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Presenting current research in the Goulburn Broken Catchment

The Riparian Rehabilitation Experiment: Evolution of a practical methodology

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Abstract:

There is growing enthusiasm to evaluate stream rehabilitation projects. We have undertaken the long process of conceiving, designing and implementing an evaluation of riparian revegetation on Victorian streams. Two approaches were initially considered: space-for-time substitution, whereby we try and learn about the impact of riparian replanting by examining conditions at existing rehabilitation sites; and a dedicated experiment, where a controlled, long-term field study is employed. In our case, space-for-time substitution was not a viable methodology, and consequently we are in the establishment-phase of a dedicated, long-term, experiment. Experimentation in the field necessarily requires some design compromises, and in our case the characteristics of available sites influenced the experimental design we have been able to establish. We hope that sharing our experience will be useful for others contemplating setting-up this sort of experiment.

Key Findings:

Space-for-time substitution was found to be of limited utility for two reasons:

1. Rehabilitation practices have changed dramatically over the last three decades. For example, 30 years ago revegetation with exotic willows and poplars was widespread, and since then many other methods were used.
2. Secondly, the magnitude of between-site variability (due to differences in planting density, vegetated width etc.) would probably overwhelm the magnitude of the anticipated riparian impact. Therefore, we could only learn a limited amount from existing revegetation sites.

The dedicated experiment: Our initial experimental design based on the 'gold standard' MBACRI (Multiple Before After Control Reference Impact) model, including before and after sampling with replicated impact (in our case fencing and replanting), control and reference locations. Three practical issues prevailed:

1. True reference sites (i.e. locations minimally impacted by human activity), at the extent we required (>1km stream length), do not exist on small, lowland streams in the Victorian Murray Basin.
2. Few of the permanently flowing (or even semi-permanent) streams have reaches that are devoid of tree cover for more than a couple of hundred metres. Instead the streams within our scope typically have a relatively continuous in-bank tree corridor, albeit with highly degraded or modified understorey and groundcover communities, with little or no tree regeneration evident.
3. Not all landholders were willing to host a rehabilitation experiment that will extend for a minimum of 10 years. Most were willing to discuss the merits of revegetation, many expressed concern about pests, weeds and flood-damaged fencing.

Implications:

- Lesson learnt from past rehabilitation efforts have been limited. We recommend that keeping good documentation is critical because rehabilitation practices evolve. Notes on both project design and during the implementation may involve details that seem obvious and self evident today, but may facilitate learning via evaluation in the future.
- Site selection plays a central role in shaping an experimental design that can be practically implemented. The time required to locate, conduct visual inspections, and meet with landholders can easily be underestimated. After an exhaustive 6 month, we have finally locked in 6 sites (3 pairs of control and intervention reaches).
- The lack of true reference locations means that to a large extent, the likely end-point of rehabilitation is uncertain. In place of a true reference target we are using a multiple line of evidence approach (Downes et al., 2002), drawing on historical information, expert advice, and measurements taken at 'best available' (i.e. least degraded) locations.
- Our final experimental design fits a modified BACI approach. Pairs of control and intervention reaches have been established on Faithful Creek in the Goulburn-Broken region, and on Middle and Joyce's Creeks in the North-Central region, with a fourth experimental site in negotiation on Major Creek (GBCMA).

Summary:

- The goal of the Riparian Restoration Experiment is to assess the physical and biological effects of riparian revegetation by way of a scientifically rigorous experiment.
- The experiment we have established follows a modified BACI design. While this may not be as robust as the MBACRI model originally sought, it is a design that can be implemented in the field.
- The streams on which we have experimental locations are typical of the small, lowland streams found across the Victorian Murray Darling Basin. Therefore, the responses measured through this project should be indicative of changes in stream health that will result from the substantial investment now being made in riparian fencing and replanting.
- Finally, it is important to remember that just because we know something about the detrimental impacts of clearing riparian zones, does not mean that we can assume that replanting will exactly reverse these effects.

Further Reading:

- Stewardson, M., Cottingham, P., Rutherfurd, I., & Schreiber, S. (2004) Evaluating the Effectiveness of Habitat Reconstruction in Rivers. Technical Report 04/11, CRC for Catchment Hydrology.
- Downes, B. J., Barmuta, L. A., Faith, D. P., Fairweather, P. G., Keough, M. J., Lake, P. S., Mapstone, B.D. & Quinn, G.P. (2002). Monitoring Ecological Impacts: Concepts and practice in flowing waters. Cambridge University Press.
- Ezzy, M. (2001). Evaluating the Effect of Riparian Vegetation on Physical Processes in Small Streams: An investigation of space-for-time substitution in North-East Victoria. Unpublished Honours Thesis, The University of Melbourne.
- Rutherfurd, I. D., Ladson, A. R., & Stewardson, M. J. (2004). Evaluating stream rehabilitation projects: reasons not to, and approaches if you have to. Australian Journal of Water Resources, 8(1), 57-68.