



# Watershed



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## Living on Floodplains

by Professor Peter Cullen

In recent years we have learned that rivers are much more than the channel that carries water during low flow periods. The floodplain is an integral part of the river, even though it only connects to the river occasionally. The floodplain, and its associated wetlands, provide a range of ecosystem services on which we all depend.

Floodplain soils are amongst the richest agricultural soils anywhere. They periodically get replenished with silt, nutrients and organic matter during flooding. Periodic flooding is, however, inevitable, and if humans want to settle on floodplains, they need to learn to live with these periodic inundations.

We have built some towns in some pretty stupid places. This has caused unnecessary hardship to many people. Some towns, like Gundagai, have been moved after catastrophic floods. Others have tried to protect themselves by building levees to protect the developments.

This can be effective in protecting investment from small to medium floods, but leads to catastrophic losses when the levees fail and major flooding occurs, as we have seen in the Mississippi River in the USA. It is also a strategy which seems to cause significant damage to river health.

We now appreciate that healthy rivers require an adequate flow regime, adequate water quality and appropriate habitat. If all these things are adequate, then we commonly have healthy biological populations of fish, invertebrates and birds.

When we look at rivers, we need to consider:

- the riparian zone which protects stream banks from erosion during high flow, filters materials coming from the catchment and provides food, shade and habitat for fish and other animals. We know the riparian zone is damaged by grazing.

- the upstream-downstream connectivity, which is necessary for breeding of many fish species, and is degraded by weirs and dams.
- the river-floodplain connectivity, which is commonly damaged by levees, or by providing a flow regime that rarely allows flooding.

Floodplains are areas of extraordinary biodiversity. Floodplain waters have 100 - 1000 times the number of organisms found in the river channel. When a floodplain wets, a swarm of tiny creatures emerge from eggs, cysts & burrows in the mud where they have been waiting since the last flood. Algae, invertebrates, insects and fish all burst into life from their resting stages or refuges in floodplain wetlands. Then, commonly, the birds come and after that the floodplain dries and they return to their resting stages.

It is also interesting to think about the primary production in these systems. This is the process by which sunlight creates organic matter via photosynthesis. Under low flow conditions, this might take place on the bottom of shallow streams and in emergent reeds along the bank. As the water rises, it might switch to algae production as light no longer gets to the bottom of the stream. As the water rises across the floodplain it connects with billabongs and other water bodies. Some of the algae seem to survive in the soil, ready to spring to life when wetted. All sorts of organisms erupt into life and move from the river channel and floodplain water bodies to graze on the primary production. Fish commonly swim out onto the floodplain to feed on insects and other food. Floodplains and their wetlands are indeed boom and bust ecosystems.

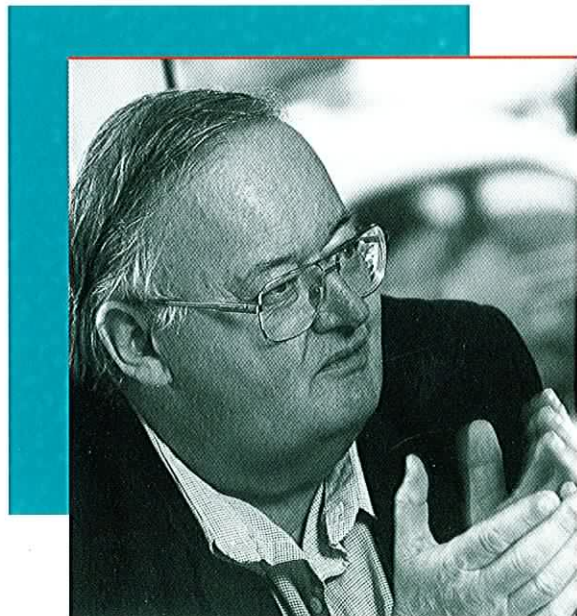
We degrade these ecosystems when we alter the flooding regime by taking excessive water or by building levees to protect developments. While levees protect against the small -medium floods, they are likely to increase damage from large floods, because people have built in inappropriate places, believing they are safe. Some of the enlightened catchment organisations are seeking to remove levees, partly because of the legal liability they incur, but also partly at least because of the ecological liability they incur.

As Australia faces the enormous bill for repairing the damage that we have caused through ignorance, it is important to appreciate that it is more cost effective to stop the degradation beforehand rather than to try and restore ecosystems afterwards. It is better to stop pest species entering our rivers rather than try to eradicate them afterwards. Healthy rivers and floodplains appear much less liable to invasion by pest organisms than degraded systems.

When floodplains flood, sediment, salt and nutrients are spread over the floodplain soils, leading to cleaner water in the channels. The floodplain traps and processes pollutants to protect rivers. Flooding is seen as resetting the system after which floodplain wetlands develop in response to their particular conditions. If large fish are trapped in a floodplain wetland as the flood recedes, then the system that subsequently develops may be very different from one without a large predator.

The CRC is engaged in numerous research projects that provide the scientific direction needed to restore and manage our floodplains. This issue of Watershed features a project on the Cooper Creek floodplain that demonstrates the importance of river and floodplain connectivity.

Floodplains and their rivers are single ecological units that give great wealth to society, if we do not manage them wisely we risk destroying the lifeline upon which this country has prospered.



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CRC for Freshwater Ecology.*

*Photo: M Ashkanasy, courtesy of Melbourne Water*