CRC for
Water Sensitive Cities

Program B: Water Sensitive Urbanism | Project B2.23 | Project duration: July 2012 – December 2016

Protection and restoration of urban freshwater ecosystems: informing management and planning

Overview

Rivers, streams, drains and wetlands are important components of urban landscapes. These freshwater habitats are valuable to people because they help create a safe environment by mitigating flooding and keeping our water clean. By providing homes for native plants and animals, streams reinforce our sense of local identity and enhance our connection to nature. If we can keep our streams healthy we can avoid algal blooms, fish kills and plagues of nuisance insects, and we can enjoy the recreational and physical amenities they provide.

Unfortunately, streams face many threats including altered hydrology, elevated levels of nutrients and other pollutants, increased water temperature and sedimentation, and reduced biodiversity. For management efforts to be targeted and effective, managers need to understand the key ecological drivers in their bioregion and how they vary among freshwater habitats (such as wetlands and streams). They also need to understand how the key drivers vary with local characteristics such as position in the catchment and soil type. This project investigates the extent to which ecological drivers vary among freshwater habitats and across a range of geographic scales in southern Australia. It also explores the sensitivity of these drivers and the extent to which improvements in different drivers deliver improvements in ecosystem function.

Key outcomes

The project will deliver conceptual urban waterway typologies or categories which identify the key ecological drivers of ecosystem health and function. It will also develop region-specific urban waterway management frameworks that will support decisions for optimising management and restoration efforts over a range of scales.

The outcomes of this project will be used by water planners in state and local governments to guide their policy and planning, and by developers, consultants and local natural resource management bodies to inform on-ground management and restoration of urban waterways.

Key findings on current institutional arrangements relating to WSUD

Recent studies have revealed that the impact of urbanisation on stream health varies among cities and bioregions. This finding suggests that the key drivers of freshwater function may differ with climate, geology, the position of the site in the landscape, the spatial scale of interest, and past land use. Specific insights include:

- Cities built on flat landscapes with sandy permeable soils with high infiltration capacity should be less affected by flashy run-off driven flows than cities built on sloping topographies with impermeable soils.
- Repairing the height and quality of groundwater is particularly important for the function of urban wetlands and streams in regions with welldeveloped superficial aquifers; while repairing river-floodplain connectivity is particularly important for the function of floodplain wetlands.
- The ability to assess urban-associated degradation in function depends on the quality of reference sites available. If reference sites are already degraded, for example by unsustainable agricultural practices, then the impact of urbanisation may be underestimated.
- Current restorative efforts in urban freshwaters focus on improving aspects of the physical environment, but this approach overlooks the importance of biotic processes for healthy ecosystem functioning. Indeed, recent evidence indicates that severe species loss can be just as detrimental to ecological function as degradation of the physical environment. The marked loss of species in urban freshwaters makes a compelling case for making biodiversity a restoration goal in urban freshwaters.

An Australian Government Initiative

CRC AUSTRALIA

Project design

This project will review the literature and interrogate existing datasets to investigate the extent to which ecological drivers vary among freshwater habitats and across a range of geographic scales in southern Australia. Secondly, the project will explore the capacity of degraded systems to improve their delivery of ecosystem services.

The project will develop a management framework that will guide the restoration or protection of urban waterway typologies from a variety of physical and social threats.

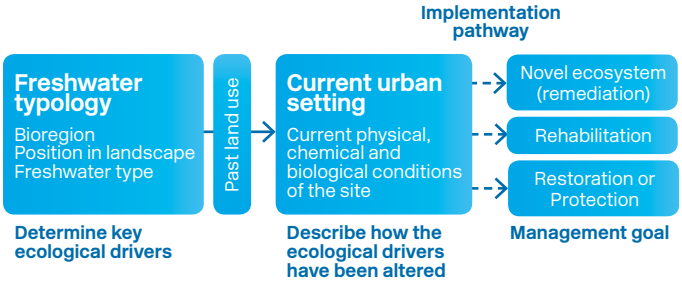

Figure 1. A framework for assessing and implementing on-ground management actions to improve the ecosystem function of urban freshwater streams. Steps in the implementation pathway refer to on-ground management actions that repair the ecological drivers; for example, protect nearby refuges or ensure upstream development is in accordance with water sensitive urban design.

Outlook

By June 2015 the project will deliver conceptual urban waterway typologies and will have explored the capacity of degraded systems to traverse to improved ecological condition. At completion of the project in 2016 the following outputs will have been delivered:

- graphical typologies that illustrate the key drivers of ecosystem function at multiple spatial scales and over time
- a decision process that guides management actions to improve and protect the important drivers of waterway condition from urban threats
- a suite of indicators that managers can use to evaluate the ecological status of urban waterways.

About the Cooperative Research Centre for Water Sensitive Cities

The Cooperative Research Centre for Water Sensitive Cities (CRCWSC) brings together interdisciplinary research expertise and thought-leadership from Australia and the world to address current urban water management challenges facing our cities and regions. In collaboration with over 80 research, government and industry partners, it develops and synthesises knowledge into powerful tools and influences key players aiming to achieve sustainable, resilient and liveable water sensitive cities.

Further information

Level 1, Building 74
Monash University, Clayton
Victoria 3800, Australia

Professor Anas Ghadouani
anas.ghadouani@uwa.edu.au
Professor Peter Davies
peter.davies@uwa.edu.au

info@crcwsc.org.au

www.watersensitivecities.org.au

CRC for
Water Sensitive Cities