

Sustainable urban rivers ~ *a contradiction in terms?*



Director, Prof Peter

The concept of land and water sustainability has penetrated community and political ethos. But will this support survive when communities understand the costs of achieving sustainable waterways? At present our task is to try to define what we mean by sustainability. We must also determine what actions are needed to bring about sustainability, and develop ways and indicators for measuring whether we are moving towards it.

The first step towards sustainability must surely be to ensure that our rivers and streams suffer no further damage. This is a necessary first step, but will not be sufficient to restore already degraded rivers. The Murray-Darling Basin Commission's decision to cap water extraction from the Murray-Darling Basin is a step forward, although a fairly obvious one when around 80% of the flow is already being extracted and the river is showing unacceptable health declines.

Moving towards sustainability for urban rivers requires both planning and management. Planning must be on a catchment basis and it must consider pollution loads from existing, as well as proposed, land uses in the whole catchment.

To restore the health of river ecosystems we must examine flow regimes, the nutrient and pollution inputs, as well as physical factors such as exotic species. It is essential to understand the ecology of the receiving waters, as well as what has caused their degradation. Rehabilitation requires removing or reducing the stresses that are causing

undesirable conditions. Often, management understanding of rivers is insufficient to guide cost-effective, low-risk rehabilitation.

If the river is degraded, the first step is diagnosing the problem. Algal blooms come about from excess nutrients and insufficient flow. Deoxygenation or toxic inflows are often responsible for fish kills. Large sand deposits and excess turbidity may indicate soil erosion in the catchment or mismanaged riparian areas.

While coastal waters may be a concern in some cities, there are generally four types of waterbodies of interest in urban areas:

- large lowland rivers;
- the estuarine element of the river as it enters the coastal waters;
- smaller tributary streams, often little more than concrete-lined drains, with highly urbanised catchments;
- floodplains, wetlands and small lakes.

As we urbanise a catchment we increase the runoff into our rivers. In addition, we increase the 'peakiness' of the water runoff. Upstream dams capturing water to supply the city compound these fundamental changes to the river hydrology.

Urban runoff also contains levels of sediment, nutrients, toxicants, organic matter and microbial contaminants that may cause unacceptable impacts on the receiving waters. We know it is better to attack these issues at the source rather than attempt to rely on downstream solutions.

Best management in the 1990s and beyond must surely require:

- urban design that slows water flow, rather than disposing of it as soon as possible;
- using floodplains and wetlands for infiltration and detention, which can help reduce the hydrologic consequences of urbanisation;
- that the high and peaky flows in urban areas are regarded as an environmental flow issue;
- active soil conservation on construction sites and the maintenance of silt traps in the drainage network to reduce sediment flow;
- that gross pollutant traps are installed and maintained in most urban catchments;
- reducing the input of raw or partially treated sewage into streams;
- that catchments are sewered and sewage overflows minimised, monitored and licensed by EPAs;
- reducing nutrient input to streams at the source (parks and golf courses) and using pollution control ponds to discharge to receiving waters.

The above recommendations include a mix of planning and management strategies. The governmental arrangements used to manage urban areas tend to avoid any effective integration of these two functions. In fact the organisational arrangements divided between State (EPAs etc), regional agencies (water authorities etc) and local agencies (governments) seem designed to minimise integration.

Integration is the key to achieving sustainability. We have clearly demonstrated that treating each symptom in isolation does not work, and indeed compounds the problem. The principles of integration are similar to those of Total Catchment Management:

- Planning must consider water volumes and quality from each land use in the catchment. While these may vary with soil type and topography, we do have estimates of pollutant loads from many urban land uses.
- The pollutant loads that receiving waters can tolerate without unacceptable change is a function of the ecosystem. We need to understand the capacity of the receiving waters to receive pollutants before these loads can be determined.
- Acceptable contaminant loads are also a function of river flow, which drives a range of ecological processes. It is important to return some natural flow signals to the biota in regulated rivers by providing fluctuating flows that mimic natural variability, rather than some constant minimum release.
- Hefty penalties should be imposed for illegal dumping of industry wastes or even garden refuse (seeds of exotics). Sewer overflows need to be minimised since we now know that the organic matter encourages nutrient cycling as well as providing a microbial hazard and a load on the oxygen resources of the river.
- Effluent discharges to urban rivers should only be allowed when there is a substantial scientific capacity to predict the outcomes.
- Best practice design, such as the use of fishways to sustain migratory, native fish populations and multi-level off-takes to avoid releasing

cold, anoxic water downstream, should be used to minimise the ecological damage caused by dams and weirs.

- Once erosion in a catchment has been addressed it may be appropriate to mine sand from rivers as a restoration measure.
- Removing willow trees that encroach upon waterways and reduce the cross-section of flow, as well as provide shade that interferes with riparian vegetation and in-stream processes is generally desirable, but active replacement with native riparian vegetation is necessary.
- When urban expansion is being considered, best practice in the 1990s requires litter and nutrient control and coarse sediment trapping.

Planners must do more than colour in maps; they must start to understand the ecological consequences of the land uses they allow. The form of the urban area and provision of water services are critical planning decisions that should not be left to other professionals once the planners have moved on.

Our communities should be able to go swimming, boating and fishing in our urban rivers, lakes and streams, without fearing health consequences. They do not want urban waterways that reek with noxious smells or are blighted by toxic or visually unattractive algal blooms. They seek attractive riparian areas rather than eroding banks.

Total Catchment Management has shown us the need for whole catchment thinking and analysis. Hopefully that simple lesson, now well understood in rural Australia, can be learned by our urban professionals before they make more costly mistakes. It is time to make a start.

– Peter Cullen

AUSRIVAS armies called in for river health program

The world's most extensive river monitoring program, AUSRIVAS, has commenced with armies of bug collectors descending on waterways throughout Australia to determine the health of the nation's rivers.

Water agencies in all States and Territories are participating in AUSRIVAS—which comes under the Monitoring River Health Initiative—that will see more than 2000 sites throughout Australia surveyed using biological monitoring techniques. The first autumn sampling run has been completed.

The CRCFE's Justen Simpson and Phil Sloane led the charge in the ACT, covering an area extending from Cooma-Canberra-Yass-Queanbeyan and including 65 test and 10 reference sites.

Justen said that the dry conditions had reduced the flow in many streams in the Cooma area. This meant that only one habitat could be sampled at some sites.

AUSRIVAS is part of the National River Health Program, which is jointly managed by the Land and Water Resources Research and Development Corporation and Environment Australia.



The CRCFE held three-half day training workshops for ACT agency staff involved in the AUSRIVAS monitoring program. The workshops, conducted by Richard Norris, Justen Simpson and Chris Williams, focused on sampling and data analysis methods.