Completed Projects
1999-2002

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River Restoration

Project 6.1: Developing criteria and concepts for planning the evaluation of stream restoration projects

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Introduction

Preparation of the National Stream Rehabilitation Manual in the first round of the CRC for Catchment Hydrology highlighted the importance of evaluating stream rehabilitation work. Projects in Australia are poorly evaluated, if at all. This has been highlighted by recent reviews of the Natural Heritage Trust projects. Many of the initial projects in the CRC's River Restoration Program (1999-2003) involved evaluating rehabilitation projects. Therefore, this small project aimed to investigate approaches and concepts around the evaluation of stream rehabilitation.

Objectives

There are, of course, well established scientific methods (research designs) that can be used to assess whether a specific intervention has had any effect. Such experimental designs are not feasible for most government and community rehabilitation projects. In this project we set-out to identify a hierarchy of evaluation methods that produce known levels of confidence for the evaluators. In the original research brief we planned to prepare three general documents, but the focus of the project shifted when we received extra support from the Murray-Darling Basin Commission (MDBC) to explore the potential for planning evaluation of a major stream habitat restoration project.

Research outcomes

The project team explored the various evaluation methods and approaches available for stream rehabilitation projects. The result was the report to the MDBC (Stewardson et al., 2001) that now forms the basis of a large evaluation project. A specific outcome of this work was exploration of the potential for space-for-time approaches.

Space for time substitution as an evaluation method

Replanting riparian vegetation is the most common stream rehabilitation activity in Australia. However, it is difficult to evaluate the physical effectiveness of the revegetation (for shading, sediment buffering, and erosion control) without monitoring the effects of the vegetation as it grows over many years. Can we avoid waiting, by instead comparing the many sites where vegetation has been planted at different times over the past decades? This would be an ergodic approach in which space is substituted for time (Figure 1).

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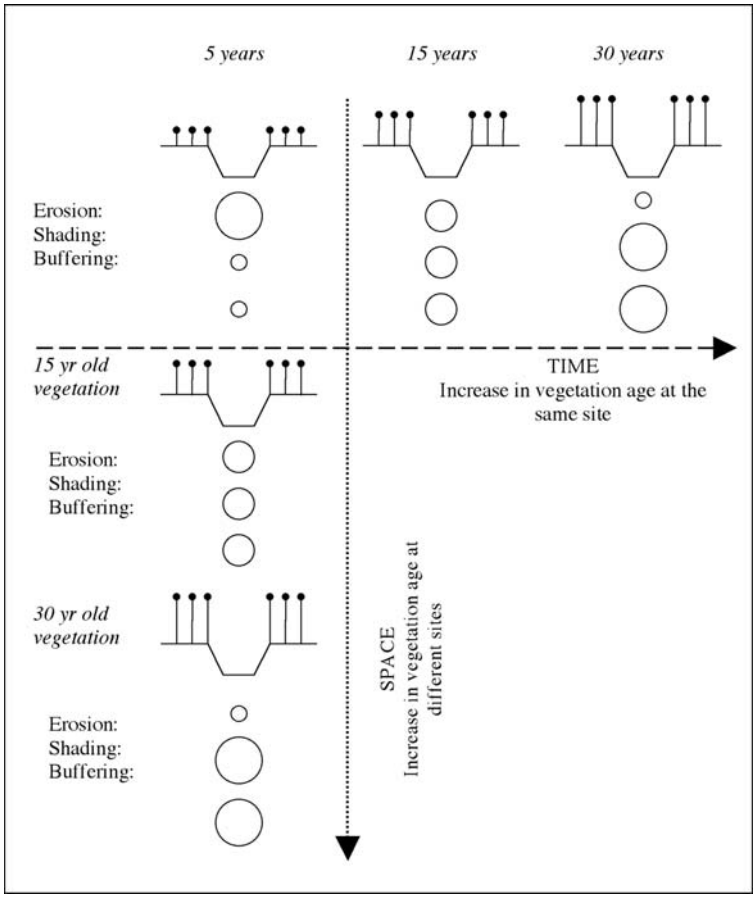

Figure 1: Conceptual model of space-for-time-substitution at revegetation sites. Note that the diameter of the circle indicates the hypothetical magnitude of the effect of vegetation on erosion, shading, or buffering.

We found that over 80 riparian revegetation projects in North-East Victoria (planted from 1 – 30 years ago) do not fulfil the theoretical and statistical assumptions of a space-for-time-substitution (SFTS) approach. The following assumptions are violated:

1. The age of the vegetation is actually a poor predictor of the character of the vegetation. This is because (a) different types of vegetation have been planted at different times, and (b) because there is only a weak relationship between vegetation age and vegetation structure (e.g. height).
2. The inherent variability between the sites was so large that it would overwhelm the effects of the age of the vegetation in a SFTS approach (see figure 2).

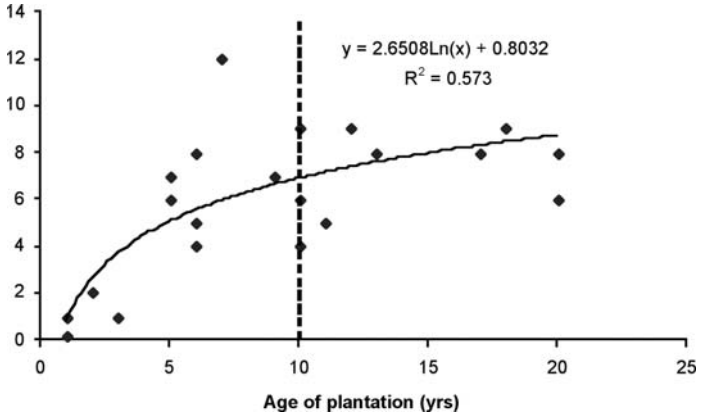

Figure 2: Correlation of average tree height with age for 22 plantations.

3. Sensitivity analysis of predictive models determined that the magnitude of the difference between sites overwhelms any effect due to riparian vegetation. This means that the magnitude of the variation found in the field sites is too great to detect the effect of vegetation of different ages.

   Only in special circumstances will post-hoc assessment of past projects provide a rigorous evaluation of the effectiveness of riparian revegetation on physical processes. The implication of this result is that there appears to be no alternative to a long-term BACI (before, after, control, impact) design experiment in assessing physical and biological effects of riparian vegetation on streams.

Application of the research outcomes

We have provided a hierarchy of evaluation methods that can be used by managers in applications and reports. Before this project, if managers wanted to evaluate a project, it was assumed that they would either describe outputs (what the money was spent on), or do an in-depth study ($P < 0.05$) looking for effects of intervention. There was a clear gap between these 'business' and 'science' models of evaluation. We now provide a full set of tools and descriptions that can be used to specify explicitly what is to be attempted. We have described a hierarchy of other evaluation methods, with lower P values, and lower cost, that provide specified levels of confidence.

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