How Well are Publicly Funded Tree Plantings Schemes Being Assessed?

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Abstract
A survey conducted by Greening Australia NSW in 2000 identified a lack of rigorous record keeping in relation to publicly funded tree planting schemes in some landcare groups within NSW. The survey revealed that not many people kept good records, which created a need to draw on a broad range of data collection strategies to determine the effectiveness of the program. Some of the data collection approaches developed included comparing aerial photographs to determine changes in canopy density and distribution, auditing survival rates, and comparing costings between revegetation and conservation of remnants. This paper will describe the issues that arose in developing these data collection processes and discuss the implications of aligning the funding processes to environmental requirements and propose protocols for future monitoring of tree planting programs.

Key Words
monitoring, evaluation, on-ground environmental work, Natural HeritageTrust, Landcare

Greening Australia has surveyed the effectiveness of publicly funded tree planting in the Kyeamba Valley up to 1999. The survey aimed to assess the effect that these schemes have had on several environmental measures. However, I found several deficiencies in record keeping that prevented a full assessment being made. In this paper, I will expand beyond tree plantings to publicly funded on-ground environmental work in general. These programs include Landcare, Total Catchment Management and Natural Heritage Trust (NHT). I will use my experience from the Kyeamba Valley Landcare NHT funded project, *Monitoring and review of tree planting, groundwater and biodiversity in Kyeamba Valley (Project No. BG0047.00)*, as a basis for exploring how the evaluation and monitoring process could be improved for future large scale on-ground environmental work.

Where is Kyeamba Valley?

The valley is about 10 km east of Wagga Wagga, New South Wales and is located between the Sturt and Hume Highways (Figure 1). It covers 104,271 hectares and has a tributary of the Murrumbidgee River, Kyeamba Creek, running through it. Like many rural areas the land has been extensively cleared for agricultural purposes which in turn has caused a number of environmental problems, such as soil erosion and rising groundwater tables. There are about 120 properties in the Kyeamba Valley Landcare Group area.

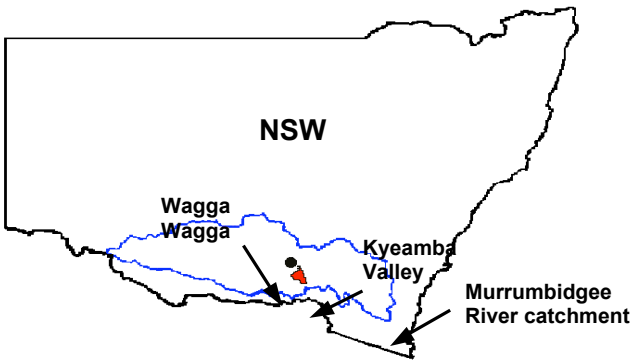

Figure 1: Location of Kyeamba Valley in New South Wales

The Kyeamba NHT Project

The project aimed to evaluate the role and effectiveness of tree plantings established by Kyeamba Landcare as part of the Kyeamba Land and Water Management Plan (LWMP). The Kyeamba LWMP set targets and provides advice for addressing identified land degradation issues such as rising groundwater, soil erosion and tree decline. The first draft was written in 1991 and finally published in 1999 well after tree planting had begun in the Kyeamba Valley. The experience and experimental results gained from the earlier work aided in the final writing of the LWMP. Prior to the plan there was no formal document readily available that identified the targets that were needed to address the land degradation issues in Kyeamba Valley. Funding for the work within Kyeamba Valley came from various schemes, ranging from the earlier National Soil Conservation Program (late 1980's) to the later Rivercare and NHT funds (late 1990's).

The present Kyeamba NHT project was to review the success of on-ground work both for their corrective action and changes in biodiversity. This paper focuses on those aspects that alerted me to weaknesses in record keeping and the ramifications that this had for monitoring and evaluating on-ground works. Therefore, my presentation will concentrate on monitoring tree survival and growth and changes in groundwater trends in relation to tree plantings.

Process of conducting the evaluation

My initial steps were to establish the project targets and to develop a list of questions to gather the relevant information. The next task was to source information. I was also always mindful of the time and money constraints of the project, so I continually assessed the outcomes of each line of investigation. I would end a line of investigation when it became too costly for the expected outcome.

Step 1 – Project targets: establishing the questions.

A. Monitoring tree survival and growth.

1. What were the plant species and number of plants per species planted at each site?
2. Where were the planting sites located?
3. Which planting method was used at each site, eg. tubestock or direct seeding?
4. Date of the planting?
5. What was the purpose of the plantings, eg. corridors, salinity or erosion control?
6. What are the sizes and shapes of the planted areas? This information was not one of the project's enquiry targets, but it was included because bird biodiversity was being assessed. Research has shown that bird biodiversity is correlated to the size, shape and connectivity of vegetation patches. Therefore, this additional information was important for evaluating how well the plantings met the requirements for birds and may have been a factor in determining the presence of the observed species.

B. Changes in groundwater trends in relation to tree plantings.

1. Where were the monitoring bores (piezometers) located?
2. Where were the tree plantings in relation to the bores?

Step 2 - Information gathering.

A. Where had revegetation been done?

I first contacted people who had been and still were involved in organising and doing the on-ground works in Kyeamba Valley. The present Landcare coordinator for Kyeamba directed me to the best sources of information including old Kyeamba Valley Landcare Coordinators' records. I found that the allocation of funds for on-ground work was listed according to landholders, with generally no reference to the property name. I immediately sought a map or list, either current and/or past, of landholders and their properties, but none existed. I then tried sourcing maps and property lists from the Department of Land and Water Conservation (DLWC) and the local city council, but neither could provide me with what I needed. For example, the local city council's map was based on the land rate postal address information and property names are only available if they are part of a postal address. Owner information can be incomplete, because if a person owns more than one property then the council records the address for only their main residence.

The main difficulty in obtaining current property ownership information is the continual change in property ownership and configuration (the land lots that make up a property). Changes in owners and property

configuration are not unusual for Kyeamba and elsewhere in rural districts, as illustrated in a local history book of the upper Kyeamba Valley (White, 1990) (Appendix 1). To put this changing land lot ownership into the context of my project, a land lot that had revegetation work done 10 years ago may then have belonged to Farmer Brown, but in the interim period the portion was split off and sold to Farmer Jones. Hindsight tells us that recording the map coordinates using a Global Positioning System (GPS) would have prevented such problems, but such equipment was not readily available 10 years ago.

This lack of the location information for on-ground works immediately complicated matters because I had no idea where in the Kyeamba catchment to look for these sites. In the end, I resorted to using recent 1:25,000 aerial photographs to locate the revegetated patches. I laid the 1:25,000 land lot map from DLWC over the aerial photographs and then traced the revegetated and remnant vegetation areas. The revegetated areas were easily distinguished from surrounding crops, pastures or remnant vegetation by their linear outlines and different canopy appearance. The resulting maps were only a rough guide to where revegetation work had occurred because of the lack of GPS coordinates, the slight differences in scale and the slight distortion of aerial photographs (Figure 2). However, the maps were still very useful in planning not only my investigations and those of a honours student, but were also invaluable when visiting farmers for discussing history, funding and reasons for revegetation sites.

Rough estimates were made of the size of each revegetated area using a ruler. More accurate measurements of the plantings could have been made using the DLWC's Geographic Information System (GIS). However, neither the personnel nor computers with the capability were available to me at the time. Such accurate measurements using GIS is very time consuming and I felt for my purposes the extra time and expense was not warranted.

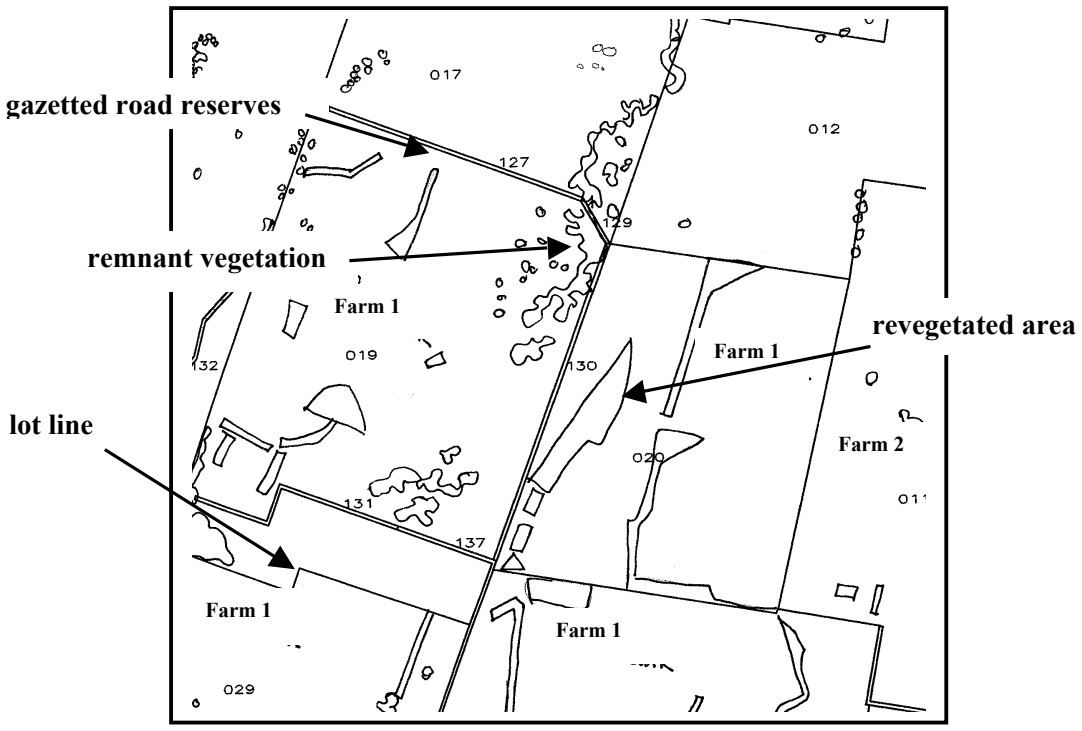

Figure 2: Example of revegetation and remnant tracings from 1:25,000 aerial photographs and 1:25,000 DLWC map.

2. What had been planted?

Finding what species had been planted at each site was again very difficult or impossible. Amidst the landcare records were several different lists of recommended seedling species for various project plantings, but no record of what species or number of individuals per species had been planted on the day. Anyone in the revegetation

game knows that the availability of plant species is highly variable depending on propagation problems and availability of seed. I also contacted nurseries that I knew had been providing seedlings for many of the revegetation works in the area. I assumed, being a business, that they would have kept copies of invoices for plants sold to various landholders or landcare groups. I also contacted past landcare coordinators and agency staff who might have been involved in some of the revegetation works.

3. Piezometers

A DLWC hydrogeologist was helpful in obtaining and interpreting information on some of the piezometers within Kyeamba Valley. Maps were available that had piezometer locations within the Kyeamba Valley on them. However, again this was not linked to property owners or property names on the map.

Results

1. Location of revegetation sites

From the landcare records, I was able to develop a list of projects and landholders that had participated in these projects. Fifty-nine projects had been funded from 1989 to 1999 with a total funding allocation of $992,395. These 59 projects do not include work done under larger scaled regional projects, such as Heartlands, Greening Australia's Fencing Incentive and Farm Forestry Programs. With the addition of these extra projects funded on-ground environmental work would have exceeded $1,000,000. Twenty-eight of the 59 projects were for revegetation and accounted for 146 revegetation patches. The estimated funding for this revegetation was $320,665, but the funding often included money for other work necessary for revegetation, such as fencing.

I located 400 patches on the aerial photograph tracings, which meant 254 patches were either self funded or funded from programs other than those of the 59 recorded projects. From the revegetated area calculations I estimated 548 hectares had been revegetated, or 0.5% of the Kyeamba Valley land area. However, results from ground truthing my map measurements suggested that 548 hectares might be an over estimation of the revegetated area, as I had over estimated the width of strip plantings that measured 1 mm wide on the map. I had estimated that these plantings were 25 m wide, but they were only 7- 10 m wide.

The maps were very useful for locating the revegetation work but I still did not know which patch was funded privately or through a funded project. To ascertain such information, visits would have to be made to each property owner. This was beyond the resources for the project. Results from my assessments to date suggests that many of these extra 254 patches were probably self funded.

2. Plants species information

Some property owners did have records of the seedling species and the number of plants per species that had been planted, but they were very few. No information was available from the plant nurseries. Direct seeding information was more available with accurate records obtained from a local landholder who direct seeded for the landcare group. However, direct seeding done by DLWC was different. Although a list of recommended species was available, the composition of the direct seeding mix varied according to what seeds were available at the time of planting. Therefore, there was no site species information for DLWC direct seeding.

The lack of knowledge of what had originally been planted made it impossible to know what had died between the time of planting and the time of assessment. Therefore, calculating percentage survival, a project goal, for each species was impossible. Assessing what is present today was also difficult because most of the trees are still immature and do not possess the adult physical characteristics that are needed for positive identification of tree/shrub species, such as bark, leaves and fruit characteristics. The situation was further complicated by the use of a wide range of species from throughout Australia, but my plant identification skills were for New South Wales, particularly for the local region. Therefore, having such a potentially wide range of species and a lack of identification skills for all those species made positive identification very difficult. The presence of species lists would have been useful to limit the range of potential species at a site.

3. Piezometers

Thirty-three piezometers were installed in Kyeamba Valley, of which Landcare funded 25. Nineteen of the 25 Landcare piezometers were located on one property, Mona Vale. Of the 19 piezometers on Mona Vale, 4 were monitored regularly and long enough to gain enough data to establish any trend or correlation between plantings and groundwater levels. These piezometers were successful because they were confined to a small subcatchment containing revegetation and the groundwater in this subcatchment responded to localised water movement, while many of the other piezometers were not as strategically placed. The piezometer measurements were also better

on Mona Vale because they were part of a long-term project and had been regularly read by a technical officer. Many of the other piezometers had only been monitored for 5 years and relied on the local landholder to do the measurements.

Lessons learnt and future directions

The problems arising in the Kyeamba NHT project should not be blamed on the members of the landcare group, but rather reflects the poor planning by the government funding bodies and too high an expectation of volunteers. Monitoring and evaluation are specialised skills and should be done only by trained individuals.

It is obvious that much potential data has been lost due to the poor records. Some could be retrieved, such as map coordinates of plantings and their history, but the cost of such recovery is high. Thus, a fresh start needs to be made for accumulating good data.

1. How to improve environmental evaluation and monitoring:

A. Develop a **hierarchy of reporting and information storage.** The information needs to be organised to allow more ready access and exchange of information among different levels of community and government organisations. At present information is very fragmented because each group or organisation keeps their own records.

   A hierarchical standard reporting and storage system is needed to accommodate the different geographical scales at which work is being organised and delivered. For example, in New South Wales the base organisational scale where environmental targets are being set is at the catchment level. This should then be the base scale at which a monitoring structure is developed and information stored. However, there must be a means for information flow within and to state and federal bodies.

B. Develop a **standard base monitoring protocol.** (In the case of NSW this should be based on the catchment blueprint targets.)
   - **Duration of monitoring.** The duration of monitoring has to be meaningful for the target being assessed. For example, evidence from groundwater levels in the Kyeamba NHT project suggests a 10-year minimum for monitoring. Ten years is probably a sensible minimum time length for most environmental monitoring because of the highly variable Australian climate and the natural lag time between implementation and a noticeable environmental affect.
   - **Frequency of measurements.**

C. Decide what **basic information is essential** for monitoring and evaluation. Monitoring information has a wide range of potential users, eg funding or research bodies. To best target the basic information requirements, consultation would be necessary with the various users. For example, in the Kyeamba the following information would have been the basic:
   - **Location information.** Record of map coordinates, property name and owner at time of work.
   - **Date that work was done.**
   - **Size and dimension of site.**
   - **Type of work occurring at the site.** If revegetation work, then plant species and preparation information would be needed.
   - **Project information** if the work has been publicly funded.

D. **Appropriate staffing**
   - **Employ staff.** Volunteers should not be expected to do a highly skilled and time consuming job.
   - **Employ experienced staff.** Monitoring is a very highly skilled job that requires an appreciation for the care that is needed in collecting such information.
   - **Quality control of staff and information.** Continual monitoring of collected information with any deficiencies being addressed immediately.
   - **Staff training.** To ensure consistency of information collection, all monitoring staff need to have standardised training.

2. Potential problems

A. **Lack of landholder cooperation** because of concerns over privacy of information. Many landholders are very wary of regulatory government agencies, such as the National Parks and Wildlife Service and DLWC, having detailed information about their farms, especially threatened species information. Landholders have to feel comfortable about the process and the information being gathered and stored about their property.

B. **Loss of quality data from high staff turnover.** Many of the problems arising in Kyeamba were from the high staff turnover (6 Landcare coordinators in 10 years) and the subsequent loss of information continuity.

C. Inability to develop a monitoring structure and protocol. Consultation with all the potential users of information will make it difficult to develop a standard monitoring protocol and structure before it is needed.

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Appendix 1: An **example of changes in a property's owners and configuration**