FRESHWATER ECOSYSTEMS

Biodiversity management issues

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Changes to river channels

Rivers are dynamic ecosystems, shaped by the influences of climate, vegetation, geology and surrounding landuses. River courses are affected by processes of erosion and deposition which occur under natural flow and flood conditions.

River modification works change the natural course or form of the river. Removal of meanders and/or changes to the shape of a river channel have occured in most Victorian catchments.

Photo: T. Doeg

Channelising waterways creates un-natural beds and banks.

Why are rivers modified?

Rivers are modified for a number of reasons. Much of Victoria's settlement and agricultural production has taken place on the river floodplains where periodic flooding is a natural hazard. Consequently, rivers have been modified or 'controlled' in an attempt to improve drainage and reduce flooding.

Modification works usually involve rearranging the river bed or bank material. It is commonly believed that straightening the channel, either by constructing a totally new river canal, or a flow path across a meander bend, increases river drainage.

In extreme cases, the river channel capacity can be increased by enlarging and straightening the channel and then lining it with concrete. This usually happens in urban areas. Off stream works, such as the construction of levee banks or retarding basins are also designed to prevent flooding.

Rivers are also modified to reduce erosion. This may involve the removal or relocation of sediment bars and islands within the channel to prevent flows from being diverted into the banks and causing erosion. As with flood works, this leads to a straightening of the channel. 'Alignment training' uses structures constructed on the stream bed to train or divert the channel away from eroding banks. Bank battering alters the natural slope of the stream bank to improve stability.

Freshwater ecosystems are complex and dynamic

Until recent decades, rivers and streams were regarded as a resource to be exploited. They were seen as convenient channels or drains for the supply of water or transport of wastes.

With great improvements in our knowledge of these freshwater ecosystems, we now understand that they are a complex mix of chemical, physical and biological factors, all of which interact.

Human activity can add to the complexity by altering and interrupting natural cycles in ways that can threaten the survival of these ecosystems.

But there are actions communities and governments can take that lessen or even reverse the effects of these activities.

Changes to river channels is one of a series of ten brochures which outline the impact human activities can have on the natural cycles of freshwater ecosystems.

Natural Resources and Environment
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What are the physical effects of river modification works?

Almost all river modification works use earth-moving machinery in or near the river channel. This damages the river bed or banks, and can, in the short term, increase the amount of sediment flowing into the river.

In the longer term, almost all river modification increases the activity of the stream. With a new form, the hydrology and geomorphology of the stream will be out of balance and the stream will seek a new equilibrium. Where flow is increased, bed and bank erosion accelerates, deepening and widening the channel. The increased deposition of sediment downstream can change the river form many kilometres below the works.

Photo: T. Doeg

In-stream works can seriously damage habitat.

While river modification works may solve flooding problems at one particular point, increased flows downstream, coupled with sediment deposition, can lead to even greater than normal flooding at different places along the river.

The increased speed of the water and greater levels of erosion and deposition increase turbidity levels and reduce water quality. These changes can also have significant effects on aquatic flora and fauna.

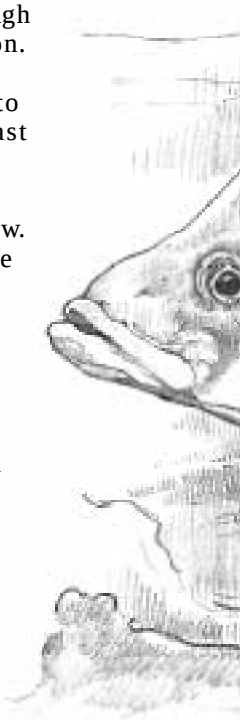
How do modification works affect aquatic fauna?

The immediate effect of river modification is to remove or alter in-stream habitat, such as rocks, logs and aquatic plants. These features are important resting and breeding areas for aquatic fauna. They also provide shelter during periods of high flows. The habitat is either washed away due to increased flow rates or covered with sediment by erosion and deposition. Habitat loss or destruction is common when rivers are realigned.

When a river is completely 'channelised' it removes all instream habitat. With one uniform channel of fast flowing water the diversity of flows in a natural river is lost.

The flow rate can increase to such a speed that fish or other aquatic fauna are unable to move upstream, or even maintain their position in the river without being swept away. Sections of river with uniform high flow can form a barrier to fish migration. Many fish species move upstream by travelling from one slow flowing area to another. They are unable to traverse fast flowing river channels.

River modifications can affect natural instream processes, such as energy flow. Natural irregularities in streambeds are important habitats for aquatic fauna, and are essential in accumulating organic material - an intrinsic part of the food web. Changing natural streambeds can alter the physical and biological conditions necessary for processing organic material. A natural variety of habitats is critical for sustaining a diverse community of aquatic flora and fauna.



River realigning changes natural flood regimes, disrupting the evolution of river ecosystems and their natural function. The impact of these changes on the timing and extent of regular floods is unknown, but flooding is important for many native fish species. Australian Bass, Golden Perch and the Common Galaxias need floods to provide the stimulus for migration and breeding.

What is being done to manage this issue?

- Investigations into the results of river realignment or modification have shown that the expected benefits (flood mitigation, improved drainage or reduced erosion) generally didn't occur. Channel modification or straightening has now been largely discontinued by water management agencies.
- Active rehabilitation of habitat lost by previous modification is relatively common. This includes installation of artificial riffles, pools, meanders, and bankside vegetation.
- Licences are required from Water Authorities before any works can be undertaken in waterways.
- In the Latrobe River meanders removed many years ago have been reconstructed. A similar program is underway in the lower Goulburn river. Wood debris and snags are being returned to several rivers across the state.

Golden Perch require a variety of flow conditions.

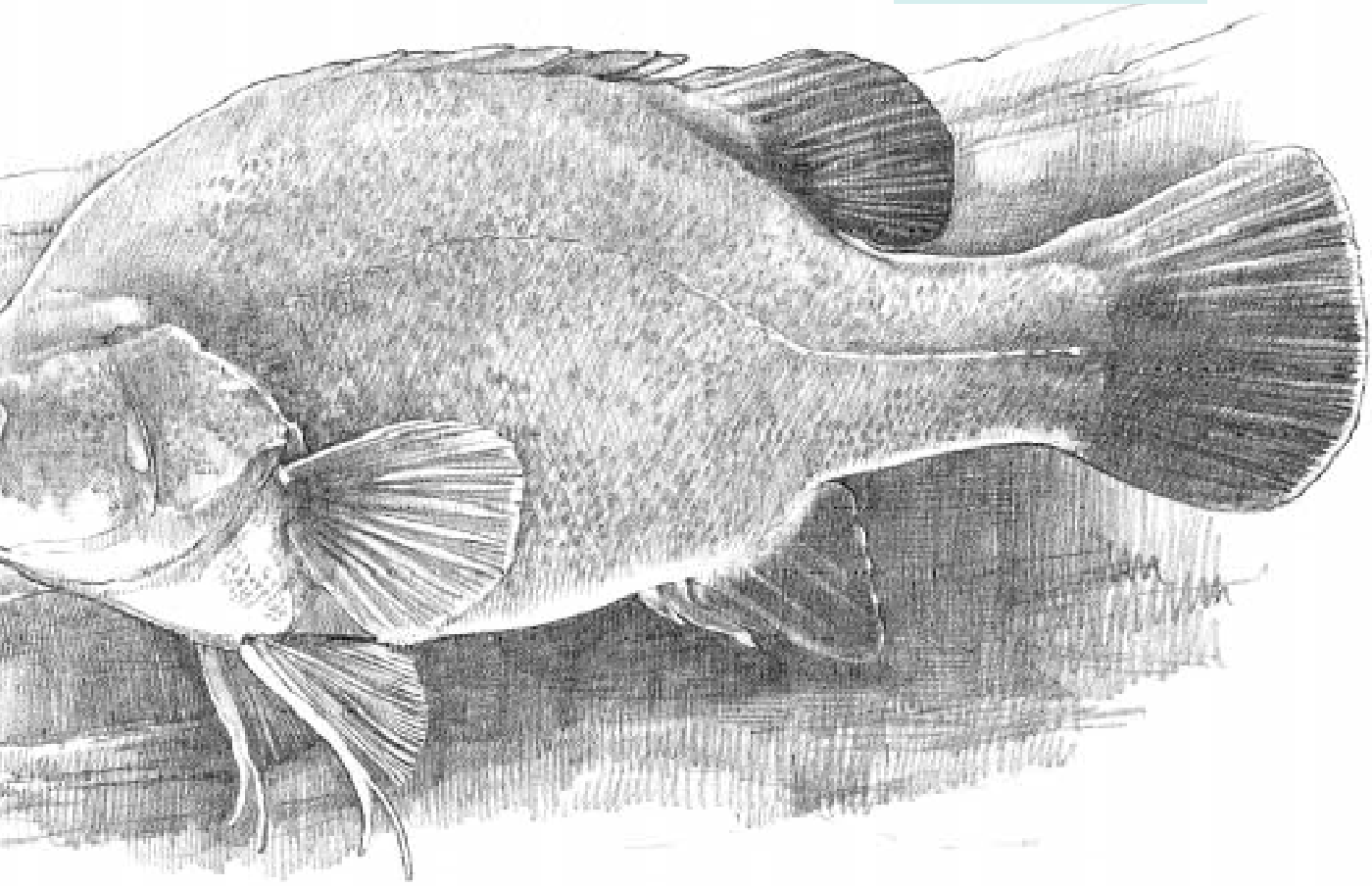


Photo: T. Doeg

Concrete channels have no in-stream habitat.

Actions to reduce future changes to waterways

- Avoid realigning or widening water ways, removing instream habitat or riparian or instream vegetation. Seek other methods to address the problem.
- Always investigate whether the proposed works will solve the problem.
- Where river modification works are considered necessary, follow approved guidelines or obtain CMA's advice for performing these works to minimise the impacts on the stream ecosystem.

FRESHWATER ECOSYSTEMS

Glossary

Aquatic ecosystem
An interacting group of plants and animals and the physical and chemical components of the environment that surrounds them.

Channelised
When all of the meanders in a river or stream are removed to create a straight channel.

Alignment training
Stabilising eroding stream banks by placing material, like rocks, in the stream to deflect the water away from the bank.

Bank battering
Reducing the natural slope of the stream bank to prevent erosion.

Hydrology
The behaviour of water.

Geomorphology
The form of the earth's surface and the forces that affect it.

Equilibrium
The balance between forces acting on a stream bed or bank.

Illustrations by Marje Crosby-Fairall

More issues for freshwater ecosystems

Activities which can threaten the survival of freshwater ecosystems rarely occur in isolation. Often a river or stream is affected by a number of activities which, in turn, can cause others to occur.

This brochure is one in a series of ten. For a more accurate picture of the potential impact of human activities on Victorian rivers and streams, read all ten.

The brochures cover:

1. Changes to natural flow patterns
2. Changes to temperature patterns
3. Changes to riparian vegetation
4. Sedimentation of rivers and streams
5. Toxic materials
6. Increased salinity
7. Removal of woody debris
8. **Changes to river channels**
9. Instream barriers
10. Introducing fish outside their natural range

Further Information

Department of Natural Resources and Environment (NRE)
Your nearest regional office
Customer Service Centre 136 186

Websites www.nre.vic.gov.au, www.waterwatch.vic.gov.au

Your Catchment Management Authority
CMA offices are located in each major Victorian catchment. Details www.nre.vic.gov.au

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