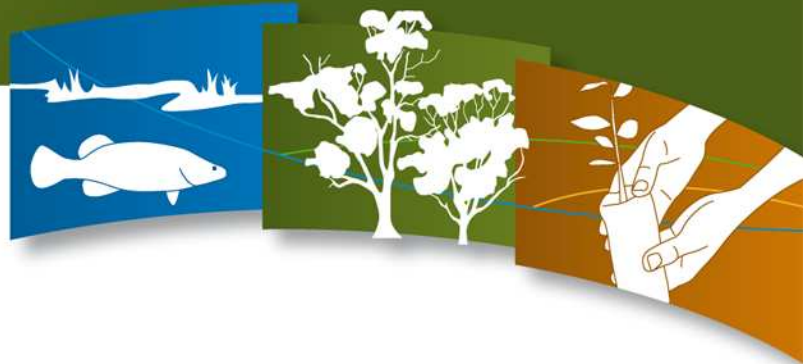


# What are environmental flows?



Connecting Rivers, Landscapes, People

## The concept of environmental flows

Diverting water from a river system for irrigation, industrial and domestic uses changes the 'natural' flow regime of a river. These diversions have the potential to degrade environmental values in a catchment by producing an inadequate flow regime. Developing and implementing suitable environmental flows is a key process to ensure that diversions from a river are balanced with the ecological needs of the river.

## Environmental flow recommendations

Determining environmental flow recommendations is a complex and scientific process. However they are based on three simple, but fundamental principles.

1. Environmental flows are provided for the benefit of aquatic biodiversity.
2. Environmental flow recommendations involve all components of a flow regime.
3. Environmental flow recommendations need to be associated with specific objectives.

## What is meant by 'natural' flows?

European settlement and development has caused major changes to the flow in river systems.

The broad scale removal of vegetation has resulted in an increase in the volume of water reaching the rivers. However, damming of waterways, diversions for urban, industrial or rural use and the construction of farm dams have usually resulted in a reduction of flows in rivers. The two opposing actions do not necessarily counteract each other, with the result that Victorian rivers have irretrievably been altered in post-European times.

It is clear that there is no likelihood of the restoration of pre-European stream flow patterns to Victorian streams. Both the channel form and, presumably, the biodiversity have become adapted to the new post-European stream flow conditions (or may still be reacting to these changes).

Hence, the 'natural' flow of any river in the context of flow management planning should simply be taken to mean the flows that would exist if no diversion or storage of water occurred, but accepting that there have been increases in flows due to vegetation removal.

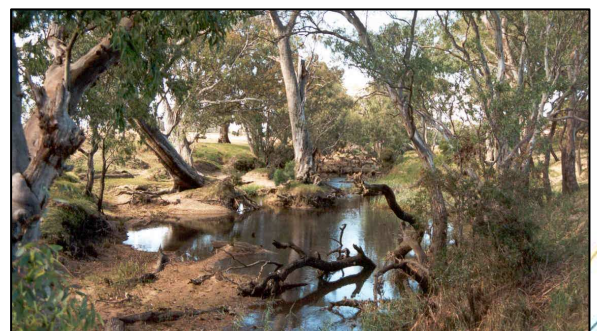
## Components of a natural flow regime

There are six basic components of a flow regime that have specific environmental effects.

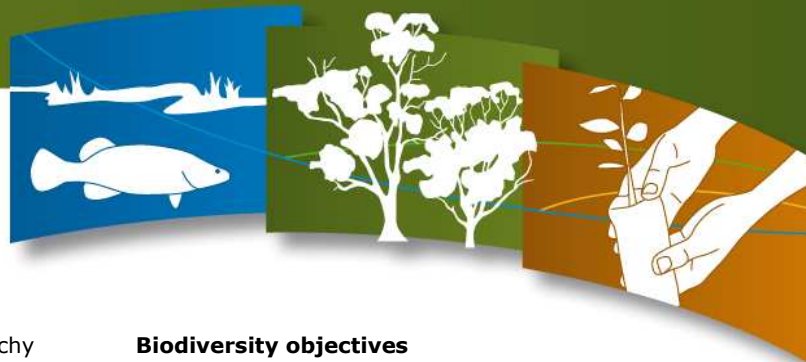
**Zero flows** – periods when there is no detectable flow of water.

Any pools that remain during zero flows are refuges for fish and other species. However, over the dry period, water quality in these isolated pools deteriorates with increasing temperatures and salinity and decreasing water and oxygen levels. Therefore flushes of fresh water, or 'freshes' are also important (see below).

**Low flows** – flows that provide a continuous flow over the bottom of the channel, but do not fill the channel to any great depth.



*Instream habitat is exposed during low flows.  
Photo: Greg Chant*



In the Australian environment, where rainfall is patchy and highly variable, all natural waterways have times where flows are low. Some parts of the stream bed may be exposed, including rocks and logs. Under low flows, some of the stream may be unsuitable for some species as the water is too shallow or slow moving. This may restrict the movements of some species, such as platypus. Shallow water may also promote the growth of algae.

**Freshes** – flows that produce a substantial rise in river height for a few days, due to short bursts of rain. Freshes play an important role in maintaining water quality in the stream environment by refilling pools and providing inputs of fresh water. The higher freshes may allow fish and other species to move around the river, possibly across shallow riffles to new habitats. Small flushes of water also redistribute food by drifting macro-invertebrates and organic matter around the stream. Freshes may also replenish soil moisture for riparian plants growing along the banks. Cleaning the bed habitat by dislodging excessive algal growth and sediment is another important role of freshes.

**High Flows** – a term used to describe the persistent increase in seasonal baseflow that occurs over autumn, winter and spring, but which remain confined in the channel.

During high flows, the entire length of the channel is connected with relatively deep water, allowing movement of fish and other species along the river. Practically all habitat in the river is covered, including rocks and logs. Additionally, high flows may scour or redistribute sediment that may build up during low flow periods. Sustained high flows often provide the trigger for breeding or migration of fish so their young can be washed downstream to suitable habitats.

**Bankfull Flows** – flows that completely fill the channel.

These flows have the main function of determining and maintaining the shape of the channel.

**Overbank Flows** – flows that spill out of the channel onto the floodplain.

These flows are vital for the health of wetlands associated with the river system. Floods that link rivers to their floodplains are an integral part of stream ecology by controlling organic inputs from the floodplain to the river.

Other important aspects of flows are the rates of rise and fall, the year to year pattern of flows and the small-scale of variability for each flow type.

#### What do environmental flows aim to achieve?

Recommendations for environmental flows are based on biodiversity and flow objectives.

#### Biodiversity objectives

Biodiversity objectives deal with biological components of the system the ultimate outcome of the environmental flows. For example, these can deal with the desired condition of individual species (such as a fish species or a particular plant), or might include an entire community of migratory fish or macroinvertebrates. These objectives can also outline particular processes, such as spawning, migration or germination to aim for. The maintenance of a particular channel size or form (such as pools and riffles), and even acceptable levels of siltation may also be a specified objective.

#### Flow objectives

Flow objectives deal with the flow regime itself. The main aim of the flow objectives is to explicitly describe the environmental flow (i.e. low flows, freshes) that will achieve the biodiversity objectives, such as spawning.

#### Environmental flows for the Loddon River

The need to balance the consumptive needs of existing water uses and the provision of water for the environment has been recognised by federal and state governments. A bulk entitlement defines the amount of water that an authority is entitled from a river or storage, and may include the rate at which it may be taken and the reliability of the entitlement. Water for the environment is generally provided by placing conditions on the BE of a consumptive user, for example by requiring Goulburn-Murray Water (G-MW) to release a particular environmental flow regime from a storage/s.

A bulk entitlement has been established for the Loddon River that includes environmental flow recommendations to meet specific biodiversity and flow objectives.

#### Would you like to find out more?

To find out more please contact the managers of environmental water:

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HUNTLY VIC 3551  
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Or visit our website at:  
[www.nccma.vic.gov.au](http://www.nccma.vic.gov.au)

Information for this fact sheet was sourced from:

- Department of Natural Resources and Environment (NRE) (2002) *Environmental Flows Technical Resources Manual*.
- Loddon River Environmental Flows Scientific Panel (2002) *Environmental Flow Determination of the Loddon River Catchment: Final Report*. Unpublished Report to the NCCMA and NRE.