1.3 Spatial prioritization of waterway management for biodiversity outcomes

Summary

River restoration activities such as riparian fencing and replanting, fishway construction, and pollution control, are now major areas of investment for catchment management authorities such as Melbourne Water. A major question therefore, is how best to distribute this investment to maximise the ecological outcomes. The aim of this project is to implement spatial planning tools so that different planning options and their associated outcomes can be evaluated. This will inform prioritization of restoration works and protection and scales of investment for next water plan

Research Theme

Models of ecological response

Timing

2014-2016

Project Team

Chris Walsh
Nick Bond

Deliverables

The project will provide maps (as GIS layers) that rank sub-catchments on their basis of their degree of importance for restoration and/or protection based on their biodiversity values and the associated costs in achieving/protecting those values (whehter expressed as economic, social, opportunity etc.). The aim will be to develop and revise the prioritsation outputs based on regular interactions with a range of

Background

Conservation planning approaches typically are used to rank areas of existing habitat in terms of their contribution to avoiding biodiversity loss. An alternative approach is to consider the potential biodiversity gains from habitat restoration (Thomson et al. 2009). In this case models of species occupancy patterns are developed for a range of future restoration scnearios, and these future scenarios used as a basis for ranking currently degraded habitats (i.e. excluding currently intact areas). These ranks provide an indication of the priority that should be given to restoring particular areas. Depending on the time-scales over which restoration benefits are expected to accrue it is also possible to take into account the potential time lags before those benefits are realised (Thomson et al. 2009). For example, while barrier removal may achieve immediate outcomes, the benefits of riparian restoration in terms of shading may not be realised for decades. Whether to include such lags will be considered against the time-frames of restoration outocmes and rates of restoration investment, noting that any lags in biodiversity gains will be more critical to planning when restoration effort is also spread over many decades.

Methods

We will use Zonation SCP software to develop sysetmatic planning recommendations that quantify the expected biodiversity outcomes in terms of expected increases in habitable range of different species for varying levels of investment. These recommendations will be based on predictions of present and potential future distributions of biota under a range of plannig scenarios. We will work closely with melbourne water to derive estimates of costs associated with particular management and restortion options (e.g. in terms of the costs of fencing and replanting/km, reducing stormwater inputs, removing barriers etc.).

We also note that there are presently two primary software tools that support systematic conseration planning; Marxan and Zonation. The two tools share much in common, and are

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under ongoing development. Both share a high degree of functionality, including the ability to explicitly address the connectivity patterns inherent in the spatial hierarchy of river networks, as well as uncertainty in distribution patterns. However, at present they are both somewhat limited in their ability to incorporate differential responses of multiple species to multiple types of restoration intervention, together with different costs, all at the same time. We are currently exploring options to collaborate with colleauges at Griffith University (Mark Kennard and Simon Linke) who are currenlty developing algorithms to address this problem, and there is potential for them to adopt this as a case study.