

Resource Links

Gold Mining – Victoria’s Northern Region
<http://www.egold.net.au/biogs/EG00299b.htm>

Goldmining at Kyneton
<http://www.egold.net.au/biogs/EG00207b.htm>

Provision of domestic and irrigation water

The discovery of gold in central Victoria in 1851 led to the rapid development of a number of substantial population centres. These towns had an urgent requirement for fresh water and for this reason the Coliban Supply System was developed.

The scarcity of water in the goldfields prompted the building of a reservoir in 1866 on the Coliban River south of Malmsbury, and the construction of a number of tunnels and several hundred kilometres of open channels and ditches to carry water by gravitational flow to the Bendigo-Castlemaine goldfields region. Malmsbury Reservoir has subsequently been enlarged twice in 1887 and 1940. Over the years increasing demand for domestic, irrigation and stock water have resulted in the construction of two more reservoirs on the Coliban River south of the original one: the Upper Coliban in 1903 and the Lauriston in 1941.

Major towns that the Coliban Water Supply System supplies today include Bendigo, Castlemaine, Woodend, Kyneton, Malmsbury, Heathcote, Axedale and Goornong. In addition to supplying water to the 50,000 residents in the Campaspe catchment, water is also transported via the system to the adjacent Loddon catchment, where it supplies a population of almost 100,000.



In 1882, the Campaspe Weir (2700ML) was completed 12km south of Rochester to supply the water needs for local irrigators via channels.

The reconstruction of the Waranga Swamp into the Waranga Basin in 1902 marked the beginning of large-scale irrigation water from the Goulburn River. At the Campaspe Siphon, 2km to the north of Rochester, the Western Waranga Main Channel (capacity 2,800 ML/day) is siphoned under the Campaspe River carrying irrigation water to northern Victoria irrigation regions.

Irrigated agriculture did not begin on a large scale in the Campaspe catchment until the completion of Lake Eppalock in 1963 on the Campaspe River a short distance downstream of its confluence with the Coliban River. Although initial investigations date back to the 1890's, construction did not commence until 1930 but ceased in 1933 due to economic depression when the dam had a capacity of only 1500ML compared with its planned 75,000ML capacity.

Lake Eppalock was enlarged between 1960 and 1963 to its present capacity of 312,000ML. The reservoir was constructed to:

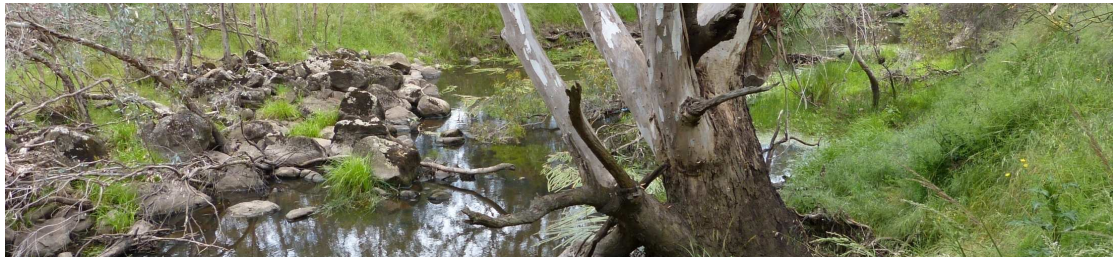
- safeguard the supply to the Coliban Supply System
- permit increased development in urban areas, including the Bendigo urban complex and other towns
- maintain the rural supply within the Coliban Supply System
- provide irrigation water to the Campaspe Irrigation District
- secure supplies to diverters along the Campaspe River downstream of the dam
- supplement supplies to the Waranga Western Main Channel.



Photo: Campaspe Weir, north of Elmore



Photo: Campaspe Siphon, north of Rochester



Under river regulation, stream flows are high during the irrigation period (August to May) and much lower during the remainder of the year. The flow regime of the Campaspe River below Lake Eppalock has thus been completely reversed by river regulation. This impacts upon the native aquatic and riparian ecosystems that rely on the seasonal river flows to survive and reproduce. The temperature of releases from storages also has the potential to affect river biota.

The Campaspe Irrigation District was developed as an intensive dairying area by the Rural Finance Commission from 1964 to 1976 on the dryland plains of the Campaspe catchment. Despite extensive surface drainage, high water tables developed quickly and salinity and waterlogging problems emerged in the late 1970s.

The Campaspe Irrigation District was decommissioned from 2010/11 following the uniting of the District with the larger Goulburn-Murray Irrigation District (GMID) to allow a number of existing Campaspe District irrigators to move to alternative supply arrangements sourced from the Goulburn system.

Groundwater is a significant and valuable component of the North Central region's water resources. Where a groundwater aquifer is highly connected to surface water, a decline in groundwater levels will affect users of both the groundwater and the connected surface water. The groundwater contribution to river flow is also reduced. It also impacts on wetlands and other dependent ecosystems like native vegetation. Groundwater is used extensively for stock and irrigation purposes and increasingly for town water supplies in the North Central region. In some towns, such as Trentham, groundwater is used to augment surface water sources, while in others, it is the primary potable water source, such as Elmore. Thirteen groundwater systems of different geology and flowpath lengths have been identified within the North Central region, consisting of local, intermediate and regional types. Dependable groundwater supplies for stock and domestic bores are available at depths less than fifty metres in some areas of the North Central region.

Groundwater use is most extensive in the south of the region for irrigation of horticultural crops and pastures. Mineral springs in this area are also used which also support both the processing and tourist industries. Increasingly, deep lead aquifers in the middle and lower reaches of the Loddon and Campaspe valleys are also employed.

Resource Links

Coliban Supply System
Coliban Water

<http://www.coliban.com.au/site/root/about/history2.html>

Water supply in the Campaspe basin
Goulburn-Murray Water

<http://www.g-mwater.com.au/water-resources/catchments/campaspebasin>



River flows

The river's natural flows and hydrologic cycles have changed significantly since settlement. Alterations to flow regimes, flood cycles and natural channel structure has left the rivers and creeks in a drastically altered flow regime. Weir construction, dams and irrigation diversions that completely changed the river are now controlled and managed within a very altered and regulated system.

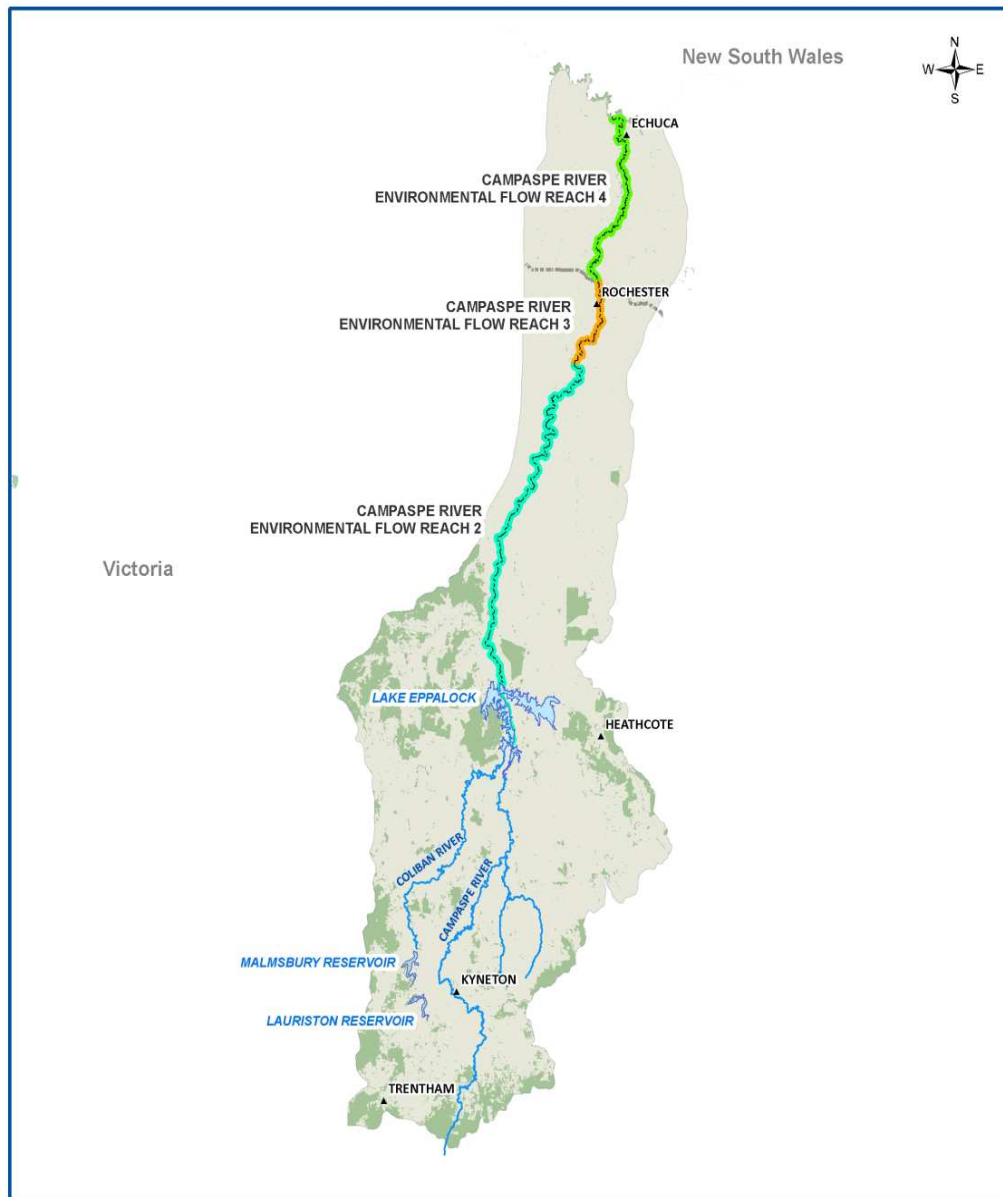
Environmental Flows

Flow regulation and over extraction were the most important factors in the decline of river health and loss of biodiversity in the Murray-Darling Basin. Many of the rivers and creeks in north central Victoria are 'flow-stressed' because too much water was extracted for other uses and natural flow patterns changed so dramatically.

There is a need for a balance between how much water we take out for industry, agriculture and domestic use and that which is left in the river system to maintain the environment. We now have an improved understanding of the environmental water requirements of our rivers, the benefits of environmental flows and better techniques and tools for assessing these needs.

The lower Campaspe River (below Lake Eppalock) is highly regulated due to the operation of Lake Eppalock, and the Campaspe Weir and Siphon, north of Rochester. Although highly regulated, the Campaspe has recently received significant volumes of environmental entitlements through the Goulburn- Murray Irrigation District Modernisation Project and the implementation of the Murray-Darling Basin Plan. This additional water provides a strong opportunity to meet the environmental flow objectives for the Campaspe and improve the health of the lower Campaspe over the coming years.

An environmental flow study was completed for the Campaspe River in 2005. The objective of the study was to provide a flow regime that reflects the natural seasonal pattern and variability required to enhance the ecological health of the river, rather than trying to return the river to pre-settlement conditions. Environmental flows for the Campaspe River are managed according to the objectives and delivery mechanisms for four distinct sections or river reaches, according to Figure 2.



Campaspe River downstream of Lake Eppalock Environmental Flow Reaches



- ▲ Main Towns
- EFlow Reaches**
 - CAMPASPE R2
 - CAMPASPE R3
 - CAMPASPE R4
- Reservoirs
- Waterways
- Campaspe Catchment
- Waranga Western Channel



DISCLAIMER:
This information product has been derived from the best quality data available at the time of its development. The North Central CMA accepts no responsibility for the accuracy of this product.

Figure 2: Campaspe River environmental flow reaches



During the Millennium Drought environmental water deliveries focused on emergency releases of water to avoid catastrophic events, principally fish deaths events. Inter-Valley Transfers provide summer base flows and some summer freshes downstream of Rochester along Reach 4 (see Figure 2).

Full entitlements have been reinstated in the Campaspe system since 2011 after a decade of drought, and with the establishment of the Campaspe Environmental Water Entitlement in July 2013 that has positioned the river for recovery after the drought and floods.

The current focus for environmental flow management is to both continue and maximise recovery of the Campaspe system after the drought. This will be achieved primarily by the provision of winter flow components including high flows and freshes.

Successful negotiations with the Commonwealth Environmental Water Holder have given North Central CMA access to a volume of water for use in the Campaspe, and inter-valley transfers provide an alternative pathway for delivering consumptive water to provide environmental benefit in Reach 4 below the Rochester Siphon. Environmental flows are only one part of a healthy river and the maximum environmental benefits can only be realised with complementary river restoration works such as fencing, erosion control, pest control and revegetation.

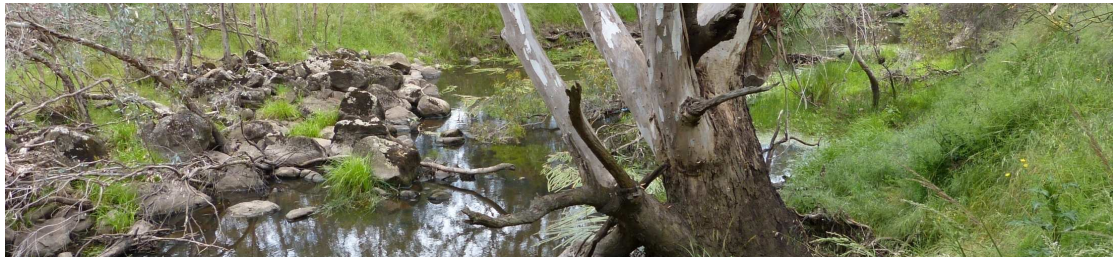
Resource Links

Campaspe River environmental flows
http://www.nccma.vic.gov.au/Water/Environmental_Water/Campaspe-Coliban_System/index.aspx

Flooding

The Campaspe River catchment experienced major flooding in three separate events in 2010-11. Flooding occurred in September 2010, November 2010 and January 2011. Riverine flooding downstream of the major water storages was progressively worse in each of the events, with the January 2011 thought to be the largest flood on record for the township of Rochester, affecting approximately 80% of the town.

Whilst floods can adversely impact properties, machinery, livestock and townships, flooding is also the key to maintaining the health of both the river and the floodplain. Transfer of sediments, nutrients and organic material between the river and the floodplain is vital to the maintenance of both ecosystems.



A flood stimulates a boom in floodplain productivity with the regeneration of floodplain and riparian plants, and the breeding of invertebrates and vertebrates such as waterbirds, frogs and tortoises. It opens the floodplain as new habitat for fish and macroinvertebrates and is often the cue for breeding for these species. As the flood recedes, it transfers organic matter back to the river, replenishing in-stream energy sources and ensuring recruitment in fish populations and insect communities.



Photo: Floodwaters along the Campaspe River at Elmore, January 2011

Throughout the drier decades, it can become very difficult to envisage a flood occurring in our region. With such high increases in our regional township populations, newcomers to the region may underestimate the impacts of flooding across central and northern Victoria. When floods do occur across our region it unfortunately provides those who live in flood prone areas very little time in which to respond. For that reason, it is important that all residents are aware of their flood risk and of some of the basic measures they can take to avoid its effects.

The North Central CMA's role with flood is to:

- Assist emergency services
- Collect flood information
- Implement recovery programs



Resource Links

Flood studies and plans
North Central CMA

http://www.nccma.vic.gov.au/Water/Floodplans/Management/Flood_Studies_and_Plans/index.aspx

Flood Victoria

Victorian Government

www.floodvictoria.vic.gov.au/centric/home.jsp

Water storages

Initial investigations into constructing a dam in the Eppalock region began in 1908, however it wasn't until 1960 that works began with construction completed by 1964. Lake Eppalock is the seventh largest lake in Victoria, covering over 3,000 hectares and holding more than 300,000 megalitres of water.

Lake Eppalock is an essential asset which forms part of the Central Victorian tourism industry with a variety of quality recreation options and businesses servicing visitors to the lake. Management by community and government enables investment and economic benefit while maintaining the value of the prime purpose of the lake to supply urban, irrigation and environmental water.

When full, Lake Eppalock holds 304,651 megalitres and in places is over 30 metres deep. This water is used to supply irrigation and stock and domestic users downstream as far as Echuca, 90 kilometres away.

As well as supplying raw water for urban treatment, Lake Eppalock also supplies water to White Swan Reservoir via the Goldfields Super Pipe for use by Central Highlands Water.

Goulburn-Murray Water controls 82% and Coliban Water controls 18% of the water in Lake Eppalock.

In addition to Lake Eppalock, Western Water manages the relatively small Woodend (Campaspe) Reservoir on the Campaspe River at Ashbourne that contributes to the Woodend water supply.

Coliban Water's Kyneton Water Reclamation Plant produces Class B water used to irrigate the Kyneton racecourse, sports grounds and botanic gardens as well as the extensive irrigation system on site at the water reclamation plant. In winter the majority of this water is stored in the on-site lagoons awaiting irrigation over summer or is discharged to the Campaspe River in accordance with the EPA licence.



Resource Links

'Lake Eppalock'

Goulburn Murray Water

<http://www.g-mwater.com.au/lakeeppalock>

Woodend Reservoir

<http://www.westernwater.com.au/wsservices/Pages/Reservoirlevels.aspx>

Campaspe Basin

jGoulburn Murray Water

<http://www.g-mwater.com.au/water-resources/catchments/campaspebasin>

Declared water supply catchments

http://www.nre.vic.gov.au/dpi/vro/nthcenreg.n.nsf/pages/nthcen_lwm_cma_dwsc

Lake Eppalock Land and On-Water Management Plan

http://www.g-mwater.com.au/downloads/Storages/2_Dec_13_-

[Lake Eppalock Management Plan FINAL - for web.pdf](#)

Wastewater discharge from Kyneton Water Reclamation Plant

Coliban Water

http://www.coliban.com.au/site/root/your_to_wn/coliban/kyneton.html

River health

The Murray Darling Basin Association Sustainable Rivers Audit in 2012 rated the health of the Campaspe River ecosystem as very poor.

The **Fish** community of the Campaspe River system was rated in very poor condition. The fish community of the Campaspe had reduced numbers of expected native species and low biomass of those native fish populations present. Alien species comprised over 90% of the biomass. Native fish recruitment was poor, moderate and extremely poor in the Upland, Slopes and Montane zones respectively. Large-bodied native fish were few, and showed no evidence of recruitment.

The **Macroinvertebrate** community of the Campaspe River system was rated in moderate condition. The Campaspe Basin ranked 11th of 23 basin valleys in the Murray Darling Basin for this theme. There was a moderate difference from reference condition for presence and frequency of occurrence of expected families in samples from edge and riffle habitats. The proportion of sites in moderate condition was high (57%) across all zones, and eight of the 33 sites (23%) were rated in good condition. Family richness was moderate and reduced compared to reference condition, with Lowland zone site communities being the most diverse.

The riverine **Vegetation** of the Campaspe River system was rated in extremely poor condition. The abundance and diversity of Campaspe riverine vegetation was in very poor condition overall and is notable for the extremely poor condition of the Slopes zone. The quality and integrity of valley riverine vegetation is in very poor condition



overall, with no difference between zones: Upland, Slopes and Lowland zones all show a very large difference from reference condition.

The **Physical Form** of the Campaspe River system was rated in moderate condition. Overall, the valley's riverine physical form was characterised by channel enlargement and simplification. There was also indication of elevated sediment loads since European settlement and associated sedimentation within the Lowland zone river channel and floodplain. Channel form, bed dynamics and floodplain form indicators were all moderate and showed minor differences from reference condition. Bank dynamics were in good (near reference) condition.

The **Hydrology** of the Campaspe River system was rated in moderate condition. The mainstem river reaches were generally characterised by a large difference from reference condition in flow seasonality, moderate alteration in flow variability and low- and zero-flow events and near to reference condition in high-flow and flow gross volume. The headwater streams were generally characterised by little or no alteration in any of these indicators. There was a large difference from reference condition for the flow regime within channels.

The Campaspe River represents a key reservoir of biodiversity across the Victorian Riverina and Goldfields bioregions. An important value is the relatively intact River Red Gum overstorey along lower ISC reaches 1 – 5 (Figure 1). In particular it contains many vulnerable, threatened or depleted Ecological Vegetation Classes (EVCs) including Plains Grassland and Riverine Chenopod Woodland.

Resource Links

Sustainable Rivers Audit
Murray Darling Basin Authority
<http://www.mdba.gov.au/sites/default/files/RA2-SUMMARY-FINAL.pdf>

Murray-Darling Basin
Murray Darling Basin Authority
<http://www.mdba.gov.au/about-basin>

Management of riparian land

Riparian (or riverside) fencing is the simplest way of managing animal access to waterways to protect water quality and river health values. Fencing riparian zones improves biodiversity of flora and fauna, reduces erosion and sedimentation and reduces stock losses.

Whilst there are considerations with fencing out river frontage, such as weed management, vermin control and fire hazard management, these impacts are all considered within management agreements to ensure landholders are supported to improve the health of the waterway.



The four year (2012-16) 'Caring for the Campaspe River' project is the first large scale onground works restoration project to be implemented, delivering river health improvements for the river. Funded by the Victorian government, the project complements the delivery of environmental flows downstream of Lake Eppalock. It also complements the modification of the Echuca stream gauge (completed in May 2014) to enable the passage of migratory native fish upstream from the Murray River.



Photo: Official project launch by Hon Minister Peter Walsh MP, 15 March 2013 at Rochester

The overall project target is to improve the condition of 400 ha of riparian vegetation along the Campaspe River leading to improvements in aquatic and riparian ecosystem health and fish population viability of the river.

The project area includes the Campaspe River (ISC reaches 1 to 7, see Figure 1), its aquatic environment and associated species and the adjacent riparian zone. The Campaspe River tributaries, floodplain and adjacent land use are excluded unless project work in these areas will have a direct benefit to the Campaspe River.

2012/13 marked the commencement of the project with the establishment of a Project Reference Group to guide the community engagement activities and prioritisation of on-ground works throughout the life of the project. This group meets quarterly and contains representatives of the community, Indigenous groups, local government and Goulburn-Murray Water.

July 2013 marked the beginning of three years of onground implementation of fencing, weed control and revegetation works on both private and public land along the river.

Earlier in 2013, 650 landholders along the entire river were contacted directly (with the assistance of local government) regarding opportunities to be involved in the project. The onground output targets for the project include:

- 80km of riparian fencing
- 163ha of woody weed control
- 48ha of willow control
- 80ha of revegetation
- community engagement activities



Over 130 individual landholders from along the length of the river expressed an interest in being involved in the project with which the North Central CMA is progressively working with.

Acknowledging that there is more demand than current funding levels, the North Central CMA is also working together with Landcare and community groups to support complementary works along the river through other funding opportunities. In this way, community groups can also benefit from the project with boosted membership and positive partnership projects.

Resource Links

<p>Caring for the Campaspe North Central CMA http://www.nccma.vic.gov.au/Water/Rivers/Campaspe_River/index.aspx</p>	<p>Managing riparian land Land & Water Australia http://lwa.gov.au/files/products/river-landscapes/pf020253/pf020253.pdf</p>
<p>Managing riparian widths to achieve multiple objectives Land & Water Australia http://lwa.gov.au/files/products/river-landscapes/pf040748/pf040748.pdf</p>	<p>Crown land water frontages Department of Environment and Primary Industries http://www.dse.vic.gov.au/property-titles-and-maps/managing-crown-land/managing-crown-land-fact-sheets/managing-crown-land-fact-sheet-crown-land-water-frontages</p>

Invasive plants and animals

Invasive (pest) plants and animals are a major cause of degradation to North Central Victoria's natural resources – our land, water, biodiversity and farmland assets. Their effective management is crucial to the environmental, economic and social wellbeing of our region.

All natural resource management practitioners have a duty of care to minimise the negative impact of invasive species on our natural assets. The North Central Invasive Plants and Animals Strategy (2010-15) was prepared to reflect Australian and Victorian biosecurity approaches to managing the risk and impact of invasive species across all land tenures.

A biosecurity approach combines species-led and asset-based approaches to invasive species management to achieve the most beneficial community outcomes from government investment. The North Central Invasive Plants and Animals Strategy adopts the biosecurity approach and sets clear goals and actions for invasive species management. It was developed with the input of natural resource management agencies and the community. It outlines high-risk invasive species and priority



natural assets under threat from invasive species in North Central Victoria, and highlights the importance of coordinated action and community engagement in tackling these issues.

Importantly, the strategy also recognises that there are many other invasive species that are not considered to be of high biosecurity risk, but which pose significant problems on a local or regional scale.

The control of weeds is important for the health of the Campaspe River, which itself provides provides a pathway for the spread of invasive species via seed and debris carried by water (including floodwater).

Willows in particular have a significant impact on river health and can increase erosion, consume a substantial amount of water and provide very little habitat value for our native animals, fish and water bugs, compared to native plants. They also restrict access for recreational activities such as fishing and boating.

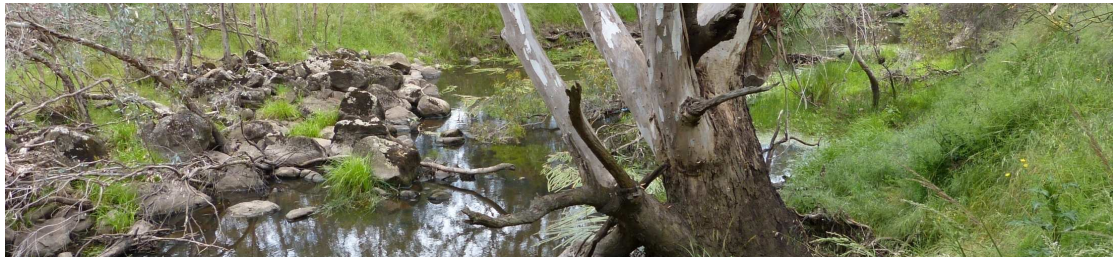
Management of weed species has benefits for both public and private land. Weed management helps to create an opportunity for native plant species to re-colonise areas previously dominated by invasive weeds; increase biodiversity values; prevent the further spread of invasive species; improve structure and function of land-based and aquatic ecosystems; increase community enjoyment and amenity values; and increase land productivity and value.

The distribution of weeds along the Campaspe River is largely linked to rainfall. The upper catchment has comparatively higher rainfall and is associated with woody weeds such as willow, gorse, blackberry, broom and hawthorn. The observed extent of Texas Needle Grass along the riparian corridor has also increased since the 2010-11 flood events.

Riparian weeds in the relatively drier lower catchment include olive trees, wild fruit trees, peppercorns, date palms, briar rose and pasture grasses.

Invasive animals of concern along the Campaspe River that are within the scope of the North Central Invasive Plants and Animals Strategy (2010-15) are rabbits, foxes, hares, feral goats, deer, cats and pigs. Exotic fish known to occur in the lower Campaspe River include:

- Carp *Cyprinus carpio*
- Gambusia *Gambusia holbrooki*
- Goldfish *Carassius auratus*
- Redfin Perch *Perca fluviatilis*



In addition to Carp and Goldfish, the upper Campaspe River also includes the following exotic fish:

- Rainbow Trout *Oncorhynchus mykiss*
- Brown Trout *Salmo trutta*

Resource Links

NCCMA Invasive Plants and Animals Strategy 2010-2015 North Central CMA http://www.nccma.vic.gov.au	Gorse National Best Practice Manual http://bit.ly/WCF8xW
'Willows in the North Central region'- Strategic Action Plan North Central CMA www.nccma.vic.gov.au	Victorian Blackberry Taskforce www.vicblackberrytaskforce.com.au/
Weeds of National significance –Willows www.weeds.org.au/WoNS/willows/resources.htm	Blackberry control manual http://bit.ly/Zcp0jm
Victorian Gorse Taskforce www.vicgorsetaskforce.com.au/	Identifying weeds www.weeds.org.au/weeds/lists/wons.html
Gorse –Weeds of National Significance www.weeds.org.au/WoNS/gorse/	Controlling carp <i>Landline</i> http://www.abc.net.au/landline/content/2012/s3550676.htm Information about carp http://www.dpi.nsw.gov.au/fisheries/pests-diseases/freshwater-pests/species/carp/general-information

Native flora and fauna

Native flora

The Campaspe River represents a key reservoir of biodiversity across the Victorian Riverina and Goldfields bioregions. An important value is the relatively intact River Red Gum overstorey along the lower ISC reaches 1 – 5 (see Figure 1). In particular, it contains many vulnerable, threatened or depleted Ecological Vegetation Classes (EVCs) listed below.

- No 56 Floodplain Riparian Woodland (Vulnerable)
- No 132 Plains Grassland (Endangered)
- No 803 Plains Woodland (Endangered)
- No 74 Wetland Formation (Endangered)
- No 168 Drainage-line Aggregate (Endangered)
- No 106 Grassy Riverine Forest (Depleted)
- No 823 Lignum Swampy Woodland (Vulnerable)
- No 267 Plains Grassland/Plains Grassy Woodland/GilgaiWetland Mosaic (Endangered)
- No 235 Plains Woodland/Herb-rich Gilgai Wetland Mosaic (Endangered)



- No 103 Riverine Chenopod Woodland (Vulnerable)
- No 295 Riverine Grassy Woodland (Vulnerable)
- No 814 Riverine Swamp Forest (Depleted)

The following threatened flora species are found along the riparian corridor of the Campaspe River:

- Buloke *Allocasuarina luehmannii*, listed under Flora and Fauna Guarantee (FFG) Act 1988
- Australian Anchor Plant *Discaria pubescens*, rare in Victoria
- Tufted Hair-grass *Deschampsia caespitose*, rare in Victoria

Native fauna

Many threatened fauna species also utilise the riparian habitat along the Campaspe River, including:

- Swift Parrot *Lathamus discolor*, endangered under the EPBC Act 1999, listed under FFG Act 1988
- Barking Owl *Ninox connivens connivens*, FFG listed
- Powerful Owl *Ninox strenua*, FFG listed
- Bush Stone Curlew *Burhinus grallarius*, FFG listed
- Crested Bellbird *Oreoica gutturalis gutturalis*, FFG listed
- Grey Goshawk *Accipiter novaehollandiae novaehollandiae*, FFG listed
- Speckled Warbler *Chthonicola sagittata*, FFG listed
- Flood dependant species - Diamond Firetail *Stagonopleura guttata* & Hooded Robin *Melanodryas cucullata cucullata*, listed as threatened under FFG
- Squirrel Glider *Petaurus norfolcensis*, listed as threatened under FFG



Photo: Swift Parrot (courtesy Chris Tzaros)



It also supports a range of aquatic fauna including platypus, water rats and fish. The Campaspe River is considered to have a high density of large wood instream, providing good habitat for native fish. Specific migratory native fish in the Campaspe River include Murray Cod, Silver Perch and Golden Perch. Non – migratory native species include Flathead gudgeon, Southern Pygmy Perch, Mountain Galaxias, River Blackfish, Australian gudgeon and Murray-Darling rainbowfish. Many of these fish species are listed as vulnerable, threatened or endangered:

- Golden Perch *Macquaria ambigua*, vulnerable under FFG
- Murray Cod *Maccullochella peelii peelii*, vulnerable under EPBC & threatened under FFG
- Silver Perch *Bidyanus bidyanus* , listed as threatened under FFG
- Trout Cod *Maccullochella macquariensis*, listed as endangered under EPBC threatened under FFG
- Murray Spiny Crayfish *Euastacus armatus*, FFG listed
- Murray-Darling Rainbowfish *Melanotaenia fluviatilis* FFG listed
- Macquarie Perch *Macquaria australasica*, listed as endangered under EPBC and FFG listed



Photo: Murray-Darling Rainbowfish

Resource Links

Wildlife of the Box Ironbark Forest
www.publish.csiro.au/samples/Box%20IronbarkSample.pdf

VicVeg Online
<http://www.vicveg.net.au/vvHome.aspx>

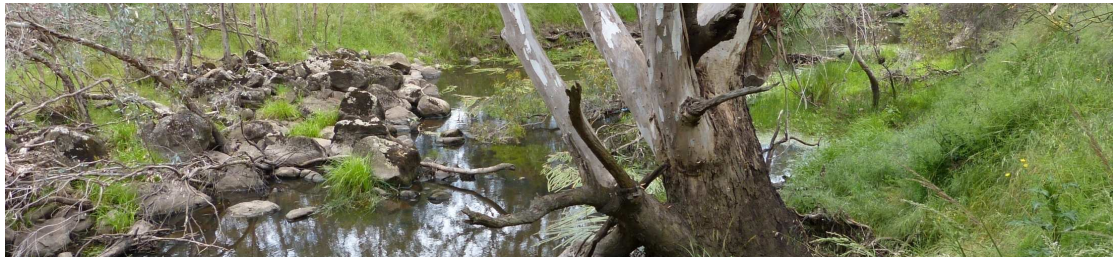
Native Vegetation Plan
 North Central CMA
<http://bit.ly/Zu0iyb>

Advisory lists of rare or threatened plants and animals in Victoria
 Department of Environment and Primary Industries
<http://www.depi.vic.gov.au/environment-and-wildlife/threatened-species-and->

[communities/flora-and-fauna-guarantee-act-1988/protected-flora-controls](http://www.depi.vic.gov.au/fishing-and-hunting/recreational-fishing/fish-stocking)

Fish stocking in our waterways
 Department of Environment and Primary Industries
<http://www.depi.vic.gov.au/fishing-and-hunting/recreational-fishing/fish-stocking>

Platypus and Water rats
 Australian Platypus Conservancy
<http://www.platypus.asn.au/>



Erosion control and sustainable soils

Australian soils have been subject to severe degradation ever since European settlers cleared the land and began developing it for agriculture.

Whilst Australia has long been a land of droughts and flooding rains highly variable climatic conditions have been much more prevalent with the onset of a protracted drought in the mid- 1990s. These climatic extremes leave the land much more susceptible to degrading processes that include wind and water erosion.

The soils of northern Victoria are subject to considerable pressures as farmers strive to achieve profitable agricultural enterprises in the face of highly variable climatic conditions, increasing market demands, and escalating production costs.

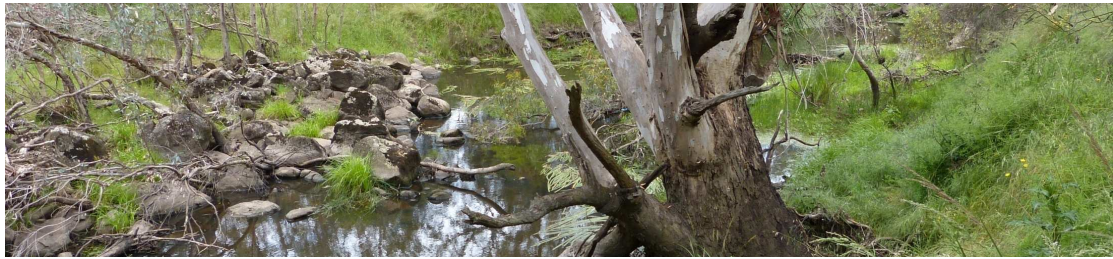
The economic value in protecting one of our most precious resources is enormous. Protecting our soils from erosion and improving soil structure will have added benefits right through the economy; from farmer to the consumer.

The Eppalock catchment in 1960 presented the former Soil Conservation Authority (SCA) with a unique challenge in soil conservation extension. Although there was the opportunity of undertaking a major soil conservation programme on a whole catchment basis, the Authority was also faced with some definite handicaps in undertaking this large works programme and associated extension activities.



Photo: Land degradation in the Campaspe catchment pre 1960

The Soil Conservation Authority developed a policy of assistance to landholders, and two types of works are involved to address the siltation threat to the proposed Lake Eppalock water storage. This included productive work, embracing general improvement in land use and management. This productive approach aimed to return value to the farmers for the capital and effort they put into their properties. Second, non-productive works, which included erosion control structures, stopping



gully heads, fencing to keep out stock, putting in silt traps, planting of trees and vegetation to stop gullies.

The Eppalock Management Project was a remarkable example of successful rural extension both in regard to its magnitude and results.

Resource Links

Riparian Land Management Technical Guidelines. Volume One: Principles of Sound Management. Chapter 6.

Land and Water Resources Research and Development Corporation (LWRRDC).

<http://bit.ly/YpYzYn>

Eppalock Catchment Project

Department of Environment and Primary Industries

http://www.nre.vic.gov.au/dpi/vro/nthcenreg.n.nsf/pages/nthcen_lwm_eppalock

'Farming for Sustainable Soils' Factsheet
North Central CMA

<http://bit.ly/XoFsh7>

'Land degradation and erosion'

Department of Primary Industries

www.nre.vic.gov.au/dpi/vro/nthcenreg.n.nsf/pages/nthcen_lwm_ld

Community

The North Central CMA works with community groups and individuals to protect and improve rivers and the natural environment in north central Victoria by undertaking projects to restore river health whilst funding on-ground works to protect and improve the environment.

North central Victoria has unique and sometimes complex social, economic and environmental values. In undertaking our role the North Central CMA recognises our responsibility to consult and work with local communities to look after the region's precious waterways and the surrounds for the use and enjoyment for future generations.

The communities that live along and near the Campaspe River have a strong association and affinity for the river and its natural and social values. Many landholders are committed to caring for and enhancing the river environment as indicated by the interest in fencing, revegetation and weed control incentives as part of the Caring for the Campaspe (2012-16) project delivered by the North Central CMA.



There are ten active Landcare and community groups along the river's length. These include:

- Ashbourne Landcare
- Carlsruhe Landcare
- Campaspe River Walk Committee (Kyneton)
- Langley Landcare
- Campaspe Valley Landcare
- Upper Campaspe Landcare Network
- Axedale Our Town Our Future
- Longlea & District Landcare
- Rochester River Reserve Committee
- Strathallan Family Landcare
- Echuca Landcare

In addition, there are several angling clubs, recreation clubs, such as golf courses and racecourses, field naturalists and Field and Game groups with interests in and alongside the Campaspe River.

There are also many primary and secondary schools located along the river's length, many of which are involved in regular water quality monitoring through the Waterwatch River Detectives program delivered by the North Central CMA.

People who love and depend on the Campaspe River have many memories and insights to share – of the river in flood, of the marvellous flora and fauna, and of the peace and tranquillity the river provides.

Take a minute to explore the Campaspe River through the eyes of these river champions...

Resource Links

Campaspe River 'champions'

Environment Victoria

<http://environmentvictoria.org.au/index.php?q=content/campaspe-river>

Axedale Our Town Our Future

<http://www.axedalevictoria.net/project-platypus.html>

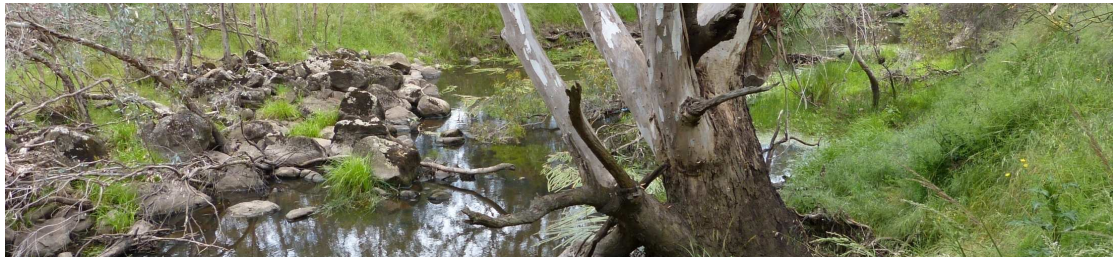
Victorian Landcare Gateway

<http://www.landcarevic.net.au/>

Waterwatch River Detectives

North Central CMA

<http://www.nccma.vic.gov.au/Water/Waterwatch/Education/index.aspx>



Recreation, fishing and tourism

The Campaspe River is particularly valued for fishing, boating, camping and passive recreation. The Campaspe Weir pool near Elmore holds particularly high social value for passive recreation (fishing & caravanning). Other popular sites include Turpins Falls (swimming, kayaking), English's and Barnadown bridges (camping, fishing) and Rocky Crossing Reserve (kayaking, camping). The river is a key feature of many towns along its length with community groups supporting enhancement works in Kyneton, Axedale, Elmore, Rochester and Echuca for passive recreation and tourism opportunities.

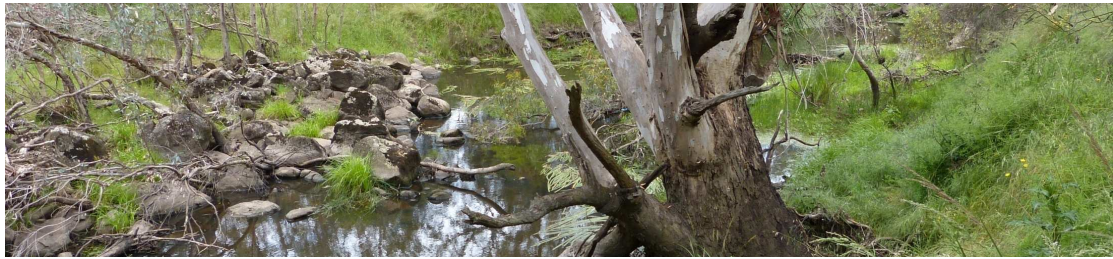


Photo: Turpins Falls, Langley



Photo: Summer swimming at Turpins Falls

Lake Eppalock, in the heart of the Goldfields, is central Victoria's largest water storage. Known as the "sailing centre of Central Victoria" the lake plays host to regular events throughout the year, including power boat racing. Around 40 sites around Lake Eppalock are now occupied by social clubs and commercial caravan parks.



Resource Links

Campaspe River fishing
Department of Environment and Primary Industries (DEPI)
<http://www.depi.vic.gov.au/fishing-and-hunting/recreational-fishing/fishing-locations/northern-victoria-inland-fishing-maps/campaspe>

Lake Eppalock recreation
Goulburn Murray Water
<http://www.g-mwater.com.au/water-resources/storages/campaspe/lakeeppalock>
 Turpins Falls
<http://victorianwaterfalls.com/turpins.html>

O'Keefe Rail Trail
Bendigo Tourism

http://www.bendigotourism.com/images/documents/okeefe_rail_trail.pdf

Search 'Campaspe River'
Parks Victoria
<http://parkweb.vic.gov.au/>

Axedale Our Town Our Future
<http://www.axedalevictoria.net/project-platypus.html>

Kyneton river walk
Macedon Ranges Shire Council
http://www.mrsc.vic.gov.au/Arts_Sport_Leisure/Healthy_Lifestyles/Walking_Routes_and_Maps

Local government in the Campaspe catchment

Shire of Campaspe
www.campaspe.vic.gov.au

City of Greater Bendigo
www.bendigo.vic.gov.au

Mount Alexander Shire Council
www.mountalexander.vic.gov.au/

Mitchell Shire Council
www.mitchellshire.vic.gov.au

Macedon Ranges Shire Council
www.mrsc.vic.gov.au