

Theories of landscape ecology

A1

Project Leader: Dr Nick Bond

The role of Project A1 is to fill in our knowledge about the whole-of-river- and catchment-scale ecology of freshwaters, so we can understand how freshwater ecology is networked across the landscape.

Project summary

This project is taking a spatially explicit view of river networks, and drawing from ideas developed in landscape ecology, to better understand the role of dispersal versus local population processes in maintaining local populations of aquatic biota. The project is trialling and developing remote sensing techniques mapping habitats in intermittent streams together with genetics and mark–recapture techniques for examining dispersal. We are further trying to understand whether dispersal is affected by the way habitats are arranged or distributed within river systems, particularly as a function of hydrology. These questions are of fundamental importance in predicting the response of populations to such factors as drought, barrier removal or creation, and the loss or restoration of habitats.

By the end of this project, the team will understand:

- how populations of biota are connected along rivers, and hence how they will respond to factors that affect the spatial distribution of habitats, such as climate change, drought and habitat restoration;
- which features of a landscape are critical if a population is to persist, and how they must be arranged within the stream network;

and the team will be able to:

- model the links between habitats and population connectivity (e.g. appropriate access between feeding and spawning areas) so we can predict responses to stream management;
- describe the likely impacts of varying rainfall, temperature and other aspects of climate change on freshwater fauna;
- provide data relating freshwater populations to stream characteristics as inputs to models relating streamflow to freshwater ecology in rivers and floodplains;
- build a trial 'ecological response model'.

The information gathered in this project will feed into eWater projects R2 (Ecological modelling platform) and P6 (Restoration, planning and prioritisation tools).

Key achievements 2006

- Reviewed the literature on spatial population modelling and landscape ecology to provide a sound theoretical and conceptual basis for the field component of the project.
- Located study areas in the Moonie River in Queensland and the Goulburn River Catchment in Victoria.

2007–2008 key deliverables

- Measures of the roles of refuge habitats and dispersal of individuals in facilitating the recovery of populations when drought conditions end.
- Field data from both field locations as per project plan.

The project team

Project leader Dr Nick Bond is a Research Fellow with the School of Biological Sciences at Monash University. His research interests include restoration ecology, the effects of natural and human disturbance on aquatic ecosystems, the ecology and population dynamics of intermittent streams, and the effects of habitat patchiness on population and community structure.

Please contact him at <nick.bond@monash.edu.au> for further details on Project A1.

The research team also includes staff of: Monash University, Griffith University, The University of Melbourne, Department of Sustainability and Environment Victoria and Queensland Department of Natural Resources and Water.