



Flooding for Life

SUSTAINING A VIBRANT
GUNBOWER FOREST





NORTH CENTRAL

Catchment Management Authority

Connecting Rivers, Landscapes, People

This booklet is prepared by:

*Melanie Tranter
Gunbower Forest Project Manager
North Central CMA*

*For further information visit
www.nccma.vic.gov.au and click on the
link to the Flooding for Life project.*

Paperback ISBN 978-0-9871960-0-2
Online ISBN 978-0-9871960-1-9



The North Central Catchment Management Authority acknowledges Aboriginal Traditional Owners within the catchment area, their rich culture and their spiritual connection to Country. We also recognise and acknowledge the contribution and interests of Aboriginal people and organisations in the management of land and natural resources.



Flooding for Life

Floods are a natural part of our catchment process. While they can cause significant economic and social damage, they also bring water to floodplains, wetlands and billabongs. In doing this, floods trigger an important cycle of ecological events - replenishing soil moisture, germinating seed banks and transferring nutrients between the floodplain and river.

The importance of floods is reflected in the vibrancy they bring to Gunbower Forest. Flooding sustains diverse life within the forest, allowing birds, fish and native animals to thrive.

As the waters recede, the forest comes to life and is enjoyed by people arriving to experience the recreational benefits that the water gives. Floods are vital for Gunbower Forest, and for all those who depend upon and value this significant site.

We face some challenges in ensuring that Gunbower Forest receives the floods it needs to flourish.

The Murray River is now a highly managed waterway, with many weirs and dams in place along its length to control its flows. As a result, floods that spill from the river into the forest are less frequent, shorter and smaller.

In addition, our changing climate is affecting rainfall patterns. Years of extreme drought and water scarcity across northern Victoria were followed by devastating floods in 2010–11. This highlights our region's increasingly variable climate and rainfall, and the need for us to adapt.

Through the Flooding for Life project, we are providing water to the forest in times when it needs it - reducing the gaps in its boom and bust cycles. This is part of a long-term commitment towards a healthy and vibrant forest for the benefit of everyone.

Throughout this publication, we've explained what is being done to achieve this.

David Clark
Chairman

North Central Catchment Management Authority

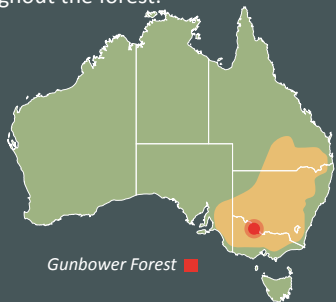
A walk-through Gunbower Forest

Gunbower Forest spans 20,000 hectares along the Murray River floodplain near Cohuna, downstream of Echuca. It is an internationally important wetland and includes one of the most significant remaining areas of River Red Gum forest in Australia.

It is also Australia's largest inland island, bounded by the Murray to the north and Gunbower Creek to the south.

The forest is home to many endangered plants and animals, such as the Giant Banjo Frog and Intermediate Egret. It contains numerous sites of Aboriginal and post-settlement cultural heritage. These sites indicate people's strong connection to the forest, both historically and today.

Recreational activities, such as camping, kayaking, fishing, riding and bushwalking are very popular throughout the forest.



Reedy Lagoon is one of the most intact examples of a floodplain billabong in the entire Murray River valley. It provides a reference by which the restoration of other Murray floodplain wetlands can be assessed.

Plants of many shapes and sizes

Gunbower Forest is a mosaic of River Red Gum, Black Box and Grey Box trees amongst wetlands on low-lying land, where water can be retained for long periods. Habitat is provided for a variety of wetland plants, fish, frogs, waterbirds and other aquatic species.

Surrounding the wetlands are River Red Gum trees, under which flood-dependent species such as sedges are growing. During floods, this environment provides fish nursery areas, feeding and breeding places for colony-forming waterbirds and waterfowl, as well as breeding sites for frogs.

Stepping up on to the higher ground, the understorey beneath the River Red Gums becomes grassier and requires less water. Here, the forest transitions into Box woodlands where Grey Box trees can be found.

Channels run throughout the forest, bringing water from the Murray River during smaller floods. In larger floods, the river breaks its banks providing much needed water to plants across vast areas of the forest.





Going with the flow

As water moves into the forest, so do the waterbirds. Thousands of waterbirds migrate to the area to breed, taking advantage of the abundant food resources that follow the floods.



Special bird breeding site

The importance of Gunbower Forest for bird breeding has been recognised through its listing on the Register of the National Estate (Australian Heritage Council). The area is known as an 'indicative place' for waterfowl breeding and a Wetland of International Importance under the Ramsar Convention. It is also subject to migratory bird international treaties with Japan and China.



The Ramsar convention

Ramsar is an environmental treaty that focuses on the conservation of internationally-important wetlands. The convention was signed in 1971 in the town of Ramsar, Iran. Gunbower Forest was designated a Ramsar area in December 1982. A management plan guides activities at the site to meet the obligations of this treaty.

Trouble ahead unless we act

The pattern of the Murray River's flow is no longer natural. It is highly controlled through the placement of dams and weirs along its length. This regulation reduces the river's natural variability and allows water to be stored and diverted for human use.

Regulation of the Murray has meant that fewer floods occur and, when they do, less water breaks the river's banks and reaches Gunbower Forest. This has impacted on the diverse plant and animal life throughout the forest.



Flooding of the River Red Gum areas of Gunbower Forest



Reduced flooding

According to climate change predictions, floods are expected to occur less often and for shorter periods. For example, we have already seen a significant decrease in large floods that encourage major bird breeding.

From the mid-1990s to spring 2010, Gunbower Forest suffered extensively through lack of water. It relied upon minor flooding, environmental water and rainfall. By 2008 around 5% of our surveyed trees were dying each year and around 60% were extremely stressed.

By having a means of delivering water to these areas, this decline can be arrested when natural floods do not occur. This was evident by the quick recovery of the stressed trees when they got the water they needed during the flooding of spring 2010.

This graph depicts the number of times the River Red Gum areas of Gunbower Forest would have flooded between 1997 and 2006. It compares the differences between the flooding that actually occurred against what would have happened without regulated river conditions.

What it shows is that, even during one of the worst droughts on record, the River Red Gum forest would have received six large floods during the period shown.



Before flooding



After flooding

Something fishy

Gunbower Creek provides fantastic habitat for native fish.

The use of Gunbower Creek as an irrigation supply carrier has ensured some permanency of water in the creek and its weir pools, maintaining native fish populations. This has helped to support a good diversity of native fish in Gunbower Creek, but their numbers are much less than expected.

The weirs that were built as part of this system prevent fish moving freely along the creek and stop the high winter flows that bring food for the fish and provide triggers for breeding.

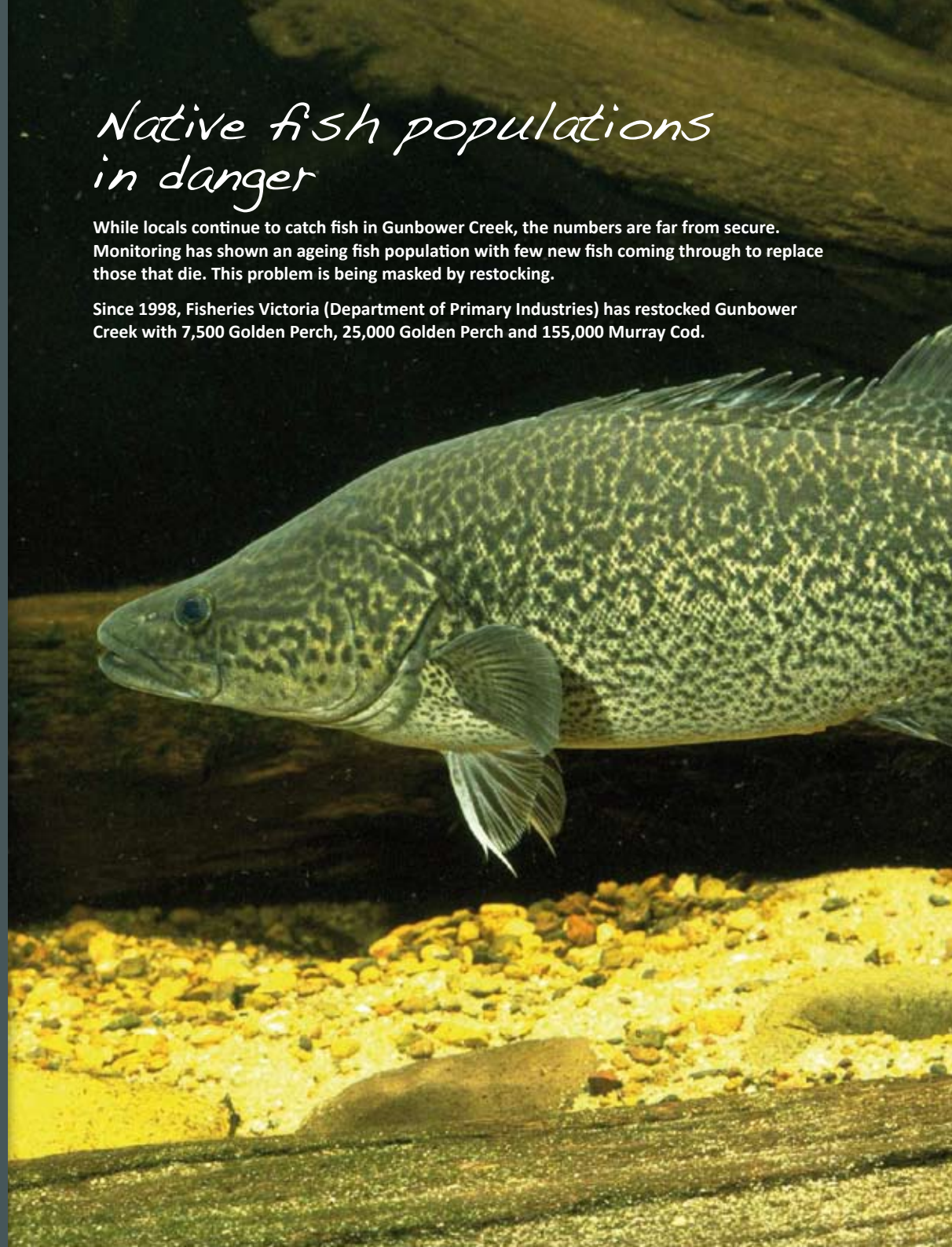


The above graph shows the numbers of Murray Cod caught in Gunbower Creek against a "mystery location" with similar habitat. The differences can be attributed to weirs and low winter flows in Gunbower Creek that don't occur at the mystery site. This shows the potential for recovering fish populations if we get these two things right.

Native fish populations in danger

While locals continue to catch fish in Gunbower Creek, the numbers are far from secure. Monitoring has shown an ageing fish population with few new fish coming through to replace those that die. This problem is being masked by restocking.

Since 1998, Fisheries Victoria (Department of Primary Industries) has restocked Gunbower Creek with 7,500 Golden Perch, 25,000 Golden Perch and 155,000 Murray Cod.





Barriers to fish movement

Restoring fish populations partly depends on enabling them to move more freely between the Murray River, Gunbower Creek and Gunbower Forest.

Fish movement is currently blocked at various points along Gunbower Creek. Barriers at the top (National Channel Offtake) and bottom (Koondrook Weir) restrict fish from moving in and out of the creek. This disconnects the creek from the main breeding populations of species in the Murray River such as Murray Cod, Golden Perch, Silver Perch and Bony Bream.



A tricky proposition

Fish and larvae entering Gunbower Creek must first pass through the National Channel Offtake regulator. As they pass beneath the gates of the regulator, the pressure of the water is so strong that most of them die. This stops fish moving back into the Murray River and reduces the flow of new genes, which could result in a decline in fish numbers or even local extinctions.

Hidden treasures

Depleted woodlands

Box woodland in Gunbower Forest consists of Black Box and Grey Box trees. In some areas, one or the other dominates, while in other places there is a mixture of the two species.

Gunbower Forest is home to the largest remaining intact area of Grey Box forest in Victoria. This helps it to be one of the best surviving examples of this kind of forest. Different animals and wildflowers can be found in the box woodlands and goannas are commonly seen.

Grey Box Grassy Woodlands have recently been listed as endangered under Commonwealth law. This means that they are protected and strict approval processes exist around any activities that may impact upon them.

The importance of the Grey Box trees within Gunbower Forest has also recently been recognised through the Forest's incorporation into the Gunbower National Park.





River Red Gum communities

The term 'community' is used to describe a whole suite of plants that live in a particular area. While River Red Gums are common, many of the plants that grow beneath them are not. It is these rare plants that result in Gunbower Forest's River Red Gum communities being classed as threatened.



A working river

River regulation has allowed Murray River communities to develop and prosper. With irrigation came burgeoning agricultural industries, especially fruit, dairy, and wine. For example, the gross annual value of agricultural production in the Loddon Campaspe Irrigation Region, which includes the Torrumbarry Irrigation District around Gunbower Forest, was \$370 million from 359,000 hectares of farmland in 2007.

River regulation also moderated the damage from uncontrolled floods and kept the river flowing during droughts. Yet there have been unintended environmental consequences. Carefully restoring Gunbower Forest's water-dependent ecosystem is the theme of this publication.

A changing forest

Dry conditions throughout Gunbower Forest have changed the types of plants that are present. This is greatest in the understorey of the River Red Gums, where native plant diversity has fallen and weeds are growing.

Of most concern are the grasses, wildflowers and sedges that grow beneath the big trees. Many flourish only after flooding, setting seed and dying until the next flood comes along. If the period between floods becomes too long, the viability of the seed reduces and less of them reappear over time.

It is the disappearance of these plants that leads to the loss of diversity in the forest, which has a profound effect on the ecosystem.

River Red Gums under which flood-dependent plants live have now shrunk to a narrow zone around and reaching into the wetlands. They crowd the open areas to access water, which has affected the types of waterbirds that use them.

The area of wetlands has therefore reduced. On higher land now rarely reached by water, River Red Gums are being replaced by the less flood-dependent Black Box woodlands.



Local fish extinctions

Of the 22 species of native fish expected to be present, seven of these are now considered locally extinct in Gunbower Creek. These are the Macquarie Perch, Murray Hardyhead, Southern Purple Spotted Gudgeon, River Blackfish, Southern Pygmy Perch, Olive Perchlet and Murray Galaxias.

Some of these changes happened quickly. During the 1960's Macquarie Perch was so abundant that people could "scoop them up with pitchforks within the lagoons and billabongs" (local resident, Cohuna).

The main reason for local fish extinctions is changed flow patterns, the presence of exotic fish and barriers that prevent fish from moving freely and breeding throughout the creek. Feral fish species such as Carp and Redfin Perch compete for habitat and can host viruses which can kill native fish.





A forest lifeline

The North Central Catchment Management Authority (CMA), together with other agencies, is working to provide a lifeline for the forest. With funding from The Living Murray program, we are building water management structures to provide Gunbower Forest with water in a way that is similar to natural flooding. Up to 5,000 hectares of forest will receive water this way.

We have used specialist advice to assist us, such as ecologists, engineers, soil scientists and surveyors. Local knowledge has also been a key part of this process.

We will monitor our work to understand how successful we have been in bringing new life to Gunbower Forest.



Electrofishing in the forest wetlands.

About the North Central Catchment Management Authority

The North Central CMA is the lead agency coordinating and monitoring natural resource management in north central Victoria. We work with local communities to manage and protect the region's diverse environment.

A key part of our role is providing environmental water to important sites, including Gunbower Forest through the 'Flooding for Life' project. We use the best available science as the basis for this work.

Together with the community, the North Central CMA has developed the Gunbower Creek Waterway Action Plan to identify priority actions to protect the future health of the creek. Key issues identified through this process included terrestrial and aquatic weeds, water quality, grazing of stream frontages, native fish management and flow in Gunbower Creek.

Using this plan, we have been successful in securing funding to commence implementing a range of activities. This has allowed for things such as fencing creek frontages, willow and blackberry control, trials for aquatic weed control, the installation of a fishway at Thomsons Weir and the development of environmental flow recommendations for the creek.

The health of the creek is influenced by its management as an irrigation carrier and the farming activities that occur around it. The North Central CMA works closely with a range of agencies such as Goulburn-Murray Water and the Department of Primary Industries to foster an integrated approach to the management of the creek.

For more information visit www.nccma.vic.gov.au



Our project vision

*To maintain and improve
Gunbower Island by enabling
native plants and animals
to flourish, restoring the
floodplain's health for
future generations.*



The Living Murray

The Living Murray is a major river restoration program. It was initiated in 2002 in response to evidence showing the declining health of the Murray River. It focuses on restoring the health of six significant sites – known as icon sites – along the river.

As part of this program, water management structures are being built at icon sites to enable water from the Murray to reach targeted floodplain areas.

The Living Murray is the largest environmental works program of its kind in Australia. It will support 37,000 hectares of significant forests, wetlands and lakes along the Murray River system.

The Living Murray program is a joint initiative of the New South Wales, Victorian, South Australian, Australian Capital Territory and the Australian governments, coordinated by the Murray–Darling Basin Authority.

For further information about The Living Murray, visit www.mdba.gov.au

Icon sites

Gunbower Forest, combined with Koondrook–Perricoota Forest in NSW, has been identified as one of six icon sites through The Living Murray program. The map below shows the location of each icon site. These sites were chosen for their environmental, cultural and international significance.

Each icon site has specific ecological targets that we are seeking to achieve. At Gunbower Forest these relate to wetlands, River Red Gum forest, waterbird breeding and native fish.



Water to the rescue

Managed floods have been delivered to Gunbower Forest since 2003. This has allowed us to see first hand what can be achieved when this water is used well.



Peregrine Falcons, a worldwide depleted species, have been regularly breeding in the flooded Gunbower Forest wetlands.

Environmental water

An environmental water entitlement provides water to protect rivers and wetlands. It is particularly important in droughts when it can be used to create refuges in a dry landscape. In wetter years when more water is available, environmental water helps the environment rebuild and prosper.

Environmental water is legally set aside to protect rivers and wetlands – using it does not affect anybody else's water allocation. The amount of environmental water available each year varies depending on water availability and seasonal allocations, as is the case for other water users.

Gunbower Forest may have access to environmental water from a range of sources, including:

- The Living Murray program
- The Commonwealth Environmental Water Holder, which has obtained the water through Australian Government initiatives
- The Victorian Government Environmental Water Allocation for flora and fauna conservation.

For more information about **environmental water** visit www.nccma.vic.gov.au

Getting results

These 'managed floods' have stimulated many of the environmental benefits of natural floods. The water provided a refuge for waterbirds and fish in an otherwise parched landscape. It enabled local plants to complete their lifecycle and replenish their seed banks, improving their resilience.

More aquatic vegetation is now present amongst wetlands. River Swamp Wallaby Grass—threatened in Victoria—was found growing at Black Swamp. Many waterbirds have been seen at flooded sites, including waterfowl, waders, raptors and colony nesting species. Rare birds observed at watered sites include the Australasian Grebe, White-bellied Sea Eagle and Eastern Great Egrets.

Importantly, the Eastern Great Egret – threatened in Victoria and nationally – has been breeding in the flooded wetlands. This is a sign that we can get the results we are looking for.

We have also found a range of frogs and fish. In the creek, three fish species appeared in surveyed catches for the first time: Freshwater Catfish, Bony Herring and Trout Cod.



Encouraging responses

Larger predatory birds, such as this Whistling Kite in the Little Gunbower Wetland, enjoy the increased food supply during floods contributing to the cycle of life.

Rare butterfly makes a comeback

Environmental water releases to the parched Gunbower Forest during 2008 were rewarded with a resurgence of plant and animal life, including the return of a rare butterfly—the Spotted Grass Blue Butterfly. It was the first time this butterfly had been recorded in Victoria for 15 years.

This butterfly feeds on a rare plant found around the edges of the wetlands which has grown prolifically since the managed floods commenced.



Carpet Pythons

Once common, Carpet Pythons are now endangered in Victoria. They are non-venomous and grow up to three metres long. They have recently been sighted around environmental water in the forest after a long absence.



Yellow-footed Antechinus

The Yellow-footed Antechinus is an adaptable little native marsupial that resembles a mouse. It feeds on invertebrates, eggs, nectar and sometimes small birds. Flooding helps to increase its food supply and it has been seen more commonly around the forest since water releases commenced. Unfortunately for the males, they have a two week frenzied mating season that ultimately results in their death.





Flooding the Forest



The Flooding for Life project is creating ways to deliver water to different areas of the forest through Gunbower Creek when environmental water allocations are available. By using this infrastructure to supplement natural inflows from the Murray River, we can use much lower volumes of water to provide the floods the forest needs.



Turtle passage is considered as part of the design of all new regulators.

Wetland regulators

Gunbower Forest wetland regulators allow water to reach areas that need flooding more often. By building a series of regulators, we can control where water flows, improving water efficiency.

The first wetland regulator was built in 2006, with the construction of the Little Gunbower Creek regulator. This was followed by upgrades to the Yarran Creek, Reedy Lagoon and Black Swamp regulators in 2011.

The installation of a new fishway at the Yarran Creek regulator will enable native fish to swim in and out of wetlands, ensuring that they are not trapped when the forest dries out.

Murray River regulators

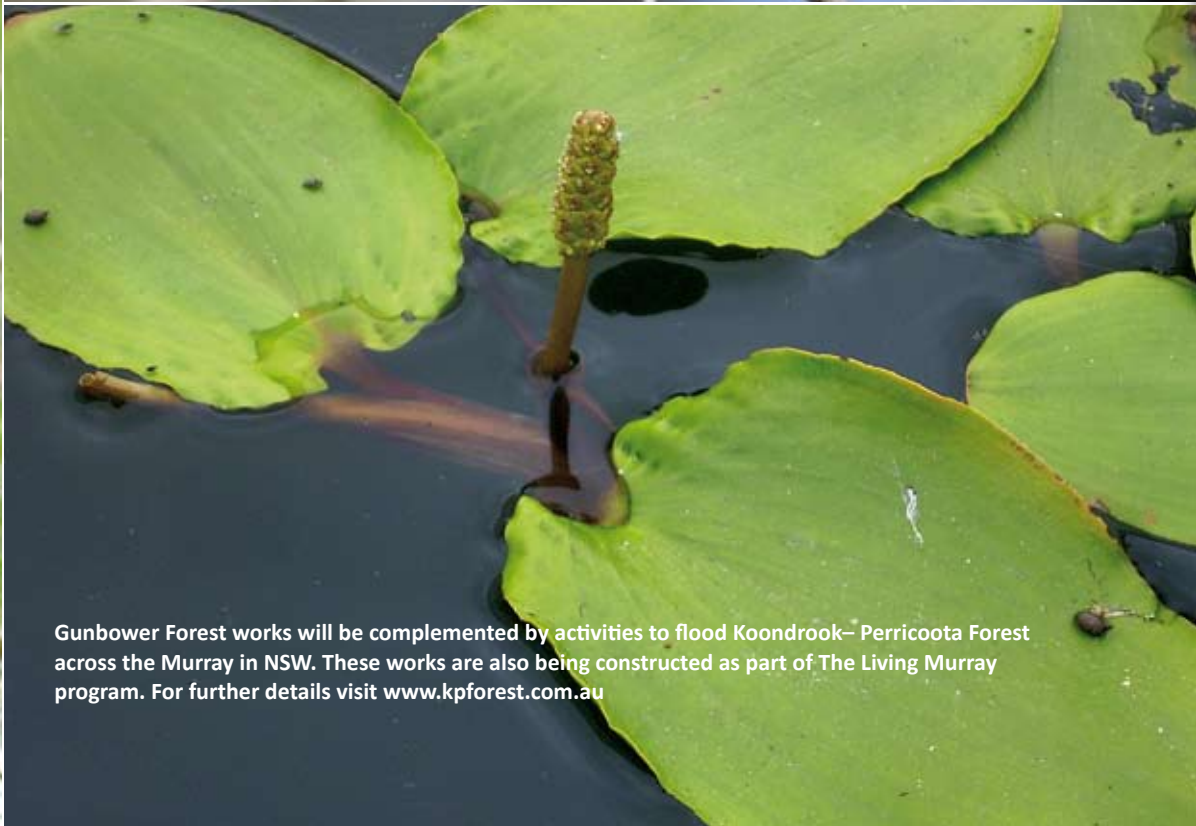
The Shillinglaws, Barham Cut and Wattles regulators were upgraded in 2006.

When the Murray River has high flows, these regulators can open to capture passing water and fill the forest wetlands. They can also be closed to retain water within the forest and reduce the amount of environmental water needed for managed flooding.

Solutions for

Large volumes of water need to be delivered to get the water to push out of the depressions and into the River Red Gum trees. A large channel is planned to drop water into the top of the River Red Gum forest, resulting in around 5,000 hectares of forest being flooded.

River Red Gums



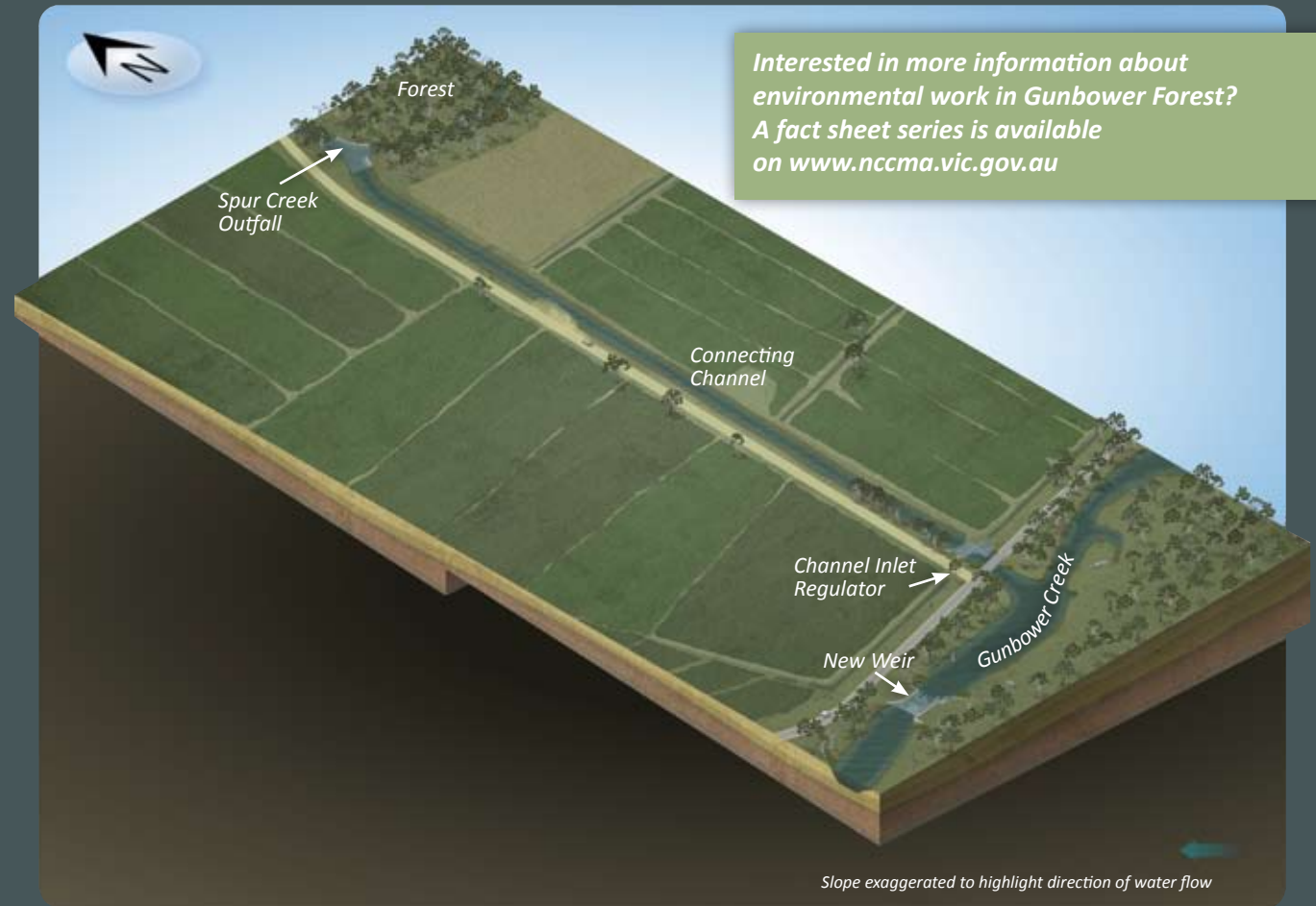
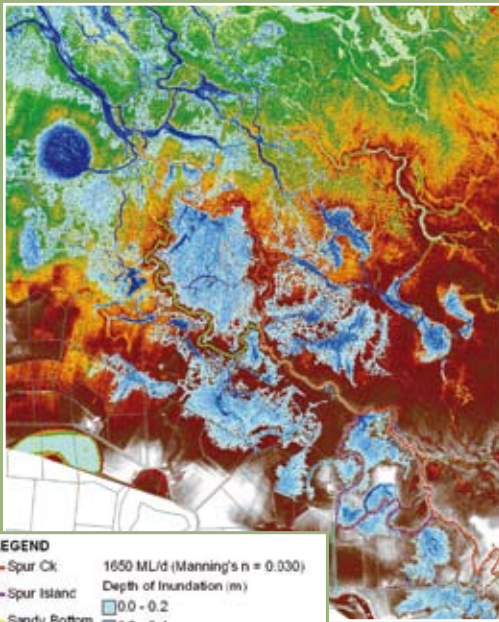
Gunbower Forest works will be complemented by activities to flood Koondrook– Perricoota Forest across the Murray in NSW. These works are also being constructed as part of The Living Murray program. For further details visit www.kpforest.com.au

Working out the science

A one metre grid survey has been captured by flying over the Gunbower Forest floodplain and checked using on-ground surveys.

A topographic computer model was then built to simulate what happens when water is released from different points. It was an important piece of work, helping us to select which works to build.

After checking the model against past flood events we have found it to match up well. To do this we looked at satellite images of flooding, old forestry inundation maps, local knowledge and environmental water releases.



Works to be done

In the Hipwell Road area Gunbower Creek meanders close to the edge of the forest. By constructing a short channel we are able to tap into a major floodrunner (Spur Creek) which passes near the forest boundary. Spur Creek will then distribute the water through the forest in the same way it does in a natural flood.

To do this, a one kilometre channel will be built connecting Gunbower Creek to Spur Creek. Flow into the channel will be controlled by a regulator that will be constructed at its connection to Gunbower Creek.

Given the flat landscape, a new weir on the creek is needed to push the water out into the forest.

Some works will be needed to prevent water escaping from low spots in the forest and along Gunbower Creek. Different options are being explored, including flood easements and levees.

Minor erosion control works will be undertaken at the forest outfall (where water spills back to Gunbower Creek) and at the channel outfall into Spur Creek.



For more information on our seasonal watering proposals visit the environmental flows page on the North Central CMA website on www.nccma.vic.gov.au

Joining with nature

Environmental water is intended to meet the shortfall between natural flooding and the forest's water needs. Often the water available is not enough to bridge this gap. In this case, decisions about where to use environmental water are based on where the best results can be achieved.

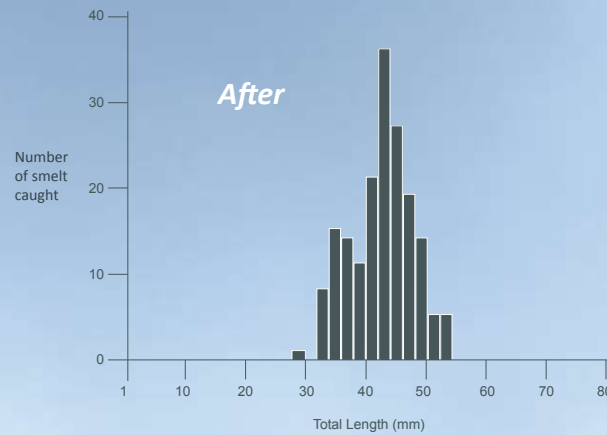
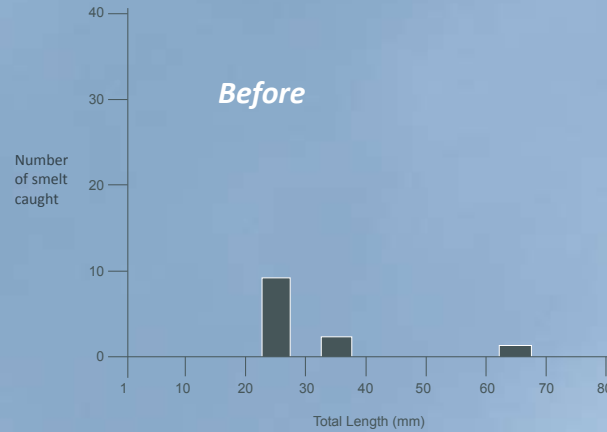


Small native fish - the unsung heroes

Stimulating the breeding of small native fish is a key part of our operating strategy as they are a building block in the local food chain.

Flooding starts a surge in the presence of water insects and zooplankton, which feeds the small native fish and encourages them to breed. The small fish then become food for larger fish like the Murray Cod. The number of small fish present influences the number of fish eating birds, like the egrets, that breed in the forest.

Our releases have been successful in building up the numbers of the small native fish. These graphs show the number of Australian Smelt found at a monitoring site in Little Gunbower Creek before and after releasing environmental water:



Operating strategy

A strategy for the future use of the regulators has been developed by the North Central CMA. This strategy considers how water should be delivered to the forest to provide fully managed floods or to supplement natural inflows from the Murray River.

The aim of the strategy is to supply the water needed to meet a range of ecological objectives set for the wetland, River Red Gum, frog, fish and waterbird communities of the forest.

It considers how often the water is needed, when it should be delivered and for how long. It takes into account some of the risks (such as aquatic weed invasion) which may influence how we operate the works.

The operating strategy will be used by the North Central CMA to prepare seasonal bids for environmental water.



Sharing the system

To deliver water to Gunbower Forest we need to work in with other users of the system. We do this by working closely with the system operators (River Murray Water and Goulburn-Murray Water) during the planning and delivery stages.

Hybrid floods

When the Murray River is high and enters Gunbower Forest, additional water may be diverted into the forest as environmental water. This is done to increase the length and size of smaller floods, and to allow waterbirds to complete their breeding cycle. By building on natural floods, greater ecological responses can occur, using less environmental water.

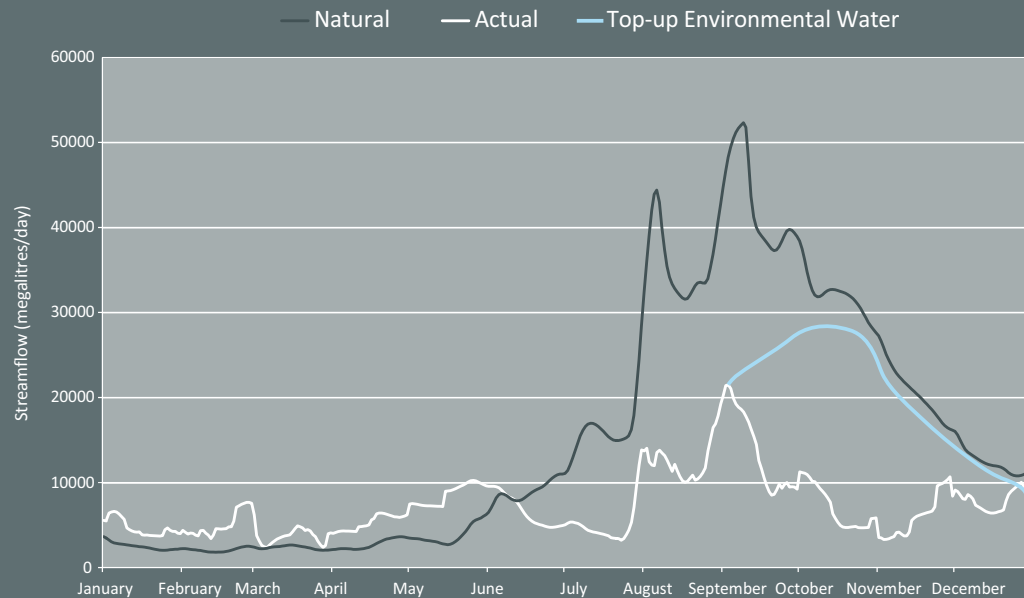


Just add water

In 2005, the Murray River flooded and water flowed into Gunbower Forest wetlands. The flood was relatively small and dropped away quickly.

Without river regulation, the flood would have been much bigger. This meant that the right cues were around to trigger waterbird breeding - if the flooding could be maintained long enough for them to rear their young.

By adding environmental water via the Yarran Creek Regulator, the flood's length was extended. This resulted in significant bird breeding, which would not have happened without the extra water. It was a good demonstration of how environmental water can be most effectively used.



Making the most of technology

The same technology that is modernising the Torrumbarry Irrigation System is used for the Gunbower Forest regulators. The gates can be operated remotely to allow the structures to be used as part of the irrigation system. This will help Goulburn-Murray Water system planners manage demand and can improve transit times for irrigation customers.

Sharing the system

Gunbower Creek is one of many waterways used to supply irrigation water. It is important that after irrigation demands are met, there is still enough room to transport environmental water.

Our assessment showed that after irrigator demands have been met, in most years environment water needs can be delivered as well.



Preserving water quality

Up to 70% of the water that enters Gunbower Forest flows back into the Murray River. This water may then be allocated for downstream consumptive use, diverted to other icon sites or remain in the river to meet its flow requirements.

Given that this water continues downstream, it is important that its quality is maintained.

What is blackwater?

When floods occur, organic matter like gum leaves are washed into the water. The bacteria that break down this organic matter use oxygen as they work. In warmer weather, the bacteria work much faster and the demand for oxygen is much greater.

Sometimes this can result in not enough oxygen being available for other underwater animals to breathe. In severe situations, fish and crustaceans can suffocate. This happened along the Murray River during the summer of 2010-11, when flooding commenced much later than would have occurred if the winter high flows were not captured by storages.

This is commonly known as a blackwater event because the tannin that has leached from the organic matter turns the water a tea colour. During managed floods, this risk will be mitigated by releasing during the cooler months and by releasing sufficient water to create a through-flow.



Murray Crayfish rely on good water quality. Underwater animals can be seen coming to the surface for air when there is insufficient oxygen in the water, exposing them to predators and illegal catching.

What are those red pipes in the forest?

Groundwater bores—seen as red pipes on the soil surface—are used to monitor groundwater throughout the forest. They allow us to see how the groundwater is responding to cycles of wetting and drying. The bores are checked monthly and help us understand the connection between groundwater and things such as tree health and local salinity.

Balancing the ledger

The same accountability that applies to irrigation water also applies to the use of environmental water. All water that flows into, and out of, the forest is measured to account for water use at the site.

Flow trials have been conducted to measure losses in passing water through Gunbower Creek. These will be used to calculate losses in delivering water to the forest or environmental flows through the creek.



Seepage & evaporation

To calculate how much water will be used during different flood events, we need to know how much will be lost through seepage and evaporation. To do this we have:

- used evaporation measurements from the Kerang weather station
- measured weekly evaporation rates when the forest is flooded
- mapped the forest soils and measured how quickly water seeps through the different types.

Before delivering a managed flood, we plan how we will release the water and then use these measurements to calculate what volumes will be needed.



A person wearing a white long-sleeved shirt, a red life vest, and tan work gloves is leaning over the side of a boat. They are holding a large, greyish-brown Murray Cod fish by its mouth and gills. The fish is partially submerged in greenish water. The background shows the water and the boat's edge.

A native fish haven

Historically, Gunbower Island would have been an important mid-Murray nursery area for native fish, playing an important role in contributing to regional fish populations.

In 2010 we teamed up with fish ecologists to develop the Gunbower Island Native Fish Recovery Plan. By looking at the kinds of fish that are present and what they need to thrive, we identified actions to take to restore the 'fish hot spot' potential of Gunbower Island.

Tagging Murray Cod on Gunbower Creek.



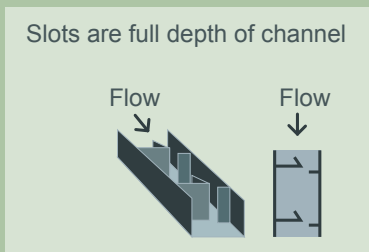
Bigger rocks in the Thompson Weir fishway provide areas where fish can rest as they swim up through the ramp.

Fish on the move

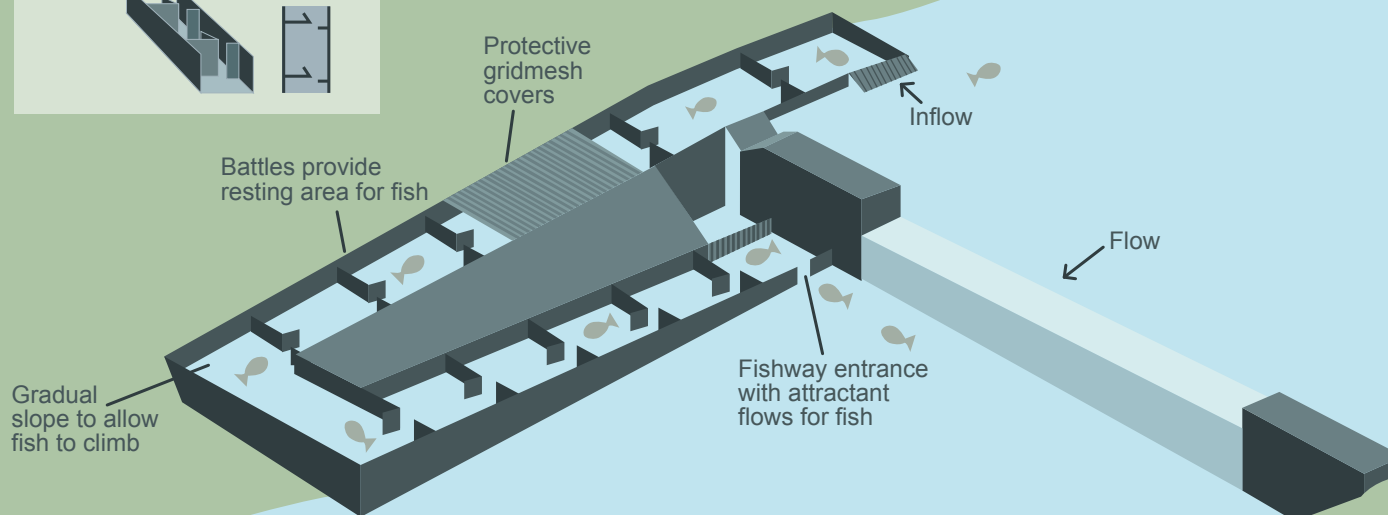
The Native Fish Recovery Plan considers how to improve linkages across all of Gunbower Island - the creek, its lagoons, the forest and the Murray River. Installing fish passage, and getting their operation right, is a key way to do this.

Fishways aim to provide a safe pathway around a barrier, such as a weir or regulator. Fishways have been installed at Torrumbarry, Gunbower and Thompson weirs. Other priority fishways are planned for the National Channel Offtake regulator and the Koondrook and Cohuna weirs.

The North Central CMA is seeking to secure funding to allow the fishway construction program to continue.



There are various types of fishways - this is a typical vertical slot fishway like the one built at Gunbower Weir.



Not to scale

Creek flows

Many fish rely on both Gunbower Creek and the forest for different parts of their life cycles. Getting the flows right to both of these areas is critical to support native fish populations.

The creek does not have its own environmental allocation and bids for water need to be submitted on a seasonal basis. Low flows in winter and the lack of passing flows at Koondrook Weir are key things that need to be addressed.

The Native Fish Recovery Plan provides a good justification why this water should be made available for use in Gunbower Creek.



The mysterious case of non-existent Trout Cod



Few anglers expect to find Trout Cod in the Murray River near Gunbower Forest. Some challenge the idea that Trout Cod were ever seen or caught this far down the river. However, it's time to think again...

Trout Cod numbers have plunged since the 1950s. By the end of the 1960s they were extremely rare and little was known about their former range. It was commonly believed that they were never found downstream of Echuca, but fishing talk suggests otherwise.

To get to the bottom of this, a researcher interviewed old anglers and looked at historical photos to see if there were any Trout Cod in their catch. The stories left no doubt that Trout Cod were once found all the way down to Swan Hill.

Upon talking to Gunbower Creek anglers, we heard about fish in Gunbower Creek that "look like Murray Cod but are different". It sounded like the mysterious Trout Cod and, in 2007, we found it in our fish surveys for the first time.

An interesting fact

Edward Curr, who travelled the area extensively prior to it being taken up by pastoralists, wrote of "Kanbowro" the local Aboriginal name for the area. It is thought that the pronunciation was mistaken by early (European) settlers, hence the name Gunbower that we know it by today.

Sources indicate that Kanbowro/Gunbower translates to "twisting and tortuous like the necks of the black swans", an apt description of the lagoons and meanders of Gunbower Creek.



Freshwater Catfish lives again

For the first time in more than 50 years, Freshwater Catfish were recorded in fish surveys during 2009. This species had almost disappeared from Victoria but was found in three lagoons along Gunbower Creek. One of these, Turners Lagoon, now has a healthy population. We are studying the special characteristics of Turners Lagoon in the hope of creating catfish-friendly conditions in other lagoons.





A visitor's haven

Between 20,000 and 30,000 people visit Gunbower Forest over the Christmas and Easter holidays, bringing income into the surrounding towns of Koondrook, Gunbower and Cohuna.

These visitors are attracted to a range of Gunbower Forest's values, including many fish and birds.

Improving the way water is managed in Gunbower Forest will help to protect the social and economic values it provides.

Food, fibre & medicine

Gunbower Forest is the traditional country of the people of the Barapa Barapa and Yorta Yorta Nations. Over many generations, the local Aborigines passed down their knowledge on the plants of the forest and how to use them.

Nardoo: a native fern which flourishes in response to flooding. It's spores can be ground into an edible flour for cooking. It can be toxic if not prepared properly and is believed to have contributed to deaths of the early explorers, Burke and Wills in 1861.



Old Man Weed, Sneezeweed: found in low lying areas on the Murray floodplain, it is used as a traditional medicine plant for a variety of ailments. It contains a natural antibiotic, anti-inflammatory and antifungal agents which has now been extracted for use in a commercially available ointment.





Saltbush: a semi-succulent, perennial shrub that produces round, tomato shaped fruit that is edible. Dried out, the fruit can also be eaten like raisins. Both the leaves and fruit of saltbush are edible, with a sweet though slightly salty taste. It is now being grown commercially and finding its way onto the menus of progressive restaurants.



Scarred trees: one of the many archaeological reminders of the traditional owners of the lands. The scar is due to the removal of a large slab of bark taken from the tree to make things such as canoes, shields and coolamons (for carrying things). Stone axe marks can often be seen where the cuts were made. Unfortunately few such trees remain today due to timber removal.



River Red Gum logging goes back a long way

Gunbower Forest has a long history of logging since the early days of European settlement. While a large proportion of Gunbower Forest is now National Park, the parts that remain as State Forest continue to supply River Red Gum timber. However, reduced flooding has also impacted on commercial production, with tree growth slowing.

Evidence of the early timber cutting days can still be seen around the forest, as notches carved into old tree stumps. Wooden planks inserted into these notches provided steps that allowed the loggers to climb up the trunk and fell the tree where the timber was solid.

Flooding and firewood collection

With no natural gas available in the local area, residents collect firewood from Gunbower Forest's logging coups for winter warmth. Firewood collection is managed by the Department of Sustainability and Environment. We work closely with the department to ensure that managed flooding does not inundate firewood collection areas.

Can the Intermediate Egret prosper again?

Gunbower Forest has a flagship species – the Intermediate Egret (*Ardea intermedia*). However, the Intermediate Egret is critically endangered. Because of its special needs for breeding, its fate will be a measure of success in restoring Gunbower Forest.

Gunbower and Barmah Forests are the two main Victorian sites where egret breeding has been recorded. Intermediate Egrets bred in thousands on wetlands along the Murray River in the 1930s, but numbers have been declining since then.

Egrets eat fish, so they take longer than other waterbirds to start nesting after floods. As colony nesting waterbirds, Intermediate Egrets provide telling signs of flooding and wetland health. The shorter floods that occur due to river regulation have had a big impact on their ability to breed, hence the drop in population since the 1930s. The last time Intermediate Egrets bred in Gunbower Forest followed the 1974–75 floods.

Delivering sustained floods that provide enough food for Intermediate Egrets to complete a breeding cycle is a key target for water management in Gunbower Forest.



Health checks for River Red Gums



Tree health score = 1

A tree in this condition is considered unhealthy. Most of its original canopy has been lost and it has a lot of young growth. The tree uses a lot of energy to put on this new growth and follow up flooding is needed for it to recover.



Tree health score = 3

Trees are starting to show signs of being in trouble when they start losing their leaves and a lot of light can be seen through them. This tree is still classed as healthy as it retains some of its original canopy, has few dead branches and no mistletoe. Even though this tree is showing signs of stress it has a good chance of recovery if it is flooded.



Tree health score = 5

A tree is considered healthy when it has at least 75% of canopy cover. There should be some new tip growth and the bark should be intact (or have only minor cracking). Some dead branchlets and leaves may be seen.

What is a healthy tree?

Each year we visit the same sites to quantify the tree's canopy (its top) as a measure of its health. Each tree is given a tree health score of between 1 and 5.

Following consecutive years of flooding in Gunbower Forest, almost 60% of trees assessed in 2005 were healthy. That is, they had a tree health score of 3 or more.

A lack of follow-up flooding and rain meant that by 2008, this number had fallen to 15% of trees assessed. More disturbing is that by 2008, about one in 20 trees assessed was dead.

Lack of flooding has also affected the food and habitat available for native animals, leading to a decline in numbers and species. For example, the Carpet Python, Squirrel Glider and Growling Grass Frog are now rarely seen in the area.



Tracking the benefits

How do we know that environmental water is working? And how do we know whether we're getting the best results with the available water?

A comprehensive and reliable monitoring program helps answer these questions.



Sand monitor on Batemans Break

Making a difference

A monitoring program has been established to encompass both Gunbower Forest in Victoria and Koondrook–Perricoota Forest across the river in NSW. The same approach is used at all of The Living Murray icon sites to enable a comparison.

Each year we go back to the same sites and look at birds, fish, frogs, groundwater, wetlands and floodplain vegetation. We track changes, identify emerging risks and decide when and where environmental water is required.

We also collect information on external factors such as local climate and other land management activities. This provides a more complete picture of the difference being made.

Building on previous work

Data has been collected to provide baseline information. Once we start making large scale releases to the forest, this gives us something to measure against and assists in determining whether we are achieving our targets.

For more information on our the results of our monitoring visit the project website on www.nccma.vic.gov.au

An example of our photo point monitoring is shown here.



Thank you...

The North Central CMA would like to thank the following partners who have provided a valuable contribution to the Flooding for Life project:

Murray-Darling Basin Authority

Department of Sustainability and Environment

Goulburn-Murray Water

Parks Victoria

Shire of Campaspe

Shire of Gannawarra

Members of the Barapa Barapa Nation

Members of the Yorta Yorta Nation



Photo credits

Note: where multiple photos appear on a page from different photographers the position on the page is denoted by (R) and (L) for photos appearing on the right and left hand side of the pages respectively.

Melanie Tranter, North Central CMA: pages 4 (top), 5, 9 (R), 10 (L), 11 (centre), 15, 16 (L), 22, 27, 29, 31, 32, 33 (L), 35 (top), 38, 39, 40, 41, 44

Australian Ecosystems: pages 3, 7, 10 (R), 11 (R), 14 (L), 20 (R), 21 (L), 24 (bottom)

Courtesy of Cohuna and District Historical Society: pages 36, 37

Murray-Darling Basin Authority: pages 8, 9 (L), 13 (foreground), 27 (insert),

David Kleinert: cover page, inside cover, pages 1, 6, 12, 13 (background), 17, 18, 19, 20 (L), 24 (L, top), 26, 28, 33 (R), 46, 48, 49

Murray-Darling Freshwater Research Centre: pages 14 (R), 34

Kathryn Stanislawski, North Central CMA: pages 2, 4 (bottom), 30, 41

Kane Ellis, North Central CMA: page 16 (R)

Anna Chatfield, North Central CMA: page 45 (L)

Shaun Cunningham: page 47

Hugh MacGregor: page 23

Keith Ward, Goulburn-Broken CMA: page 43, 45 (R)

Steve Parish Publishing: page 21 (R)



Printed on recycled paper.

© Copyright, North Central Catchment Management Authority, 2011.

This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the *Copyright Act 1968*.

ISBN 978-0-9871960-0-2

Disclaimer: This publication may be of assistance to you but North Central Catchment Management Authority and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate to your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from your relying on any information in this publication.

