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Restoring landscapes with confidence — an evaluation of the science, the methods and their on-ground application

Final report



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Executive summary

- Landscape restoration is a relatively new science in Australia, which has generated a large volume of knowledge and is essential to underpin increasing levels of investment. Land & Water Australia's (LWA) Native Vegetation and Biodiversity Research and Development (R&D) Program and its predecessors, have funded a number of projects over the last decade on how best to protect, rehabilitate and restore native vegetation and biodiversity in agricultural and pastoral landscapes. The present project was commissioned by LWA as a timely assessment of the extent to which the research, tools and information that are currently available on landscape restoration are being used by regional natural resource management agencies and other organisations to achieve on-ground outcomes.
- Landscape restoration is a term that is widely used to cover activities aimed at improving native vegetation and biodiversity outcomes at paddock to landscape scales. There is no one definition to which everyone refers; rather, it is an umbrella concept under which a number of different philosophies and approaches are grouped. The concept appears to have greater currency in the more highly cleared landscapes of southern and eastern Australia, compared to the more intact systems in central and northern Australia. The term 'restoration' is applied much more broadly than its definition encompasses, including activities that are more closely aligned

with landscape rehabilitation (while the latter also seeks to improve the condition of degraded areas, it is not necessarily concerned with moving the landscape in the direction of the pre-existing state). There is also an extensive range of landscape restoration approaches, tools and guidelines available. This diversity of intent, approaches and tools, makes it difficult for people to work out which approach or technique best applies to them and the work they are doing. Further, the range of approaches, tools and guidelines are scattered amongst websites, publications, guidelines and in 'people's heads'. This makes it hard for people to know if they are accessing the most up to date, or relevant, work for their region.

- Landscape restoration research is grouped around a number of 'themes', including connectivity and corridors, buffers and edge effects, vegetation patterns in the landscape, ecological processes and disturbance, resilience and recovery. The focus varies geographically in Australia, and includes both increasing the extent of native vegetation in highly cleared areas, and maintaining and enhancing vegetation condition across all landscapes. Research has largely focused on mammals and birds, less on plants (apart from vegetation as habitat), and even less on soils, although these areas are starting to gain more attention. While conservation planning and prioritisation science and tools are not usually included in the ambit of landscape restoration science, they have an important role to play and are of keen interest to policy and on-ground practitioners.
- The context within which landscape restoration research is undertaken and applied is critical, as is setting clear restoration goals. The main restoration approaches used by regional groups include focal species, thresholds, improving vegetation condition, maintaining or enhancing structural and floristic diversity, and establishing connectivity/corridors in the intensive land-use zone. The effectiveness of these approaches once implemented is largely untested. The concept of ecosystem services is being increasingly adopted, but there is limited quantitative information available that is relevant to regional decision-making. Emerging trends are the increasing number of large-scale 'biolink' style projects to combat threats

such as climate change and continuing fragmentation. These approaches have a limited scientific basis at the moment, but it is likely this will be addressed as part of ongoing monitoring, evaluation and research assessments.

- Greening Australia, as a key national organisation with a proven track record of on-ground works engaging local communities and individuals, has recently taken a strategic decision to move towards transforming landscapes rather than simply maintaining its past focus on engaging with others to do local on-ground works. The organisation is using the Conservation Action Planning tools in implementing this shift. While this has potential to play an important role in bringing together good science and local knowledge to ensure that landscape-scale projects are strategic in their work, it also presents a cultural and capacity challenge to Greening Australia. The organisation's credibility rests heavily on its history of community-based on-ground works. The challenge will be to embrace the new philosophical approach, while also retaining 'grass-roots' delivery of on-ground programs.

- Landscape restoration theories and approaches need to be demonstrated in action, and the 'real life' challenges and opportunities they bring need to be clearly communicated. There are many projects underway across Australia that claim to be about 'landscape restoration'. These projects are diverse, and there are a large number of different agencies and organisations running them. Within states and territories there is no central coordinating mechanism, so it is quite common for projects to be underway that only a few people or groups know about.
- Experts are often inaccessible, and there is a high demand for people with knowledge about landscape restoration who can work with others to build capacity and translate that knowledge into on-ground action.
- There is a lack of 'logic' for people to use to work out which landscape restoration approach is best suited to the work they are doing. Research findings are scattered amongst different publications, and there is little synthesised information that clearly compares and contrasts different approaches to landscape restoration.



Photo courtesy of Greening Australia Capital Region.

- People working in the area of landscape restoration are time poor and seemingly overwhelmed with demands to achieve on-ground outcomes in short, unrealistic project time-frames. Attending workshops and investing in building organisational and individual capacity, is a low priority for senior management. In addition, many people report being 'workshopped out' and 'consulted out'. This has implications for the design of communication strategies as people are often unwilling or unable to attend meetings and workshops that are viewed as outside 'core business'.
- Policy and funding program frameworks are not conducive to achieving long-term sustainable landscape restoration outcomes. In general, funding programs demand on-ground investments within two to three years, leaving little time for planning and sourcing sound scientific advice to underpin projects. The short time-frames also mean it is impossible to effectively engage local communities, as there is little time to invest in the building of relationships prior to work being undertaken, or to maintain relationships in the longer term.
- The focus of many landscape restoration projects and policies has been on private land, with a parallel set of initiatives on publicly funded conservation reserves. These two areas will need to form closer partnerships in the future if effective landscape scale restoration is to occur.
- Staff turnover in organisations at all levels results in a loss of corporate memory and difficulties engaging with local communities, as relationships of trust cannot be established with the constant changeover in personnel. This has implications both for undertaking longer-term landscape restoration projects, and for follow-up evaluation and shared learning. Landowners need to feel confident in the staff they are working with, and need to trust that they will receive consistent support. Unless monitoring and evaluation objectives are well defined and resourced beyond the life of an initial project, replacement staff are unlikely to be able to continue this work.
- Non-government organisations and private sector groups are becoming major players in large-scale restoration projects, with industry having the potential to increase their influence as well. There is a need to reflect this changing dynamic in policies and programs that have previously focused on regional groups and state agencies as the main organisations working in landscape restoration. With this shift, and with growing frustration of non-government and private sector organisations at the inadequacies and 'red tape' of government programs, a disengagement with what governments have to offer is occurring. Various organisations are increasingly seeking out other sources of support, whether from philanthropic organisations, the corporate sector or elsewhere. While this may have short-term benefits to the public purse, it will exacerbate an already growing disconnect between strategic on-ground action and the policy and program environment in which people operate.
- There is a need for research into landscape restoration and socio-cultural issues. It is difficult to undertake landscape restoration approaches without a willing community to be involved with and supporting such approaches, yet there is little work being undertaken in this area.
- Numerous research gaps in landscape restoration were identified through workshops, interviews and questionnaires. These ranged from a need to better understand the role of cryptic biota such as fungi and rhizobia in restoration, through to improving the transferability of results between species and regions. The rapid increase in the number of large-scale 'biolink' projects was also identified as an area requiring investment so that the scientific basis underpinning such projects could be evaluated.



1. Project overview

Regional natural resource management (NRM) agencies across Australia are becoming increasingly responsible for the development and implementation of on-ground actions for the conservation and management of native vegetation and biodiversity. At the same time, investment through initiatives such as LWA's Native Vegetation and Biodiversity R&D Program and its predecessors, has been investigating how best to protect, rehabilitate and restore native vegetation and biodiversity in agricultural and pastoral landscapes.

Research on landscape ecology undertaken by Australian scientists such as Andrew Bennett, Sue McIntyre, David Lindenmayer, Richard Hobbs, Andrew Young, Hugh Possingham, John Ludwig, Craig James, David Freudenberger and Josh Dorrough, is world-class. It has led to a number of advances in our understanding of how our landscapes function, and helped tease apart the complex ecological processes and systems that maintain native vegetation and biodiversity. These advances include the seminal work on landscape conservation principles and thresholds developed for grassy woodlands in eastern Australia, as well as research on focal species, plantation design, revegetation, landscape function, and the distribution of watering points for domestic stock within arid regions. National and international ecological research on such topics has the potential to inform the way that agricultural and pastoral landscapes are managed, how on-ground programs are designed, and restoration efforts monitored.

It is currently unclear, however, what impact the science of landscape and restoration ecology has had on the planning and implementation of on-ground activities at the regional, sub-catchment and property scales.

In order to shed light on this key issue, this project assessed the extent to which the research, tools and information that are currently available, are being used by regional natural resource management agencies to achieve on-ground outcomes. It examined how well the science that has been undertaken is embedded in day-to-day practical approaches, and investigated what makes research relevant, meaningful and able to be easily integrated. In cases where the available research is not being used, questions were asked about what were the impediments: lack of knowledge about or access to the research?, a lack of capacity to understand and apply the science?, the format in which the science is presented?, whether it is perceived as relevant to a particular region or project?, or whether a lack of scientific credibility or other social factors intervened?

The definition of landscape restoration used in this project has been adapted from the definition of ecological restoration developed by the Society for Ecological Restoration International, as follows.

"Landscape restoration is the process of assisting the recovery of a landscape that has been degraded, damaged or destroyed. It is an intentional activity that initiates or accelerates landscape recovery with respect to its health (functional processes), integrity (species composition and community structure) and sustainability (resistance to disturbance and resilience)."

Restoration overtly attempts to recover a pre-existing condition close to the original state, although this will rarely be possible in practice. The related practice of *rehabilitation* also seeks to improve the condition of degraded areas to resilient, self-supporting ecosystems, but not necessarily in the direction of the pre-existing state. Many on-ground projects in Australia do not explicitly differentiate between restoration and rehabilitation, so the term landscape restoration is often used to cover both of these activities. Landscape restoration can therefore encompass many factors such as biodiversity, water quality and quantity, and nutrient cycling. For the purposes

of this project, the focus is on the retention and restoration (through improved condition and/or extent) of native vegetation for biodiversity values. Humans generally view landscapes as regions that cover an area of a few square kilometres or greater. In reality, research and on-ground action that is relevant to landscapes can be undertaken at a number of scales.

Using these boundaries as the basis of our understanding of landscape restoration, the project investigated:

- the range of strategies, approaches, tools and knowledge that exist to assist regional natural resource management agencies better plan and manage native vegetation and biodiversity;
- through discussions with a range of stakeholders and a review of the available literature, which of the strategies, approaches, tools and knowledge are being used and why/why not;
- how regional NRM agencies and their 'client' practitioners can best be supported to access and apply the information and tools available, and what needs to be done to facilitate this; and,
- where gaps exist in the resource base and how they can be addressed in a second phase of the project.

This analysis has enabled our research team to meet the objectives as stated in the project brief:

1. Evaluate current approaches to landscape restoration and the current and potential impacts of science-based knowledge for informing these.
2. Ascertain the interest and the needs of regional planners and practitioners (regional bodies, Greening Australia, state agencies) with respect to a resource base of landscape restoration and the elements that should comprise these.

Photo courtesy of Greening Australia Capital Region.



2. Project methodology

A review of existing research, tools and information has been undertaken to develop a comprehensive assessment of the 'state of knowledge' on landscape restoration (as per the definition outlined in Section 1) science. This was complemented by feedback from research scientists, who responded to a set of questions about landscape restoration and its on-ground application. The 'state of knowledge' review was modified for use at each of the project's four regional workshops as a conversation starter, and as a way of providing an overview of landscape restoration science. This document has now been developed into a stand-alone 'State of Landscape Restoration Knowledge Discussion Paper' by Professor Jann Williams. It is recommended that the Discussion Paper be published and made available to project participants.

A questionnaire was developed as a precursor to the regional workshops and desktop surveys. This questionnaire 'primed' participants so that they thought about the tools and knowledge they use for landscape planning and restoration, and identified any gaps they perceived as impeding their achievement of on-ground outcomes.

Four regional workshops were held for detailed discussions with a range of stakeholders to explore which research, tools and information are being used and why/why not. Questions were asked about where gaps exist in knowledge and in capacity to use what is available, and what the components of a useful and accessible 'resource base for landscape restoration' need to be.

The four regions chosen in consultation with the LWA Project Steering Committee were:

1. Northern Victoria (North Central, Goulburn Broken and North East CMAs). Contact: Geoff Park. Dates: 27–29 February 2008 (workshop on the 28th).
2. Central west New South Wales (Lachlan and Central West CMAs). Contact: Paul Ryan. Dates: 10–12 March 2008 (workshop on the 11th).
3. South-west Western Australia (Gondwana Link, South Coast NRM). Contact: Deon Utber, DEC. Dates: 8–10 April 2008 (workshop on the 9th).
4. Central Queensland (Fitzroy Basin Association [FBA]). Contact: Graham Lightbody, FBA. Dates: 16–18 April 2008 (workshop on the 17th).

It took considerable effort by the research team to encourage people to attend and participate in the four regional workshops, a significant finding in itself. All four workshops were challenging to organise, as people were reluctant to attend until they could see 'what was in it for them'. The research team feels this reflects the enormous stress and strain many people are working under in NRM. Competing pressures and demands on time, combined with many different Commonwealth and state agencies running workshops to ensure they 'consult' with the regions, have led to people being 'workshopped out' and 'consulted out'. The introduction of the new 'Caring for our Country' program, and in particular the transitional arrangements associated with it at the time the workshops were being run, added extra demands on workshop participants, making it less likely for them to attend.

The research team used personal contacts, several e-mails and telephone calls to get people to fill out the questionnaires and come to the workshops. Even with this high level of contact, some people failed to turn up on the day. It is possible that more people would have attended the workshops if they directly addressed the landscape restoration projects in their region. For example, workshops providing practical advice on 'best practice' restoration science and how particular approaches can be developed and implemented in different landscapes, could be perceived as more valuable. This approach requires substantial planning and resources, but is worth keeping in mind for future projects.

Section 4 provides a report on each of the workshops that covers the research, tools in current use, information, and level of understanding in the region about landscape restoration. It provides an overview of the workshop findings and contains recommendations from participants about how the region might maintain or improve work being undertaken in landscape restoration. Section 4 also provides a desktop review of the situation within those states and territories that did not have a workshop. This helped ensure that an Australia-wide coverage of the issues associated with landscape restoration was achieved.

Photo Roger Charlton.



3. State of landscape restoration knowledge review

It was originally intended to undertake a 'state of knowledge' review of landscape restoration science as the foundation for this project. It soon became apparent, however, that it would take several months of concerted effort to systematically review the volume of literature that has been generated on landscape restoration and relevant related topics. Consequently, this 'state of knowledge' Discussion Paper presents a number of perspectives on landscape restoration science and its application. The Discussion Paper is provided as a stand-alone document and supports this Final Report.

The Discussion Paper draws on three main elements that address landscape restoration science from different perspectives:

1. a survey of some of the leading landscape ecologists in Australia;
2. a desktop review of the major Australian literature on landscape restoration science; and
3. the workshops and desktop studies undertaken as part of the larger project.

1. A survey of some of the leading landscape ecologists in Australia

A list of landscape ecologists was drawn together with input from the project steering committee. Scientists were sent an invitation by e-mail in early January inviting them to answer four questions (Box 1). Many people were on holidays at this time, so subsequent reminders were sent over the proceeding weeks. Some additional scientists were also invited to contribute at this stage. The scientists were able to respond either in writing or over the telephone, with most taking the former option.

Box 1: The four questions on landscape restoration that ecologists were invited to answer

1. What currently available landscape restoration research/principles are relevant to achieving on-ground outcomes for native vegetation and biodiversity?
2. How successfully is this research being applied by regional NRM agencies?
3. What, in your experience, are the key factors influencing the uptake of landscape restoration research by regional NRM agencies?
4. Are there major research gaps on landscape restoration that need addressing?

The intent of these questions were to help ensure the review covered the most recent research undertaken on landscape restoration, identified what new research was considered important, and captured the views of scientists on what they thought the barriers were to the uptake of their research by regional organisations and groups. Over 20 scientists responded to the invitation. The level and depth of response was encouraging and added another dimension to the Discussion Paper, which was originally only intended as a desktop review.

2. Desktop review of the major Australian literature on landscape restoration science

To ensure that the main themes and issues were covered, a number of synthesis publications were used as sources of information. These included Lindenmayer et al. (2008), Lindenmayer and Hobbs (2007a), Radford et al. (2007), Huggett (2007) and Williams (2005). The focus of landscape restoration has been on the highly cleared areas of southern and eastern Australia, so these publications tend to focus on these regions. The exception is Williams (2005), which assessed a range of research and resources on native vegetation management across Australia, several of which are relevant to landscape restoration. A useful addition to the literature on landscape restoration would be a synthesis of research and principles from the more intact landscapes of the arid zone and tropical savannas.

These publications were chosen because they provided an entry point to a large amount of relevant material, were recently published and were relevant to work being undertaken on-the-ground by catchment management authorities and equivalents across Australia. Several researchers contacted through telephone interviews also pointed to the book (and associated paper) by Lindenmayer and Hobbs (2007a), as being a key document on the latest thinking about landscape restoration. A number of other references have been used in the review to complement these documents. Where possible, these were also papers or books that synthesised current thinking and acted as a point of reference to further work. To add to this information, the lessons learnt from projects underway or recently completed, but not yet published, were also included.

3. Workshops and desktop studies undertaken as part of the larger project

The Discussion Paper has drawn on the four regional workshops and four desktop studies that were undertaken as part of the larger project on the application of landscape restoration science at the regional level (Lovett et al., 2008). The workshops were held between the end of February and mid-April in Nagambie (Victoria), Cowra (New South Wales), Albany (Western Australia) and Emerald (Queensland), with comprehensive reports written on each to capture the key learnings. To provide national coverage, desktop studies were undertaken for the Australian Capital Territory, Northern Territory, Tasmania and South Australia. Both the workshops and desktop studies drew on questionnaires that had been sent to people to explore issues related to the application of landscape restoration science. A summary version of the Discussion Paper was tailored for each of the regional workshops. This was sent to participants in advance of the workshops to act as a background document and conversation starter.

The workshops and desktop studies provided a wealth of information on the type of research that was being applied at the regional level, as well as identifying the issues of importance to practitioners (both on-ground and policy). The interests of workshop participants have been reflected in the Discussion Paper, for example, the emphasis placed by different groups on prioritisation/planning tools that are applicable at the landscape scale, resulted in a separate section on landscape/conservation planning tools being included in the final document. Another key theme that arose was the increasing use of technologies such as remote sensing and GIS, and the range of issues that surround their use.

While the terms of reference for the Discussion Paper focus on the biophysical aspects of landscape restoration, the workshop reports and desktop studies placed strong emphasis on the importance of the human elements of landscape restoration, and the impacts of costs, other constraints and the role of interactions among people. These topics are beyond the scope of the Discussion Paper, but are briefly covered in Section 10 of the document.

The Discussion Paper is a companion document to this Final Report. At September 2008 it is available as a draft document from www.lwa.gov.au/nativevegetation

4. Restoring landscapes at the regional and state level

The following workshop summaries provide a rich level of detail about how people think about, and act to implement landscape restoration goals in their region or workplace. Each workshop report is broken up into themes and topics that were common to all states and territories, with implications of the findings from each workshop provided in the last section. The desktop summaries use a similar structure so that a comprehensive national picture is provided about what people are thinking about, implementing, and finding challenging about achieving landscape restoration. The workshops and desktop studies are presented in the order in which they were completed.

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Photo courtesy of Greening Australia Capital Region.



Workshop summary — Victoria

Overview

The Victorian workshop was held on 28 February at the Lakeside Resort in Nagambie. The North Central Catchment Management Authority (CMA) hosted the event. This region was chosen because there is considerable work being undertaken by local CMAs and other organisations, that are using 'landscape restoration' as the overarching objective. In addition, Geoff Park, a member of the LWA Steering Committee for the project, was actively involved in promoting and encouraging people to attend the event. The Victorian workshop was the best attended (30 participants) of all four held. This was due to both Geoff Park's involvement and the fact that Victoria is more advanced than other states in tackling landscape scale activities. As a consequence, participants could see the direct relevance of the workshop to their day to day work.

Participants

Three CMAs were represented, the North Central CMA, North East CMA and the Goulburn Broken CMA. Victorian Department of Sustainability and Environment representatives from head office, Wodonga, Bendigo and Benalla attended, as well as Victorian Department of Primary Industries staff from Kerang and head office. Non-government organisations including the Trust for Nature, the Norman Wettenhall Foundation, Greening Australia and Friends of the Box Ironbark were also present. In general, participants were directly involved in developing and implementing biodiversity and nature conservation strategies and projects on-the-ground.

1. Awareness and understanding of 'landscape restoration'

In reviewing the questionnaire responses submitted by some participants prior to the workshop, as well as reflecting on the workshop itself, it is clear that whilst people are familiar with the term 'landscape restoration', there are a range of opinions about what it actually means. For most people, the term refers to looking at the landscape as a whole, with all its components (soil, vegetation, biodiversity, water, climate etc.) and how they interact, rather than focusing on the smaller patch scale and, for example, protecting a particular species. Landscape restoration, therefore, encompasses a broad field of academic inquiry and on-ground practices, with particular organisations using particular approaches, depending on the research contacts, regulatory and institutional environment they operate within.

Whilst all participants said they understood the term, a consistently raised issue was the gap between the concept of landscape restoration and the practical realities of implementing it on-the-ground. Some participants, although acknowledging this gap, believe the term is a good one for raising awareness and expectation within communities for projects that are going to 'connect' parts of their landscape together. This idea of connection is one that seems to resonate with people and motivate them to get involved in projects that are seeking to work at the broader landscape scale.

Other participants felt the term was too broad and amorphous for use with local communities, and preferred to use terms such as adaptive management; bush stewardship; continuums of activity from protection (keeping values intact) through to revegetation (partial achievement of prior condition); and biosite protection, as more accurately describing what can be realistically achieved on-the-ground given constraints of resources, time and access to land.

2. Theories, tools and information being used for 'landscape restoration'

The Victorian Vegetation Management Framework, Biodiversity Action Planning and Ecological Vegetation Class mapping and information were consistently referred to by participants as providing overarching guidance for their landscape restoration activities. This reflects the large number of people working in CMAs and state departments who were present at the workshop. Regional targets were mentioned in the context of work being undertaken to develop and achieve Regional Catchment Strategies.

Greening Australia representatives referred to their organisation's recent move to using The Nature Conservancy's Conservation Action Planning process as the foundation tool for all landscape scale projects. Trust for Nature, the Norman Wettenhall Foundation and Friends of the Box Ironbark all undertook landscape restoration projects, but explained what they were trying to achieve to the people they were working with in simpler terms. Simpler in this sense does not mean with less technical rigour, but rather, making the idea of landscape restoration more accessible and possibly less daunting to community groups and landholders who want to get involved in conservation management projects that are bigger than 'patches'.

Based on the questionnaire responses and feedback from the workshop, the following lists have been compiled of material being used to think about and implement landscape restoration. These responses are broken up into material supporting the theory and principles underpinning landscape restoration, and the tools and events that assist with the implementation of that theory.

Theories and principles

- Biodiversity action planning — protect, enhance and restore
- Landscape scale ecology
- Ecological thresholds — landscape, site and species
- Target setting approaches — regional, local and site
- Adaptive management principles — restoration ecology
- Conservation significance/vegetation condition
- Principles of increasing landscape value (net gain)
- Landscape context modelling (Wilson and Stothers)
- Island biogeography

Publications

- *How to plan wildlife landscapes*, 2002, Platt.
- *Land for Wildlife* notes (see www.dse.vic.gov.au).
- *Ecological Management & Restoration* journal.
- *Conservation Biology* journal.
- 'Birds on Farms', supplement to *Wingspan* journal, Birds Australia.
- *State of Australia's Birds*, Birds Australia.
- *Thinking Bush* magazine, LWA.
- *Effective landscape restoration for native biodiversity in northern Victoria*, 2007, Radford, Williams & Park.
- *How much habitat is enough? Planning for wildlife conservation in rural landscapes*, 2004, Radford, Bennett & MacRaild, Deakin University.
- *Revegetation Techniques — a guide for establishing native vegetation in Victoria*, 2002, Greening Australia.
- *Revegetation of local plant species in the Mallee & Northern Plains — from the ground up. Guidelines for Seeding and Planting*, 2006, Swan Hill Regional Seedbank.
- *The New Nature — winners and losers in wild Australia*, 2002, Tim Low.
- *Bringing Back the Bush: The Bradley method of bush regeneration*, 1988, Joan Bradley, edited by Joan Larking, Audrey Lenning and Jean Walker.
- Trust for Nature Corporate Plan.
- Best Practice Revegetation Manual, Goulburn Broken CMA.
- *Revegetation Guide for North Eastern Victoria*, 1994, F. Stelling.
- *Restoration and Revegetation Guide for the North East Catchment*, Sue Berwick & Mary Titcumb.
- *Managing and Conserving Grassy Woodlands Guide*, 2004, CSIRO.
- Natural Heritage Trust (NHT) standard outputs and framework.

Websites

- Best Practice Native Vegetation Management website <http://mail.nccma.vic.gov.au/nvbmp/NewStart.aspx>
- Greening Australia's Knowledge Exchange Flora Bank <http://www.florabank.org.au/>
- Charles Sturt University <http://www.csu.edu.au/herbarium/woodlandweb/restoration.htm>
- Ecological Society of Australia <http://www.ecolsoc.org.au>
- Arthur Rylah Institute and CSIRO — various research collaborations http://www.bcg.org.au/cb_pages/EcosystemFunctionProject.php

Tools, courses and events

- Veg Futures conferences
- Box Ironbark Ecology Course
- 5S Framework Training, The Nature Conservancy
- *Managing your patch of bush*, Victorian Department of Sustainability and Environment
- Market Based Incentives — Bush Return (natural regeneration) and Green Graze (grazing for native vegetation management outcomes)
- LWA Rivers Legacy CD 2007 (and associated products)

It is interesting to see the mix of resources being used by people, with academic papers, journals, guidelines, manuals, web-based material, decision support tools, and programs such as Greening Australia's Exchange Program being cited. This finding demonstrates that the people working in landscape restoration are adept at finding resources to support themselves and their work. However, in discussions at the workshop, and in the responses to the questionnaire, a consistent message was that while there is a great deal of information available, there is a need for it to be synthesised and made relevant to the regional or local level (see point 4).

3. Projects underway that are aimed at achieving 'landscape restoration'

An overview of landscape restoration and biodiversity conservation efforts in Victoria was provided by Geoff Park at the workshop. His presentation discussed policy frameworks, strategies, networks, funding, regional planning, bioregional planning, Habitat Hectares, the relationship to salinity/water issues, the move to larger scale restoration projects, the use of vegetation mapping that focuses on extent rather than condition, the evolution of new Market-Based Instrument approaches such as Bush Tender and EcoTender, and the development of Conservation Management Networks with intensive extension. It was evident that a major impetus for a growth in activity was the funding that came available through the Australian Government's Bushcare program under the NHT in 1997. A critical piece of information infrastructure has been vegetation mapping, especially the use of the bioregional framework and the mapping of Ecological Vegetation Classes to provide a tool for interpreting the landscape (by characterising ecosystem diversity) and guiding action.

Participants were invited to talk about work they were undertaking, which revealed that a number of projects are underway in Victoria using 'landscape restoration' as the overarching goal.

- In the Goulburn Broken region, use of focal species and recovery plans in a landscape context is being developed. The recent Land, Water & Wool native vegetation and biodiversity projects were discussed, and the attention paid to delivering research in ways that made it accessible for wool growers and others in the community.
- In North East Victoria it was reported that there were no major landscape scale projects, and this is partly a reflection of the fact there is so much public land in the region. The group discussing this came to the conclusion that nothing is simple or happens in isolation, but rather, is opportunistic and relies on a few key people in the right place at the right time. Of the few projects that are being funded, the Chiltern project and a review of Box Ironbark forests leading to a biolink project and several other activities were noted as being important to the region.

- In the North Central region, there were quite a few examples discussed of projects relating to Biodiversity Action Plan derived projects, as well as Landcare, eco-tenders, National Reserve System and the Northern United Farm Forestry Group. Links with public land managers were also discussed. Points made about these experiences were:
 - they draw on the Victorian Biodiversity Strategy, regional conservation strategy, regional vegetation management plan, and salinity management plan;
 - the science ideas underpinning them are based on island biogeography (with a question over how hostile the matrix is), connectivity, and size thresholds of remnants;
 - the projects are policy driven around what is a conservation priority with a need for status/condition information;
 - inventory data and bioregional information is important in scoping and developing new projects;
 - National Action Plan funds and hydro-geological data was important to getting projects funded as they were linked to salinity management plans; and,
 - having a researcher like Jim Radford involved, as well as including talking to landholders, was important to the success of the project.
- Other work being undertaken in Victoria includes large scale projects like the Hindmarsh biolink and Habitat 141; work by community based groups like the Birchip Cropping Group; species focused projects such as regional honeyeater and parrot projects, grassy groundcover research project (University of Melbourne); Land for Wildlife; Biolink (Wimmera region); Wimmera Mallee Landscape Function project, coastal wetland research in Geelong; 'Mega-projects' focusing on threatening processes, e.g. fox, fire and projects in Glenelg arc, Connecting Country; and community driven projects such as those managed by the Norman Wettenhall Foundation.

The CMAs are also trying to set regional targets that are cognisant of landscape restoration principles. However, there is acknowledgement that in so doing, limited resources, short funding time-scales and limited access to knowledge impedes their ability to achieve large-scale landscape change.

The complexity of landscape restoration was also raised as an issue that often made it difficult to prioritise actions, and throughout the day the tension between the desire to achieve landscape restoration outcomes and the reality of only having the resources to do 'patch scale' projects was highlighted. It was also felt that most of the policy and planning frameworks for biodiversity conservation and landscape restoration were 'top-down' in nature, yet when it came to implementation (or practice) CMAs were responsible, with all the attendant problems of being reliant upon volunteer landholders, small patches of land and limited resources.

4. Research, knowledge and communication gaps — priorities for action

Whilst it is interesting to explore the range of materials listed in point 2, many participants said that a lack of time meant that having the approaches, tools and guidelines tailored for their work, in their region, and mindful of the constraints they operated within, would be of great assistance. They said that the range of theories and approaches make it quite difficult to know which one applies to a particular region. Work to demonstrate a theory or approach in action would, therefore, be extremely useful. There was a call for researchers to develop a framework for integrating the various principles and approaches of landscape restoration and provide 'logic' for people to be able to work out what approach best suited the work they are doing.

Accessing expertise was also highlighted as something that would be of value. Those participants who had access to researchers and practitioners working in the area of landscape restoration said that the ability to discuss ideas, think about approaches and apply them in the context of their local area was invaluable. The main difficulty was that these 'experts' are few and far between, and are often very hard to access. The issue was raised that without this access, it was difficult to know exactly why some projects were being undertaken at all, as science (biophysical or social) was not always underpinning activities.

Another theme noted for further research is the lack of work being undertaken on landscape restoration and socio-cultural issues. It is difficult to undertake landscape restoration approaches without a willing community to support them, yet this is an area in which little work has been done.

Specific research actions that have been identified by researchers as part of this project, and which were discussed/added to at the workshop are:

- optimisation versus resilience — strengths and weaknesses of both approaches;
- connectivity and issues of scale — the facts about corridors and their values, other ways of connecting patches and the scale at which this needs to be done to be effective;
- questions around revegetation practices — where will natural succession work, provenance issues, pest control, best bet methods;
- conservation reserve management versus nature conservation on private land — different approaches and their strengths and weaknesses;
- nutrient management – what are the attributes (especially fertility) of a site that influences its capacity to recover? Can research develop technologies for remediating high fertility sites;
- ecology of different systems, for example, rhizosphere/soil ecology and its relationship to vegetation health;
- research into patch scale ecological processes;
- learning more from past projects, collating and synthesising existing knowledge and making it available, database of project information to draw upon. Go beyond traditional monitoring and evaluation to try and gauge the critical factors as to why/why not projects succeed;
- how effective is the use of ‘boutique’ revegetation species for restoring functional ecological processes as opposed to putting in a few key species and allowing time for natural recovery;
- how to monitor and measure biodiversity/ landscape restoration outcomes (and then link them to community stakeholder perceptions and needs);
- how to manage the tension between landscape restoration principles and the reality of only being able to undertake projects at the ‘patch scale’;

- multiple policy instruments and the role of various players in implementing landscape restoration activities — acknowledge that policy and planning frameworks tend to be ‘top-down’ rather than ‘bottom-up’ and therefore do not take account of the realities of working with landholders;
- socio-cultural and economic aspects of landscape restoration;
- demonstrating the value of on-farm biodiversity and ecological processes to land function and the flow-on practical benefits to farmers;
- consider funding a round of vegetation research projects that are defined by regional CMAs and build CMA-researcher links;
- develop an ecology for non-ecologists course — at policy level and at practitioner level;
- phase 2: state/regional workshops (or small conference) to bring researchers and regional participants together to share knowledge — the Box Ironbark workshop was suggested as a useful model to build on;
- synthesis of socio-economic constraints to NRM, including community capacity building, and presentation in clear, short form would be useful;
- develop tools to combine ecological questions with community stakeholder issues and assess how to optimise trade-offs are needed (including for other NRM outcomes such as salinity and water quantity/quality); and
- develop tools to assist regions determine what research/decision support tools are relevant to them.

5. Evaluation from participants

Overall, the evaluation is positive, with participants citing the opportunity to talk and network with others as one of the main benefits of getting together. Jann Williams’ presentations were well received, supporting the finding that people like to have their information synthesised, with key points and implications for management drawn out.

Unfortunately, Siwan Lovett was unable to facilitate the workshop due to illness, and this meant that Jim Donaldson, Jann Williams and Geoff Park had to take on this responsibility. Whilst overall responses to the workshop were positive, facilitation

was highlighted as an area that needed to be improved. Participants found the 'open-ended' nature of some of the questions difficult to answer, and there were a number of respondents who felt that the afternoon sessions were not as good as the morning. Despite this feedback, a wealth of useful information was gained for the project from the break-out groups and general discussion held in the afternoon.

Overall, however, participants appreciated the opportunity to get together with others working in the area. The contact list and presentations were sent to all those who attended as a way of encouraging that interaction to continue. For many, there is a frustration that things are happening too slowly, there are insufficient resources, and landscape restoration efforts are unable to maximise potential as a result of these constraints.

6. Key messages

- Planning and 'strategising' happens at the national, state and regional scale, however, it is actions on-the-ground that addresses problems and works with local communities. There is considerable tension between top-down agency driven and coordinated strategies and plans, and community owned bottom up approaches. As a result, there is also a lack of trust and confidence between the two.
- Science is being used to help planning but much of this is based on generalised principles that have not necessarily been applied or trialled in different regions.
- There is a need to find out what it is that helps, or would help people determine and choose the science they need or want.
- Currently, it is not clear how science has helped decision-making at the regional level.
- Monitoring and evaluation of landscape restoration projects is under-developed, with few examples of where it is being undertaken. This means there is little information to draw on from past projects, what has worked, what hasn't.
- Planning and implementation happens over a long period of time and projects tend to build upon each other — nothing is simple or happens in isolation and much is fortuitous or opportunistic and relies on a few key people and actions in the right place, at the right time.
- A good plan does not guarantee delivery — there are many socio-economic (mainly alternative, more commercial or lifestyle relevant, land uses other than landscape restoration) and capacity building obstacles. There is a need to commission work into this topic, and to then disseminate the findings to policy-makers and practitioners.
- There is a need to reconsider funding R&D models so that practitioners are able to guide research activity to those issues that are impeding their ability to achieve landscape restoration outcomes on-the-ground (for example, CMAs scope part of the research agenda).
- There is a need for researchers to develop a framework for integrating the various principles and approaches of landscape restoration and provide a logic for people to be able to work out what approach best suits the work they are doing. The framework needs to be applicable at the regional level, and where possible draw on relevant regional examples.
- There is a need for regions to be able to interpret research already undertaken and apply it to their local context. Once capacity has been built in regions then practitioners will be better able to commission the research needed to fill gaps.
- There is a need to better enable people working in landscape restoration to get together to share ideas and discuss practical application of principles. Ecology courses and other targeted training on different landscape restoration components is vital to build local capacity.

Workshop review undertaken by Jann Williams, Siwan Lovett and Jim Donaldson.

Workshop summary — New South Wales

Overview

The New South Wales workshop was held on 11 March at Cowra. The Lachlan Catchment Management Authority (CMA) hosted the event. This region was chosen because CMAs in the region are developing their Catchment Action Plans and thinking about how to incorporate landscape restoration principles and practices. Paul Ryan, a member of the LWA Steering Committee for the project, has been working with the Lachlan CMA and recommended we hold a workshop in a region that was at the planning, rather than project implementation stage. Representatives from the NSW Department of Environment and Climate Change were able to present on a number of landscape restoration projects, as were other groups working in the region.

Participants

Four CMAs said they would attend, the Lachlan CMA, Murray CMA, Murrumbidgee CMA and Central West CMA. Unfortunately, staff from the Murrumbidgee CMA were not allowed to come on the day, and staff registered from the Murray CMA failed to show up (one person was unable to come due to a back injury). This was extremely disappointing, but highlights the difficulty of getting people to come to workshops, a theme that is consistent throughout the project. Department of Environment and Climate Change representatives from Cowra and Queanbeyan attended, as well as Nature Trust for Conservation, Greening Australia and the Grassy Box Woodland Conservation Management Network. In total, 17 people participated in the workshop.

1. Awareness and understanding of 'landscape restoration'

Landscape restoration is a term all participants are familiar with, however, there was a difference in understanding that reflected how the term was used in the organisation people worked within. Department of Environment and Climate Change (DECC) staff had a strongly scientific disciplinary understanding of landscape restoration, and in their questionnaire responses discussed a whole range of issues around the limitation of the term in describing what can be achieved within existing constraints of resources, access to large tracts of land, engaging community etc. For this group, a more accurate term is 'ecosystem restoration', as this was viewed as more achievable on a smaller scale than the large-scale change that characterises landscape restoration projects. Ideally, these smaller scale projects link up to achieve broader landscape change.

In contrast, CMA staff talked about the term as relating to what they were doing day-to-day with landholders, and this group seemed comfortable with landscape restoration happening at smaller scales. Greening Australia talked about the need to 'Transform our Landscapes' rather than landscape restoration, and this reflects the organisation's move to a more inclusive approach that seeks to bring about improvements in biodiversity, water and sustainable livelihoods.

2. Theories, tools and information being used for 'landscape restoration'

For CMAs, Biodiversity Action Planning, Endangered Ecological Communities (EEC) and Priority Action Statements as part of the *New South Wales Threatened Species Act 1995*, were referred to as providing overarching guidance for their landscape restoration activities. Regional targets were mentioned in the context of work being undertaken to develop and achieve Catchment Action Plans. Other groups present used a diversity of approaches, and this is reflected in the lists that follow.

There did not seem to be one or two consistent methods being applied in New South Wales, and it was interesting that different people had different roles relating to landscape restoration. Most regions have staff, either employed by regions or 'embedded' in CMAs but paid for by the DECC. There is also a range of different people involved in landscape restoration, from experts who offer scientific expertise (specialists such as Damon Oliver, Garry Germon), advisors and planners (generalists such as Tim Gardiner, Kieran Hawker, Guy Geeves) and facilitators (network builders such as Toni McLeish). This mix of skills is a strength for New South Wales, however, what appears to be lacking are structures and mechanisms for these people to regularly communicate and integrate their activities.

Based on the questionnaire responses and feedback from the workshop, the following lists have been compiled of material being used to think about and implement landscape restoration. These responses are broken up into material supporting the theory and principles underpinning landscape restoration, and the tools and events that assist with the implementation of that theory.

Theories and principles

- Biodiversity action planning — protect, enhance and restore
- Priority Action Statements
- Island biogeography and species-area relationships
- Conservation management models
- Landscape scale ecology
- Ecological thresholds — landscape, site and species
- Target setting approaches — regional, local and site
- Adaptive management principles — restoration ecology
- Conservation significance/vegetation condition
- Species mix to build floristic and structural diversity

Publications

- *Ecological Management & Restoration* journal.
- *Thinking Bush* magazine, LWA.
- *Emu*, Royal Australasian Ornithologists Union.
- *Australian Journal of Zoology*, CSIRO.
- *Wildlife Research* journal, CSIRO.
- *Austral Ecology* journal, Blackwell Publishing.
- *Pacific Conservation Biology* journal, Surrey Beatty & Sons.
- *Biological Conservation* journal, Elsevier.
- *Conservation Biology* journal, Blackwell Publishing.
- *Wingspan* journal, Birds Australia.
- *Austral Bugle*, newsletter of the Southern Tableland Grassy Ecosystems Conservation Management Network.
- *Woodland Wanderings*, newsletter of the Grassy Box Woodland Conservation Management Network.
- Munro, N.T., Lindenmayer, D.B. & Fischer, J. 2007, 'Faunal response to revegetation in agricultural areas of Australia: A review', *Ecological Management and Restoration*, vol. 8, pp. 199–207.
- Various DEC/NPWS Threatened species Handbooks for landholders, former NSW Department of Environment and Conservation/ National Parks and Wildlife Service.
- Drielsma M, Ferrier S. 2006, 'Landscape scenario modelling of vegetation condition', *Ecological Management and Restoration*, vol. 7, pp. S45–S52.
- *Bush Tracks*, Greening Australia.
- *Bringing Birds Back*, Greening Australia.
- *Native Vegetation Guide for the Riverina*, 2002, Charles Sturt University.
- Central West Best Management Practice Guidelines.
- *Managing and Conserving Grassy Woodlands Guide*, 2004, CSIRO.
- *Wildlife Management Manual for the Riverine Plains*, National Parks and Wildlife Service.

Tools, courses and events

- Social mapping techniques (University of Queensland)
- Web searches on researcher names such as Lindenmayer, Bennett, Hobbs
- Use of expert panels

As with Victoria, there is a mix of resources being used by people, with academic papers, journals, guidelines, manuals, web-based material and programs such as Greening Australia's Exchange Program being cited. New South Wales participants did not list as many supporting tools as those from Victoria, and there seems to be fewer regional guidelines available. There also seems to be less sharing of information between organisations in New South Wales, and this may reflect the limited opportunities people have to get together.

3. Projects underway that are aimed at achieving 'landscape restoration'

The session focusing on landscape restoration projects in New South Wales began with two presentations, the first of these was by Rob Taylor from the DECC, who talked about the Western Woodland Way project, a landscape restoration project that is part of the Alps to Atherton initiative. This is an ambitious project and one that would see a vast area of land connected with the aim of preserving, protecting, restoring and linking many different habitats. The project is still in the planning phase and is starting to identify key areas along the Western Woodland Way where work will commence. The idea is that eventually the Australian Alps to the Atherton Tableland will be linked by a series of smaller projects. This project is characteristic of a number of landscape scale projects underway in New South Wales.

The second presentation was by Mark Sheahan, also from the DECC, on work he is doing to identify priority landscapes on the south-west slopes. In essence, Mark is trying to find the least disturbed sites within naturally fertile parts of the landscape, as these have the greatest chance of restoration and long-term viability. The project was interesting to participants as it is using a variety of information sources, and highlights the problem of maps or aerial photos that classify a site as being 'native vegetation' on the basis of tree density. Habitats that actually have good recovery potential such as open

grasslands or woodlands, while being mapped as highly disturbed or cleared as a result of low tree density, may in fact be quite representative of their original condition. Several participants followed up with Mark on his presentation and appreciated being able to find out about the work he was doing. Both projects were operating within the New South Wales Biodiversity and Climate Change Adaptation Framework.

When participants were asked to show on the map of New South Wales the projects they are undertaking that are focusing on landscape restoration, it was almost fully covered with project sites. However, further analysis is required to determine the extent of restoration activities. Other projects being undertaken in the region are:

- The DECC are investing in a range of large scale projects. One of these is 'Alps to Atherton', with four sub-projects: Kosciusko to Coast; Slopes to Summit; Moreton to Nattai; and Western Woodland Way. The South-west Slopes work discussed above is also funded by the DECC. Science is being undertaken with Brendan Mackey and others at the ANU on monitoring and the development of performance indicators, and Sue McIntyre and others on practically applying landscape restoration principles.
- The Central West CMA has 2000 projects underway or completed with a cost of \$20 million. These projects have been placed under the banner of landscape restoration and have focused on different themes — soils, water, vegetation, biodiversity, salinity, cultural heritage, people and community. This work has also been extended to include some capacity building projects and train the trainer events to raise awareness and education about the projects that have been undertaken. Natural Resources Commission standards are overarching the work, with dollars allocated to different Catchment Action Plan targets. District staff are working with landholders to implement the projects but central theme teams cross over design and evaluation. Research needs are included in a three year investment strategy with the Catchment Action Plan looking forward to 2016 and reviewed in 2009. A major project has been the development of a Contents Management System with all project information collected and interpreted.

This product has links to the NRM Toolbar in recognition of its value as an example of what can be achieved when investment is made in good processes. Grain & Graze has also funded landscape assessment and biodiversity planning work in this region as part of its biodiversity component (Briggs and others).

- The Lachlan CMA has prepared guidelines for Biodiversity Action Planning for Landscape Scale projects, and this work has been supported by Paul Ryan from CSIRO. The guideline provides a template to assist CMA staff to plan and implement projects within a landscape restoration framework. The Lachlan CMA group felt that more effort needs to be made in linking their Catchment Action Plans to the farm scale, with some discussion around the Conservation Network in Victoria that attempts to do this.
- Nature Trust for Conservation, Grassy Box Woodland Conservation Management Network and Greening Australia all had projects underway. These varied from the purchase of properties and applying management actions to protect and restore large areas, through to projects protecting grassy box woodland on farms and linking properties together, and Greengrid and other Greening Australia projects operating at a landscape scale. All three organisations will be involved in the Alps to Atherton projects being coordinated by the DECC.

As can be seen, different organisations are focusing on different aspects of landscape restoration, with the DECC going for large scale, quite ambitious projects, and the Central West CMA viewing significantly smaller scale projects as also achieving landscape restoration. The Lachlan CMA is at the planning stage, although it is investing in a number of projects at the same time, some of these may be retrofitted in light of the new template for biodiversity action planning. The non-government organisations represented will look for opportunities to partner up with the DECC and the CMAs to maximise their investments in landscape restoration.

4. Research, knowledge and communication gaps — priorities for action

As was the case in Victoria, a key recommendation from workshop participants was to gather together existing research and tools and consolidate them into one 'product' that would act as a 'one stop shop' for landscape restoration information. Ideally, this would include case studies from different regions demonstrating how the theory of landscape restoration is being applied, and the strengths and weaknesses of different approaches. The case studies need not be confined to on-ground projects, they could also show how landscape restoration has been integrated into a regional catchment plan or strategy, and the actions flowing through from this. There was a desire by participants for practically applied examples of landscape restoration, with some wanting prescriptive guidelines to know what to do next, and others comfortable with sorting their way through the plethora of approaches on offer. The key requirement was that the information was easily accessible, in one place, and with a variety of entry points to suit different audiences.

The lack of information and knowledge about social factors in landscape restoration was commented on several times, with participants wanting to know which incentive mechanisms and social engagement strategies are the best for undertaking these types of projects. The point was made that there is often a tension between science and community values, and this was a consistent theme to emerge from both the Victorian and New South Wales workshops. We know through work on LWA's Social and Institutional Research Program and the Cooperative Venture for Capacity Building that there has been a lot of research into what motivates people to act, so rather than commission new research, it would be sensible to review what has already been done and tailor it for this particular audience.

Getting scientists out into the regions and working directly with CMAs and landholders was a priority, again echoing participants in the Victorian workshop. It was felt that when researchers interact with end-users there is a much higher likelihood of their work having practical application. It was also felt that getting 'experts' into the region talking to senior CMA managers would be valuable in raising the profile of landscape restoration and encouraging them to place a higher priority on staff attending events such as the workshop.

Unclear roles and responsibilities were raised as an issue for New South Wales. The research team found this interesting, as being clear about the organisational context within which you work is a basic requirement to knowing what it is you are there to do. Participants talked about the ad hoc communication that occurs between different levels of government, particularly between local government and CMA or state organisations. Non-government organisations rely more on having good personal connections, and it seemed that groups such as the Grassy Box Woodland Conservation Management Network played a valuable role in linking organisations together and keeping people informed about what was going on in the region.

Specific research is required on:

- principles for application of management methods and regimes required to achieve different restoration outcomes, for example, the use of total grazing pressure in vegetation management;
- implications of climate change on species resilience and extent;
- the effectiveness of corridors as a landscape restoration approach;
- identifying resilience classes, identifying refuges, using the triage approach, extent versus condition trade-offs — which approach should be used in which situation;
- restoration and rehabilitation of highly productive land;
- framework for landscape restoration for the future (30 years), interactions between different organisations, what could the future look like;
- bringing together and analysing the 'success' of completed and existing landscape restoration projects, what has worked, what hasn't, lessons learnt. What are the costs of different projects and what impact does this have on the triple bottom line;
- carbon/climate change links;
- measuring the long-term biodiversity outcomes of landscape or habitat restoration programs, for example, will they be self-regenerating. This is evidenced by a review recently by Munro et al. (2007);
- less research on birds — focal species approach is unable to answer the question of how many patches of the size needed are required to be created to ensure long term viability. There is a need for Population Viability Analysis combined with focal species, combined with spatial choice of best locations, combined with multi-species considerations, so we can develop best optimal solution given the dollars and the context within which landholders are involved;
- bio-banking ideas and how to implement them;
- need for bio-forecasting tools see studies by S. Ferrier and M. Drielsma;
- how to achieve multiple outcomes in the project design phase, rather than focusing on a single outcome (e.g. use of multi-objective criteria);
- development of software tools to enable application of analysis to different scenarios;
- development of a methodology that enables different landscape scale outcomes to be assessed;
- need for credible information about landscape restoration outcomes that landholders and other target audiences can access easily;
- need to develop ways of linking landscape scale to patch scale and how different organisations involved can maximise the connections to achieve broader landscape change;
- idea of a 'landscape doctor' able to provide advice to people about what might be the 'best' landscape restoration approach given environmental and social objectives; and
- tailoring the Conservation Value Index Tool for use by CMAs.

5. Evaluation from participants

All the evaluations are positive and, as was the case in Victoria, participants appreciated the opportunity to talk and network with others. Several participants mentioned how disappointed they were that no-one from the Murray and Murrumbidgee CMAs attended, and others said they were sorry they had to leave the workshop early. DECC staff enjoyed the workshop and commented on the value of hearing direct from the CMAs about what they are doing — this was echoed by CMA staff noting that they would follow up on the two presentations given by DECC representatives Mark Sheahan and Robert Taylor.

Participants felt that more local case study examples would have been useful, and having the workshop running over two days so that a field trip could be included would further reinforce the theory and practice of landscape restoration.

6. Key messages

- In New South Wales, the different roles and responsibilities of different organisations are not always clear and communication between groups tends to be on ad hoc informal basis. This situation makes it hard to have cross-region coordinated activities, however, the workshop was a good start in getting key players together. It may provide the basis for a community of practice in landscape restoration to be established.
- There are a number of activities that are placed under the term 'landscape restoration', with some of these being large scale, multi-party and cross-jurisdictional projects, and others being small-scale patch scale efforts.
- New South Wales NRM regions vary in their identification and articulation/implementation of regional biodiversity targets. The NSW Natural Resources Commission requires NRM regions to have biodiversity targets (which are expected to be delivered by June 2008), but it seems some regions do not have the expertise in developing these targets let alone implementing them. This problem is viewed as an issue of capacity.
- Many CMAs are gathering their own data such as spatial distribution of landscape restoration projects, but there are large gaps in consistency for data collection and protocols for data management, storage and use. This means that data sharing across regions and groups is limited and it will take significant investment to put in compatible systems to enable this to take place.
- Monitoring and evaluation appears to be rarely done as there are no reporting (accountability) requirements as drivers for undertaking this activity (although Central West CMA uses the Natural Resources Commission framework). Many past projects have been undertaken opportunistically, and poor data management, high staff turnover and consequent loss of corporate memory means people are unsure why projects were undertaken in the first place.
- Most or all landscape restoration projects require landholder willingness to be involved, and this means it is difficult to achieve targets when actions are relying on good will.
- CMAs find it difficult to attract or find expert advice. Where available, experts often spread themselves too thinly and this means informal networks and relationships often determine whether or not the advice is forthcoming. However, many landholders prefer to get their information from locally based experts as they are trusted. This could mean that a 'train the trainer' approach where local experts are taught and supported by researchers so that they can then take that information and translate it for use by landholders, may be the most appropriate method for getting information out to landholders in ways that engender trust.
- Landholder turnover (especially in peri-urban zones) is an impediment to progress. Often attention is given to staff turnover in agencies and CMAs, but not to landholder turnover. Implications exist for how landscape restoration plans are communicated, kept live and exist when properties change hands.
- The majority of landscape restoration projects are accomplished through cross agency or multi-party partnerships, an approach that requires higher transaction costs and time lags in implementation. On the plus side, it often means better and broader ownership of actions and activities.
- Extension staff are a critical resource, but funding for extension has declined and this has meant fewer people, more work, and less time to spend building trust with landholders.
- Projects need to be funded for longer time frames >10 years.
- There is a need to proactively initiate opportunities for information sharing between regions on landscape restoration (perhaps covered by a community of practice concept?) as regions do not seem to undertake this activity themselves.
- Goal setting and social considerations need to be explicit in developing landscape restoration plans — not just the ecological considerations.

- Anecdotal/community/landholder knowledge can sometimes be contrary to scientific findings and skewed by biases — this means there is a need to listen, and interpret accurately the knowledge that is being presented. Communicating the importance of scientific rigour in a way that makes it understandable and relevant for local groups, is essential to ensure the evidence stacks up against community perceptions.
- Regional staff are, understandably, strongly focused on landholders as their key stakeholders. Opportunities to engage with, and inform policy audiences are limited but need to be enhanced so that ‘real life’ constraints are factored into management strategies. Driving or influencing changes to policy are not really seen as a tool to achieve landscape change at the regional level.
- There is a need to develop ways of integrating science into discussions about priorities that take account of community values and aspirations.

Workshop review undertaken by Nadeem Samnakay, Jann Williams and Siwan Lovett.



Photo courtesy of Greening Australia Capital Region.

Workshop summary — Western Australia

Overview

The Western Australian workshop was held on 9 April in Albany at the offices of South Coast NRM Inc., the organisation that hosted the event. This region was chosen because of the substantial landscape restoration work done by the Gondwana Link alliance during the past eight years. In addition, the South Coast NRM Inc., and its predecessor the South Coast Regional Initiative Planning Team (SCRIPT) have, since 1999, been planning for a 'Macro-corridor Network' and associated long-term monitoring, as well as a series of Strategic Catchment restoration programs. A number of other relevant projects have been undertaken elsewhere in south-western Australia, for example, the Living Landscapes program in the Avon Catchment. Overall, regions across the south-west of Western Australia use a variety of approaches to the management of native vegetation and biodiversity. Priorities differ widely depending on the individual project, with salinity and water quality high priorities. Threatened species, native vegetation retention and revegetation are associated priorities.

Participants

All people invited to be part of the workshop were contacted by telephone, and provided with background information about the project, the workshop and the agenda for the day. Initially, about 20 people accepted the invitation, but 'workshop fatigue' and pressure of other work (in particular the demands of input to the Federal Government's recently announced transitional NRM arrangements) saw numerous withdrawals. Some of these were very late in the process, with one registered participant simply being a 'no show', and others offering a late apology.

Ultimately 12 people participated, some for only part of the day. Two participants only attended part of the workshop, and an additional three key people were interviewed individually by the research team in Albany on the day prior to the workshop or on the following day. A further three people were interviewed in Perth on either side of the workshop by Jann Williams and Mick Quirk. While the numbers participating were low, those present were valuable contributors with extensive knowledge of relevant work in the South Coast region such that substantial information from a diversity of perspectives was gained through the workshop, interviews and related background research.

1. Awareness and understanding of 'landscape restoration'

Landscape restoration is a term with which all participants were familiar, however, as with other jurisdictions, there were differences in understanding or emphasis that reflected how the term is used in particular organisations. Through Gondwana Link, the focus in the South Coast is on recognising and protecting areas of high floristic diversity, increasing ecological connectivity, landscape function and achieving vegetation and biodiversity resilience across large tracts of land.

A series of Strategic Catchment projects with a strong agricultural production focus form part of the implementation phase of the South Coast NRM Plan. These projects emphasise water use, salinity containment, waterway protection, weed control and, to a lesser extent, biodiversity restoration and protection. The Strategic Catchments approach sees conservation of native vegetation as just one of several outcomes being sought, and often not the priority focus.

2. Theories, tools and information being used for 'landscape restoration'

The two major players in landscape restoration on the south coast are Gondwana Link and South Coast NRM through their Strategic Catchment process. As such, the theories, tools and information these two groups use are covered in some detail on the next few pages. This is followed by a broader analysis based on feedback from the workshop participants.

Gondwana Link has a strong focus on ecological connectivity and on maintaining areas of high biodiversity in ways that maintain and enhance landscape resilience. The Gondwana Link vision is:

'Reconnected country, from the wet forests of the far south west to the woodland and mallee bordering the Nullarbor, in which ecosystem function and biodiversity are restored and maintained.'

This vision covers a distance of over 1000 kilometres, which is broken into a number of Operational Areas that are more manageable for on-ground works. To date, most work has focused on the link between the Stirling Ranges and Fitzgerald River National Parks (the 'Fitz-Stirling'). The Conservation Action Planning (CAP) process developed by The Nature Conservancy, has been used to identify a series of attributes and indicators for the Fitz-Stirling, which are based on a number of restoration principles. Two core strategies are being used, one is to try and get a direct ecological connection between the two National Parks, to a minimum two kilometres wide. It is thought that this 'connection' will enable much of the fauna to move across the landscape. The second is examining the ecological permeability of the wider landscape by working with farmers to develop micro linkages and wildlife stepping stones.

Vegetation planning and prioritisation in the Strategic Catchments process is underpinned by some general restoration guidelines that can be summarised as follows:

- Focal (or umbrella) species
- Bigger is better
- Rounder is better

GIS is used to analyse vegetation patterns, with area to perimeter ratios calculated and vegetation types mapped at a coarse scale (3 x 3 kilometre grid). Vegetation density, endemism, threatened species, ecological communities present, wetlands of significance, and the eco-regions covered, all contributed to the priority rating of catchments. Ten out of 33 catchments have been identified for strategic planning work using this approach.

Based on the questionnaire responses received from participants prior to the workshop, feedback from the workshop, and individual interviews with key participants in Gondwana Link, the following lists have been compiled of material being used to think about and implement landscape restoration.

Theories and principles

- Landscape scale ecology enhancing natural diversity through both protection and use of local provenance species mixes providing both floristic and structural diversity in seeding projects
- Target setting approaches — regional, local and site
- Island biogeography and species-area relationships
- Focal species
- Connectivity
- Ecological processes/function
- Adaptive management principles — restoration ecology
- Conservation significance
- Vegetation condition

It was noted on several occasions during the workshop that there are probably enough principles already available, but that social and institutional constraints usually win out over implementation of those principles. If goals are clearly identified then the next step should be to articulate which principles have been used and why, and to be willing to use an adaptive approach based on reflection and review over time.

Tools and events

- Conservation management models such as the Conservation Action Planning (CAP) tool developed by The Nature Conservancy. This is the tool that underpins Gondwana Link's work.
- Department of Environment and Conservation (DEC) in Western Australia uses the assessment tool described in the Strategic Catchments approach outlined above rather than the CAP approach.
- Social sciences inputs, especially from the Alcoa Centre at Curtin University (Stehlik and colleagues) were frequently highlighted as an important part of turning science into effective on-ground action.
- Spatial presentation and analysis software such as VegMachine.
- Satellite imagery such as Quickbird and Specterra.
- Action research.
- Hydrological modelling.

As in other regions, people are using a mix of information sources with academic papers, journals, guidelines, manuals, web-based material and programs such as Greening Australia's Exchange Program being cited. Along with this, an extensive body of both technical and local experiential knowledge derived from decades of work by people living in this area, is used to conserve remaining native vegetation and to improve connectivity across the landscape.

Technical/professional publications such as the *Journal of Ecological Management & Restoration* were mentioned by several participants. Access to scientific journals and related publications was noted to be dependent on individual affiliations with various universities who have institutional subscriptions to a range of journals. Without this access, individuals have to pay up to \$30 an article for journal papers, without the capacity to read the contents before purchasing. This can be a major limitation on accessing scientific papers for people at the operational level.

While there is considerable sharing of information between individuals from different organisations, direct exchange between the Gondwana Link participant organisations and the programs being led by government agencies is limited at official organisational levels.

3. Projects underway that are aimed at achieving 'landscape restoration'

Identification of landscape restoration projects in Western Australia's South Coast began with a presentation on Gondwana Link and another on the approach that South Coast NRM takes to landscape restoration. The work of these two groups has already been referred to in Section 2 of this report, and the perspectives in the two presentations provided further value.

The first presentation was by Simon Judd, The Wilderness Society's Gondwana Link Science Manager. Simon identified that Gondwana Link is an ambitious project that would see a vast area of land connected with the aim of preserving, protecting, restoring and linking many different habitats. It is a community response to an ecological crisis in which landscapes have been substantially changed over many decades. The project seeks to recognise and work with different ways of looking at 'landscape', but always with a view to protecting and restoring the critical elements of landscape and ecological function across different areas. This is occurring through both property acquisition and community engagement and participation. There is also within Gondwana Link a recognition of the need to manage the linkages between terrestrial and marine environments, including the inter-tidal areas. Simon presented a conceptual model of ecological connectivity that includes:

- personal connectivity;
- community connectivity;
- organisational connectivity; and
- landscape permeability.

Once the first three elements of connectivity are in place, it is possible to deliver landscape permeability. This was defined as the flow through the landscape, and is a reminder of the importance of non-native landscapes for maintaining ecological processes and their associated biota. The term was used in preference to landscape restoration.

The second presentation was by Deon Utber, Regional Biodiversity Facilitator with the Department of Environment and Conservation in the South Coast region. Deon gave an overview of the work he is doing to identify priority catchments, and to bring biodiversity conservation and restoration more strongly into this Strategic Catchment work.



Photo courtesy of Greening Australia Capital Region.

The Strategic Catchment approach is addressing smaller scale outcomes than the large-scale change that characterises landscape restoration projects like Gondwana Link. However, these smaller scale projects are intended to link up to achieve broader landscape change through a South Coast Bioregional Initiative Macro-corridor Network program. The South Coast NRM group began by using 'ecozones' (at a finer scale than the IBRA bioregions) and the CAP approach to guide its planning. A lack of government acceptance of the CAP process led to a shift to the Strategic Catchments approach.

Individual projects in the South Coast region identified to have a strong landscape restoration focus included:

- The Fitzgerald-Stirling ('Fitz-Stirling') section of Gondwana Link
- The South Coast NRM Macro-corridor project
- Proposal for a Biosphere nomination for Wilson Inlet
- Oldfield River catchment project (completed five years ago)
- Fitzgerald River
- Bremer River Strategic Catchment project
- Young River Strategic Catchment project
- West River Strategic Catchment project
- Middle Pallinup Strategic Catchment project
- Lake Warden wetlands project
- Welstead Estuary project
- Oyster Harbour project
- Gelham Inlet project (under development)
- Salmon Gums remnant vegetation protection — a small EnviroFund project based on size, shape and connectivity of remnants
- Curtin University 'Science on the South Coast' series of projects, including projects addressing weeds, biodiversity education, peri-urban restoration, diversity in plantations, eco-mimicry, and invertebrate diversity (www.strongercommunities.curtin.edu.au)

4. Research, knowledge and communication gaps — priorities for action

A key recommendation from workshop participants was the need for information and knowledge about social factors in landscape restoration. This was commented on several times, with participants repeatedly recognising the ability of social and institutional factors to 'overwhelm' the science in efforts to achieve landscape restoration.

Getting scientists out into the regions both to work directly with landholders and regional NRM groups in planning relevant research and to provide a 'science advisory service' on a needs basis was also highlighted as a priority.

Better understanding of the biodiversity present at fine scale, reflecting the complex mosaics on the South Coast, and the ecosystem functions such as dispersal of key fauna and plant gene flows were seen as important research needs — the focus being on systems and how they function, rather than on individual species. However, there was also a strong sense that the science should be delivered in a timely way that informs daily on-ground work, and that a lack of current science should not delay moving ahead on-ground.

Specific research needs identified by workshop participants are the need for:

- good quality vegetation mapping;
- population statistics of mammals, and dispersal of key fauna in relation to corridors, and plant gene flows;
- functional descriptions of services provided;
- restoration of ecosystem functions, such as the role of mycorrhizal fungi;
- fire regimes and their influence on landscape restoration;
- a retrospective assessment of restoration projects to find out what works and what doesn't;
- effectiveness of protective fencing and success of revegetation projects across different properties — what are the thresholds and what interventions are needed to affect them;
- demographic surveys and improved understanding of the influence of socio-economic situations on the ability to engage with landscape restoration;

- economic analysis and benefit:cost determinations for local restoration works;
- understanding about impacts of climate change on species selection for restoration projects;
- identification of which areas are free of *Phytophthora* and how they can be effectively managed, as well as the impact of other diseases such as the Banksia canker; and
- quantify the relationship between the time an area has been cleared and its ability to naturally regenerate.

What should Phase 2 of this project look like?

Based on the discussions at the workshop and from input through the questionnaires, a number of recommendations were put forward by the group for consideration in a second phase of the project.

- Case studies illustrating the application of landscape restoration principles and guidelines, with some specifics of what was done and the impacts on biodiversity outcomes.
- Ensure approaches are contemporary and able to show continuous improvement over time.
- Science translated into practical information that guides 'What am I going to do next Monday?' This would help build knowledge into their projects.
- Make sure any products improve the ease and confidence of practitioners' work, not just adding something else for them to read or put on the shelf.
- In developing a second phase it is important to work with people from the first stage, rather than start again with people not familiar with what's been done already.
- The development of 'science advisory' services would be valuable, to provide targeted expertise to help go through projects with practitioners, including socio-economic constraints.
- The need for more open and accessible science was identified. For example, LWA could help develop a system where groups like non-government organisations do not have to pay for journal articles (which currently cost around \$30 an article if you do not subscribe to the journal) and where research that is undertaken in a commercial context becomes more widely available.

5. Evaluation from participants

The evaluations completed were from those who remained to the end of the workshop, and were generally positive. Most of the participants who completed an evaluation sheet found the workshop interesting, well organised, and enjoyable. They thought that it stimulated interesting discussion about the science and practice of landscape restoration. Most saw the information provided as 'somewhat' or 'quite a lot' useful. Hearing what others are doing, sharing perspectives and getting up to date were seen as the main benefits of the workshop, with one participant commenting that it "provided more context to landscape restoration in the region" and another adding that "this is tackling a key need and a significant issue".

However, most of those who completed an evaluation sheet saw the workshop as having little impact in terms of application to their daily work. One participant saw most aspects of the workshop, other than the organisational aspects as being only of little value. The somewhat lower scores received at this workshop are likely to be related to the fact that participants felt they were on top of landscape restoration science and/or felt the LWA project could have provided more input to their specific regional context and management issues. This was not possible within the scope of the project.

Several participants commented informally that a field trip enabling more discussion based around on-ground observation could have been useful, and would have further reinforced the theory and practice of landscape restoration. However, given the pressures of other work it was also acknowledged that making time available for such a session would have been difficult.

6. Key messages

A number of key messages arose from the workshop and written questionnaires. These have been grouped into broad headings, recognising the overlap between some of the points. Where possible, these have been standardised between workshop reports.

Planning and goal setting

- Landscape restoration planning processes, whether led by government agencies or community-based non-government organisations, need to be developed and initiated over timeframes that are short enough to maintain community interest and participation.
- Perfecting targets, attributes, indicators and/or the scientific basis of the project at the expense of opportunities to retain engagement will generally be unhelpful to the ultimate outcomes on-ground. Going with a less-than-perfect project design, documenting thoroughly what has been done and the basis for decisions made, and adopting an adaptive approach to management, is important to continued participation and to the outcomes.
- Using a mix of opportunism which serves to address previously agreed targets and more strategically planned activity is legitimate, and in many cases will serve to progress outcomes more rapidly than a strictly logical sequencing of actions.
- Goal setting and social considerations need to be explicit in developing landscape restoration plans. Ecological considerations and the science that underpins them are only one part of landscape restoration. While the terms of reference for this 'Restoring Landscapes with Confidence' project focus on the biophysical aspects, workshop participants place strong emphasis on the importance of the human elements and the impacts of costs, other constraints and the role of interactions among people.

- Those involved in Gondwana Link believe they are leading the way in Australian landscape restoration work. Staff are also putting considerable effort into use of the CAP process to document and make accessible to others the processes used and the assumptions underpinning them. This will mean others can better evaluate the contribution of Gondwana Link to landscape restoration.
- Short funding cycles with changing terms of reference and discontinuities of program funding detract strongly from both community sector and agencies' ability to maintain on-ground work that is essential to ecological outcomes that occur over longer time frames (usually >10 years). It also works against the building up of trust between agencies, organisations and communities and the individuals who represent or work with them.

Collaborations and partnerships

Regular capture of the knowledge involved, and transfer of that knowledge both between key individuals and others within a landscape restoration project or program (both non-government and within government), is important in maximising the benefits of all regional landscape restoration work. However, on occasions, this capture and transfer of information is deficient for a range of reasons, including pressures of work, personalities involved, and lack of confidence and/or trust across different organisations.

Monitoring and evaluation

- Monitoring and evaluation are important, both in adapting management over time and in demonstrating outcomes from both public and private investment in landscape restoration work. Taking the time needed, and involving key knowledge providers in selecting the most appropriate attributes, targets and indicators early in the process is important. Maintaining a mechanism for recording changes over time is a key to meaningful monitoring and evaluation. The Nature Conservancy's CAP tool, comprehensively applied and maintained, offers a very useful mechanism for achieving this.

- Good baseline data is an important part of effective monitoring. Monitoring of various aspects of the landscape is underway using the following indicators — waterbird and invertebrate monitoring, vegetation change (via digital multi-spectral imagery), photo-monitoring, bore and stream gauging, the use of Veg Machine to monitor change and remote sensing of vegetation extent.

Landholder engagement and local knowledge

- Recognising and providing opportunities for the inclusion of different types of knowledge throughout the project is important. Individual and local experiential knowledge will usually play an important part in landscape restoration and can complement, and at times even precede, the scientific and technical knowledge required. This observation raises the question about whether local experience/intuition can substitute, at least in part, for the capacity to do more objective planning. This can be limited by solid inventory data and/or confidence in locally-relevant restoration and management guidelines.
- Regional agency staff are, understandably, strongly focused on landholders as their key stakeholders. Opportunities to engage with and inform policy audiences are limited but need to be enhanced so that 'real life' constraints are factored into management strategies. Driving or influencing changes to policy are seen less as a tool to achieve landscape change from the regional context.
- Delivery of landscape restoration is not mainstream in this region. It means different things to many farmers, for example, perennial pastures can be seen as a form of landscape restoration even though biodiversity impacts can range from negative to indirect. Many farmers respond to information about productivity benefits first, and then might be interested in broader NRM outcomes. Landholders attitude is often the key issue, not the ecological principles or science per se. This could have implications for whether a collaborative learning approach is taken rather than a top-down 'transfer' of knowledge.

- The biological systems in the south west have some unique features. In the Esperance subregion, vegetation types are diverse, often cryptic and endemically localised in nature. This leads to a complex mosaic of vegetation types, often with limited genetic exchange. Native grasslands and grassy woodlands are also less common in this part of Australia. Due to the nature of these systems, some caution is needed in applying some of the landscape restoration principles and research findings that have been developed in the eastern states.

Workshop review undertaken by Judy Lambert and Jann Williams, with notes also provided by Mick Quirk.



Photo Nadeem Samnakay.

Workshop summary — Queensland

Overview

The Queensland workshop was held on 17 April at Lake Maraboon Holiday Village south of Emerald. The Fitzroy Basin Association (FBA) assisted with the planning for the event. The Fitzroy Basin covers an area of some 156,000 square kilometres across four bioregions (Brigalow Belt North, 52.5% of the Basin; Brigalow Belt South, 43.5%, Central Queensland Coast, 2.5%; and Southeast Queensland, 1.5%). The work of the Fitzroy Basin Association, as one of 14 NRM bodies in Queensland, is conducted in five distinct sub-regions. The Fitzroy Basin was chosen as a focus area for this project because of a substantial investment in NRM planning and implementation throughout the past 10 years, \$9.3 million spent in 2006–07 alone (Fitzroy Basin Association Inc., *Annual Report 2006–2007*).

When reading the workshop report, it is important to understand the legislative framework in Queensland that underpins native vegetation management in the state and has the potential to influence landscape restoration. The broad purpose of the *Queensland Vegetation Management Act 1999* is to regulate clearing of vegetation in a way that conserves remnant vegetation and prevents the loss of biodiversity. Operationally, vegetation cover and type are used as surrogates for biodiversity in the implementation of the Act. Remnant vegetation has a specific definition under the Act, which is unique in Australia. It is defined as either never being cleared, or having regrown to a specific canopy height and density to be considered to have the same values as if it had never been cleared. There are three categories of remnant vegetation: 'endangered' regional ecosystems (REs), 'of concern' REs, and 'not of concern' REs.

Regional ecosystem maps developed by the Queensland Herbarium are used as the basis for implementing the legislation. These maps illustrate the extent of remnant vegetation, with 'non-remnant' vegetation being shown as white on the map. The term remnant vegetation was referred to widely at the workshop, which has a specific context and meaning due to the state legislation. The maps that are produced by the Herbarium, and the implications for managing landscapes, were also raised in discussion several times.

Participants

All people invited to be part of the workshop were contacted by telephone, and provided with background information about the project and the workshop including a workshop agenda, as well as being encouraged to complete a pre-workshop questionnaire. Between 40–50 people were contacted, all of them recommended by FBA staff or through networking with others involved in NRM in the region. Despite the major effort put into contacting potential participants, only 10 attended the workshop. Pressure of other work, a sense of over-commitment, and failure to overcome a perceived lack of relevance to those beyond the FBA staff and selected NRM agency staff, contributed to low participation. Several who were unable to participate did provide completed background questionnaires.

While the numbers participating were low, those present were valuable contributors with extensive knowledge of relevant work in the Fitzroy Basin area such that substantial information from a diversity of perspectives was gained through the workshop and related background research. The outputs of the workshop were supplemented by further talks the next day with participating FBA staff, with two research staff from Central Queensland University and with the Natural & Cultural Resources Project Manager from the Fitzroy Basin Elders Committee.

1. Awareness and understanding of 'landscape restoration'

Landscape restoration is a term with which almost all participants were familiar. However, one questionnaire respondent indicated that he preferred to use 'ecological renewal' to describe landscape restoration thinking and activities.

Several participants commented on a perception that 'landscape restoration' generally refers to more highly degraded or fragmented landscapes, and that 'looking after native vegetation and biodiversity', or similar terms, probably have more relevance to landscapes such as those in the Fitzroy Basin. One mining industry representative emphasised the fact that his industry is generally focused on 'landscape rehabilitation' on mined sites, and beyond those areas the focus is on looking after remaining native vegetation.

In discussing Jann Williams' context-setting overview of landscape restoration science, participants commented on the need to get a balance between the larger scales that produce better landscape outcomes, and the need to work at smaller scales that are relevant to individual landholders, managers and those in smaller neighbourhood catchments.

The importance of this is reflected in the fact that much of the FBA's native vegetation and biodiversity work is done through a series of Priority Neighbourhood Catchments, which together will gradually build up to larger landscape scale outcomes. It was noted that the smaller scale engagement processes are more 'natural' and evolutionary in their development, while the larger biolink style projects are more revolutionary.

Discussion followed on whether the large-scale connectivity projects such as Alps to Atherton and Gondwana Link might be more strongly driven by the perceived crisis in landscape degradation in highly fragmented areas. Some participants felt that the perception of 'crisis' in NRM terms may not accelerate uptake.

Scale was also identified as an issue affecting usefulness of spatial datasets. For instance, some vegetation data is useful for sub-regional prioritisation, but not appropriate for within property use. Participants observed that the landscape matrix in the north is more intact than that in the south. They stressed the value of non-remnant parts of the landscape (the 'white' areas on Queensland vegetation maps) in conserving habitat. The amount of regrowth, level of perennial vegetation, and presence of native grasses all contributed to landscape value. During discussion it was widely agreed that depending on their past management (e.g. how areas have been cleared, how they have been managed since clearing and the time elapsed since clearing), many of these areas have good potential to regenerate if managed differently. It was noted that areas blade ploughed will not regenerate as readily as those areas cleared by other means. The different stages of the Brigalow Development Program (each broadly representing clearing in a different decade and by different means) are, therefore, an important contributor in the landscape context. For some vegetation types such as softwood scrub, natural regeneration is generally high regardless of clearing method. This was noted to have implications both for landscape restoration and for mapping of landscapes. The importance of retaining resilience in the landscape was a key factor also considered in this context.

2. Theories, tools and information being used for 'landscape restoration'

Graham Lightbody, the Regional Biodiversity Officer for the FBA, gave a presentation on science and landscape restoration in Central Queensland. At the start of the presentation he highlighted the importance of "empowered communities" in achieving a sustainable Central Queensland. As the regional NRM body for the region, this is what FBA is striving to achieve, though the lack of statutory authority makes this more difficult than in other jurisdictions.

The FBA's second Central Queensland Sustainability Strategy is a regional plan that is underpinned by a considerable body of research. This research is collated in the CQ Information Paper and brings together relevant science and community input. The FBA attempts to define regional aspirations, targets and actions in its plans and strategies. The task is to then work to implement approaches to attain these targets, and monitor and evaluate outcomes.

Target R13: Additional 150,000 hectares of private land supporting regionally significant remnant vegetation voluntarily managed for conservation within 10 years.

Based on the questionnaire responses, feedback from the workshop and individual interviews with key participants in Rockhampton, the following lists have been compiled of material being used to think about and implement landscape restoration.

Theories and principles

Defining Priority Neighbourhood Catchments has been an important starting point for much of the work of the FBA. The Priority Neighbourhood Catchments are the primary vehicle for engaging landholders for on-ground change at a catchment scale, and include both biodiversity stewardship and strategic weed control components. Datasets used in the Priority Neighbourhood Catchment work include salinity, riparian vegetation, sediment, weeds and to a lesser extent, biodiversity data. The FBA has commissioned research to enhance the datasets, and tries to bring together science with local expertise and knowledge. As noted above, target setting is an important component of planning in this region, which would be influenced by principles related to thresholds. Principles such as connectivity and thresholds also underpin the Regional Codes that support the implementation of the *Queensland Vegetation Management Act 1999*.

Four major components have shaped landscape restoration related work within the biodiversity program:

1. Protection and enhancement of high value biodiversity assets.
2. Monitoring the condition of remnant vegetation.
3. Conserving and managing biodiversity in coal exploration and mining areas across the Basin.
4. Progressing the recovery of species of conservation concern through a landscape and habitat focus.

Central Queensland University's Centre for Environmental Management and Wetlands International (Oceania) was identified as an important provider of the science to guide this work. Much of the current work has a habitat emphasis, focusing on species including the Crimson Finch, the Yellow Chat, the Fitzroy River Turtle and the Bridled Nail-tailed Wallaby.

Tools, courses and events

Detailed mapping, including extensive use of Spot-5 images plays an important role in the work undertaken in the Neighbourhood Catchments.

Two incentive delivery approaches have been used to date in the FBA's Biodiversity program:

1. Competitive tender — tenders called and evaluated for value for money. This approach focuses on remnant vegetation management, with biodiversity as the key outcome.
2. Stewardship offer — a set offer based on land type and productivity, that aims for improved biodiversity through changes in grazing management.

As in other case study locations involved in this project, people are using a mix of information sources, with academic papers, journals, guidelines, manuals and web-based material being cited. Close proximity to and engagement with the Central Queensland University, and in particular its Centre for Environmental Management, also provided good on-ground access to relevant science.



Photo courtesy of Greening Australia Capital Region.

3. Projects underway that are aimed at achieving 'landscape restoration'

Individual projects and the larger components of the FBA Regional Investment Strategy that have a landscape restoration focus include:

- A biodiversity stewardship agreements program. Though still in an experimental phase after two to three years of operation, this involves Voluntary Conservation Agreements that target endangered species, 'Of concern' regional ecosystems, riparian vegetation and wetlands. Payment for stewardship agreements is dependent on meeting pasture biomass and ground cover targets (a measure that raised considerable debate during the workshop). Assessment tools used in the stewardship program include: Subregional Biodiversity Mapping; an Incentives Calculator; the Queensland EPA's Biodiversity Planning Assessment; Biodiversity Assessment Mapping Methodology, and Property Action Plans.
- A tender process for delivering Sustainability Strategy outcomes. In 2006, eight properties were contracted with ~\$200,000 for improved biodiversity management, based on a value for funds invested assessment. This program, trialled in the Three Rivers region, aims to develop a Brigalow Corridor Network, providing landscape functionality through managing high conservation value remnants. As part of the process, a 'filter' is applied to 'non-remnant' vegetation and its values based on current and past management. The positive and negative aspects of the process are assessed, and it is planned to revisit the project to examine flow-on adoption impacts.
- There are individual projects focusing on the Yellow Chat and Crimson Finch habitat, as well as projects on bluegrass, rainforest, and fire management. Endangered species projects are seen as more widely relevant because the habitat focus makes the outcomes useful to a range of other species not directly targeted. In this context, the 'Back on Track' project received some criticism because it was set up without local knowledge, and some of the species selected lacked local credibility.
- There are also a range of projects on riparian management, weed management, salinity and water quality funded within the Neighbourhood Catchments program.

Other projects identified, but not discussed in detail included:

- Birdsville to Bay (Hervey Bay) — currently in the planning stage. Greening Australia in Queensland is in the process of developing 'its most ambitious project for the state', which mirrors the 'biolink' projects underway in the southern states. In the east, where the corridor has become fragmented as a result of grazing, cropping and developmental pressures along the coast, this project will initially focus on the Bunya Mountains biolink, an area connecting three Nationals Parks.
- World Wide Fund for Nature South-East Queensland Rainforest Recovery Program. A multi-species recovery plan has been developed with key state and local agencies, regional natural resource management (NRM) groups, the Queensland Herbarium, the University of Queensland and Landcare. Projects are focusing on improving fire and weed management, fencing to exclude stock, revegetation, and plant and animal surveys to underpin decisions on stewardship payments and on-ground funding of fencing etc. Work is also proceeding with local landholders and land managers to encourage voluntary conservation agreements.
- Fishways is a DPI Program of works to improve upstream movement of migratory fish. Some parts of the Fishways project involve creating or maintaining wetlands as important habitat. Elsewhere it focuses on engineering solutions such as fish ladders.
- NatureAssist is an incentive component of Queensland's Nature Refuge Program and provides financial assistance for landholders who actively manage the natural and/or cultural assets of their property.
- Broadsound Coast [Natural Resources] Condition Assessment. This project aims to fill knowledge gaps to enable investments at a sub-regional scale in the following themes: Sustainable land management and use, Terrestrial biodiversity, Inland aquatic ecosystems, Estuaries and marine aquatic integrity, Water quality. Collaboration between the Fitzroy Basin Association, Central Queensland University's Centre for Environmental Management, Wetlands International — Oceania, and the Queensland Environmental Protection Agency.
- Understanding the extent of the Marlborough Serpentine Vegetation. This project aims to refine existing mapping and to facilitate improved management of Marlborough serpentine ecosystems, especially by local councils. Marlborough serpentine ecosystems are rich in endemic plants and form a very important part of the biodiversity of the Fitzroy Basin. These habitats are very significant at a state and national level. The soil and rock supporting these ecosystems are highly mineralised and, consequently, most of the area is under mining tenures.
- A biodiversity and grazing project is being undertaken by researchers from Central Queensland University. This project will assess whether conservation management of riparian vegetation (fencing of riparian vegetation, and provision of off-stream watering sources) leads to benefits for biodiversity.
- A biodiversity and mining project is also underway. Selected biodiversity values of the coal mining areas in the Bowen Basin have been mapped with the aim of delineating areas whose vegetation, size and condition can contribute to the long term survival of listed ecological communities and species. Consultation has commenced on solutions for managing biodiversity based on the values assessment and especially options appropriate for mining companies. This will lead to an operational plan.

Throughout the consideration of the various projects, monitoring and evaluation was a significant issue for all projects.

4. Research, knowledge and communication gaps — priorities for action

Workshop participants and questionnaire respondents contributed to the following list of priorities:

- The importance of local relevance as a determinant of whether science is applied was highlighted by workshop participants. To achieve this, community involvement from the start of projects is important in ensuring public commitment to any science that is being undertaken. Incentive processes based on good science are also important in helping to gain adoption. Further work examining which

incentive schemes produce the 'best' social and environmental outcomes was considered to be useful when thinking about how to apply science at the local level.

- Similarly, while monitoring and evaluation are an integral part of the work of the FBA, each year as new projects are brought on line in the Priority Neighbourhood Catchments process, more resources are required to continue all the necessary monitoring and evaluation. The methods being used must therefore be practical, easily implemented and scientifically sound. This was viewed as a priority for further investment.
- Specific research is required on social aspects of landscape restoration and management. As in other locations, participants in the Fitzroy Basin placed strong emphasis on the importance of socio-economic factors. It was felt by participants that social issues govern ultimate outcomes, with economic, cultural and personal experiences having influence. Stronger economies were seen as important in enabling landholders to take the risks sometimes needed to trial new approaches. This observation links to dot point 1 about more research into which incentive programs produce the 'best' social and environmental outcomes.
- Research to enhance the transfer of knowledge and local expertise between individuals, between organisations, and within organisations over time, could be beneficial.
- The benefits of market research to understand what is required to get landholders involved in biodiversity conservation and restoration as a priority objective, rather than in weeds management or sustainable production management was also discussed. Knowing what appeals to landholders will vary with demographics. For example, younger landholders are more likely to get involved in a tender process, and there is a need to better engage with small landholders and those in peri-urban areas.
- The importance of being able to link management practices and outcomes to biodiversity outcomes was a key point of discussion.
- The need for information on thresholds in the landscape e.g. cover, remnant size, effects of the landscape matrix etc. was identified as a priority.

- A commitment to longer-term investment in NRM to enable ongoing monitoring and feedback to participating landholders was highlighted. Participants indicated that it would be useful to know if two years of supporting landholders is effective in generating longer-term change, or whether longer term support (perhaps provided through 10 year contracts with payments at regular intervals associated with on-site follow-up) is required or achieve more enduring changes.
- Although not part of the Emerald workshop, follow-up interviews also identified the importance of recognising and engaging with Traditional Owners and other indigenous people early in landscape restoration projects. Their needs and their knowledge should contribute so that cultural assets are considered and valued just as other assets are throughout the process. The mechanisms used to do this need to consider the capacity of individual communities and their representatives to participate — this is something that has been assisted in the FBA and its catchment prioritisation process by work done by the Fitzroy Basin Elders Committee. This group has mapped capacity across the region, taking account of the stability of various Native Title claims and the other challenges faced by the various communities within each of the sub-catchments in Fitzroy basin.
- A need for improved research to guide investment by the mining industry in biodiversity offsets was also flagged by scientists interviewed in Rockhampton. In addition, the role of fire, its interactions with grazing land management, and impacts on roadside reserves, riparian corridors and the habitat trees present in these areas requires further work. Increased understanding of corridors and what is required for them to function effectively was also discussed.

What should Phase 2 of this project look like?

Based on the discussions at the workshop and from input through the questionnaires, a number of recommendations were put forward by the group for consideration:

- help make knowledge brokers available at the project scoping stage;

- develop a single searchable database that brings together all NRM knowledge with access to others with expertise and their contact information (seen possibly as an adaptation of the existing Knowledge for NRM toolbar);
- provide high-resolution satellite imagery as a tool to provide evidence-based images for landholders. Currently Spot-5 is provided by the FBA, but this wasn't considered by landholders to provide information at a fine enough scale. It was acknowledged that LWA couldn't provide the imagery itself, but that it could potentially influence other organisations;
- quantify the full economic cost:benefit to landholders as well as the transaction costs of landscape restoration activities. In this context it was noted that implementation of projects and programs becomes more efficient as learning occurs;
- undertake detailed case studies of tender processes to ascertain what worked, what didn't, and why; and
- run an annual 'roadshow' through which LWA and other science based organisations make R&D more locally relevant.

5. Evaluation from participants

All participants completed a workshop evaluation, with most rating the various aspects of the workshop either 'Somewhat' or 'Quite a lot' useful. Various aspects were rated as of only 'A little' value by one or two participants, while one or more participants responded 'Very much so' to the relevance, interest, organisation, enjoyment, ability to improve understanding of landscape restoration, to stimulate useful discussion aspects of the workshop, and as being likely to think about day-to-day applications in their work. The most positive aspects of the workshop were viewed differently by different individuals. One of the landholders present found the meeting particularly useful, saying that the workshop was "Very well run, informative and extremely enjoyable". This response was encouraging, because there was some concern that landholders may not find the workshop of value as they were not the target audience for the project. The lack of attendees from other sectors was commented on by various participants.

6. Key messages

A number of key messages arose from the workshop and written questionnaires. These have been grouped into broad headings, although there is overlap between some of the points.

Planning and goal setting

As in all areas, social and economic issues were seen as of high importance in achieving landscape restoration, with a need to understand these processes outweighing the need for further landscape science. Incorporating social and economic factors in the planning phase of restoration projects should help address the lack of focus on these areas.

- Humans were identified as an integral part of the landscape and this means that goal-setting for landscape restoration needs to take account of the need to balance conservation and production.
- There was very mixed awareness among participants of large-scale landscape restoration projects such as Alps to Atherton and Gondwana Link, as well as the role played by The Nature Conservancy and the Conservation Action Planning process. Further, there is little real uptake of those planning processes in the Fitzroy Basin, apart from the new project being developed by Greening Australia.
- Building the trust needed to have Traditional Owners or their own nominated representatives 'walk country' with those determining 'assets' to be conserved and restored, is important in holistic planning. This approach will likely become an increasingly important part of NRM planning bodies meeting their own Duty of Care, and should improve both Indigenous and non-indigenous understanding of each other's needs and perspectives.

Collaborations and partnerships

- By comparison with other case study areas, the Fitzroy Basin has relatively more intact landscapes and, as a result, its landscapes restoration work has a less apparent sense of urgency and a greater emphasis on grazing land management to sustain and improve condition.

- Being located in a region adjoining the Great Barrier Reef, the Fitzroy Basin Association has had a strong focus on water quality. Its biodiversity focus has been on remnant native vegetation and on threatened species and their habitat — this brings opportunities to manage the remnants as part of the wider production landscape within which they exist. Doing this requires engagement with landholders and industries such as mining and grazing.
- The landscape restoration work occurring in the Fitzroy Basin has a sound basis in science, with the involvement of Central Queensland University Centre for Environmental Management playing an important role with both the grazing and mining sectors.
- Mining sector work has, to date, largely been focused in mine site rehabilitation, rather than on real landscape restoration. However, increasing use of mine site biodiversity offsets is seen to provide opportunities for increasing mining company investment in landscape restoration beyond their own mine sites.
- Providing the opportunity to enhance the transfer of knowledge and local expertise between individuals and organisations, as well as within organisations, is important.

Monitoring and evaluation

- Monitoring and evaluation was identified as a key issue in all the projects that were discussed. Each year as new projects are brought on-line, more resources — including extra staff — are required to continue all the necessary monitoring and evaluation of past as well as the new projects. In general, additional personnel are not provided, so methods used must be practical and easily implemented, while also being scientifically sound.
- There is a need for improved methods for assessing the biodiversity values of those part of the landscape that are not 'core' conservation areas, with considerable debate over how well existing approaches address landscape restoration and biodiversity values.

Photo Nadeem Samnakay.

Landholder engagement and local knowledge

- Primary producers are major landholders and managers across the area. This means that landscape restoration processes depend for their success on good engagement of landholders in landscape management processes.
- Current approaches to incentive programs in Central Queensland and elsewhere tend to involve a lot of activity identifying properties, engaging landholders and finalising agreements and payments. The experience of many landholders is that after the initial flurry of activity they are left to their own devices. This can be a lonely experience. It is important to maintain the relationships with landholders over time, both from the perspective of monitoring the effectiveness of the management agreement, and keeping the 'promise' of ongoing engagement.

Workshop review undertaken by Judy Lambert and Jann Williams, with notes also provided by Mick Quirk.



Desktop review — Australian Capital Territory

Overview

The Australian Capital Territory (ACT), though small, is a well-informed and dynamic region that draws on the scientists available through CSIRO, Bureau of Resource Sciences and local universities. Greening Australia Capital Region is very active in the region, and works closely with ACT Parks, Conservation and Lands and Research and Monitoring (part of Environment ACT). These groups are collaborating on a number of large-scale projects, with the primary focus being the restoration of habitat following the 2003 ACT bushfires. Other projects include a range of peri-urban projects to link remaining native vegetation to the National Parks that make up approximately 46% of the ACT land area.

1. Awareness and understanding of 'landscape restoration'

Landscape restoration is a term with which all those consulted are familiar and feel they apply in their day-to-day work. The principles of landscape restoration have been used to underpin the development of the ACT Natural Resource Management Plan, Molonglo Catchment Strategy, Southern ACT Catchment Management Plan, Lower Cotter Catchment Draft Strategic Management Plan, Namadgi Management Plan, Canberra Nature Park Management Plan, and Murrumbidgee River Corridor Management Plan. These plans and strategies guide activity in the ACT, and achieving the objectives contained within these documents is viewed as a shared goal by the various organisations involved. Expert panels are used to develop these plans and strategies to ensure they are founded on sound science. In essence, the plans and strategies seek to maximise biodiversity through the protection, maintenance and restoration of habitat.

2. Theories, tools and information being used for 'landscape restoration'

Biodiversity Action Planning and Endangered Ecological Communities (EEC) were referred to as providing overarching guidance for landscape restoration activities. Regional targets were mentioned in the context of work being undertaken to develop and achieve the ACT Catchment Plans. Greening Australia is also using the 'transforming landscapes' philosophy to underpin its activities.

Similar publications and sources of information to those identified at the New South Wales workshop were listed as supporting work in landscape restoration.

Theories and principles

- Protect, enhance and restore
- Priority Action Statements
- Whole of paddock
- Island biogeography and species-area relationships
- Conservation management models
- Landscape scale ecology
- Ecological thresholds — landscape, site and species
- Target setting approaches — regional, local and site
- Adaptive management principles — restoration ecology
- Conservation significance/vegetation condition
- Species mix to build floristic and structural diversity

Publications

- *Ecological Management & Restoration* journal.
- *Thinking Bush* magazine, LWA.
- *ACT Natural Resource Management Plan*, ACT Government.
- *Managing and Conserving Grassy Woodlands Guide*, 2004, CSIRO.
- *Bush Tracks*, Greening Australia.
- Vegetation Exchange, Greening Australia.
- *Bringing Birds Back*, Greening Australia.
- *Native Vegetation Guide for the Riverina*, 2002, Charles Sturt University.
- Use of expert panels.

- *Grassy Ecosystems Management Kit*, ACT Parks, Conservation and Lands.
- *Riverways*, Greening Australia.
- *Planting Companion — A guide to native revegetation in the ACT Region*, Greening Australia.

As with the other states and territories, there is a mix of resources being used by people, with academic papers, journals, guidelines, manuals, web-based material and programs such as Greening Australia's Exchange Program being cited. The impression gained from the ACT is that there are good relationships with local scientists so much of the work has a strong academic base upon which practical implementation techniques can be developed.

3. Projects underway that are aimed at achieving 'landscape restoration'

- Most of the work in recent years has focused on regenerating and restoring habitat in fire affected areas. This work has been undertaken by teams drawn from ACT Parks, Conservation and Lands (ACT Forests and Parks and Conservation merged in 2007 to become ACT Parks, Conservation and Lands), Greening Australia, and Wildlife Research and Monitoring (Environment ACT). These groups try to optimise productivity, environment and social amenity goals, and seem to be working well to achieve this.
- Other activities are undertaken through the ACT Landkeepers program, which works with community groups and landholders to improve biodiversity on farm/property. Riparian works seek to connect healthy habitat along the rivers, streams and creeks that flow through the territory. Native vegetation and biodiversity projects often try to link in with riparian works, and provide further coverage so that wide areas of habitat are protected and ultimately linked in to national parks. Every effort is made to link properties where work is underway, however, the realities of working with individual landholders mean that some are willing to be involved and others have little interest. At present there are approximately 160 ACT Landkeepers sites.

4. Research, knowledge and communication gaps — priorities for action

A consistent recommendation from everyone interviewed was to gather together existing research and tools and consolidate them into one 'product' that would act as a 'one stop shop' for landscape restoration information. Ideally, this would include case studies from different regions demonstrating how the theory of landscape restoration is being applied, and the strengths and weaknesses of different approaches. The case studies need not be confined to on-ground projects, they could also show how landscape restoration has been integrated into a regional catchment plan or strategy, and the actions flowing through from this. There was a desire by participants for practically applied examples of landscape restoration. The key requirement was that the information was easily accessible, in one place, and with a variety of entry points to suit different audiences.

Strong support was given for the development of a landscape restoration course that could be run like the River Restoration and Management Course operated by Charles Sturt University. Participants felt that using distance education models with a mix of home/office-based and residential components is an excellent way to build capacity within different organisations. It was also felt that another course is required to train scientists in how to communicate effectively and work with organisations responsible for applying science in the 'real world'. Again, this course could be developed through distance education specialists, and it may be feasible to have a few sessions where participants in the two courses are brought together to learn from each other. Such a course probably exists as part of the Science Communication masters at ANU, and it would be worth investigating this further if a second phase of the project is funded.

Specific research is required on:

- Identifying the management regimes required to achieve different restoration outcomes, for example, where the total grazing pressure approach can be used
- Soils and best bet revegetation options
- On-ground monitoring of previous works — especially large scale projects, i.e. going back now after 'X' years of work and looking at outcomes
- Climate change species selection

5. Key messages

- Though small, the ACT has worked hard to develop strong relationships between the different organisations responsible for, or with knowledge, relevant to managing natural resources in the region. This has enabled the ACT to achieve more integrated approaches to restoring landscapes as all the organisations involved are working towards the same objectives. Although the transaction costs are higher by investing in relationships such as these, on-ground outcomes are optimised because roles and responsibility are clearly articulated, and organisations are working together to attain specific goals.
- Landholder turnover (especially in peri-urban zones) is an impediment to progress. Often attention is given to staff turnover in agencies and CMAs, but not to landholder turnover. Implications exist for how landscape restoration plans are communicated, kept live and exist when properties change hands.
- Projects need to be funded for longer time frames >10 years.
- Building capacity and knowledge about landscape restoration within staff employed by organisations responsible for on-ground works (Greening Australia, catchment groups, etc) is a priority, as is working with scientific institutions to better equip graduates to communicate well and apply science in practical situations.

**Desktop review undertaken by
Siwan Lovett.**

Photo Roger Charlton.



Desktop review — Tasmania

Overview

Tasmania has three NRM regions (Cradle Coast NRM, NRM South and NRM North) and these organisations are currently in the throes of developing regional investment plans. The Department of Primary Industries and Water (DPIW) oversees the *Natural Resource Management Act 2002* and has formed a partnership arrangement through the NRM Framework. The three NRM Regions operate as independent organisations. Both the Australian Government and Tasmanian Government provide funding and in-kind support for the partnership arrangement, based on the regional delivery model. DPIW in particular, provides a wide range of technical, scientific and administrative support to the regions. The North East Bioregional Network, Tasmanian Land Conservancy and Greening Australia Tasmania are some of the organisations involved in a range of projects, often in collaboration with other agencies.

1. Awareness and understanding of 'landscape restoration'

Landscape restoration is a term with which all those consulted are familiar, however, many of those interviewed said that they did not use the phrase when talking to landowners and others because it did not 'connect' with this audience. A more common way of referring to landscape restoration activities is to talk about maintaining and improving ecosystems at the landscape scale. The emphasis here is on restoration to improve integrity, condition and extent of native vegetation in the context of the landscape as a whole, rather than in isolated patches.

2. Theories, tools and information being used for 'landscape restoration'

As with other states and territories, people working in the area of landscape restoration are using a variety of principles, tools and techniques to underpin their research and on-ground efforts. One project currently underway in NRM South, is developing a pilot methodology to identify important links at the landscape scale across two neighbouring municipalities. This method uses approaches and principles such as the focal species approach, landscape-scale thresholds, creating buffers (particularly riparian, coastal and reserve), protection of habitat (especially for focal species) and functional connectivity by choosing the smallest gaps between remnants. This pilot methodology will be reviewed, and the transferability to other landscapes tested in the next eight months. It is anticipated this methodology will be translated into a decision support tool for local government and NRM groups to assist with strategic planning and identification of appropriate on-ground activity within particular corridors.

In the interim, the practical principles used to plan and manage native vegetation and biodiversity include focusing on remnants which:

- are located strategically in the landscape (e.g. linked to other native vegetation, located in the headwaters of waterways);
- have recognised regional or national values (have or provide habitat for threatened and endemic species, protect or manage threats to priority communities); and,
- have a high potential for recovery.

Actual management responses include targeting weed control in these areas, provision of off-stream watering and applying appropriate management regimes, particularly grazing.

DPIW, through its participation on NRM Incentives projects in Cradle Coast NRM, NRM North and NRM South has worked with the service providers (Greening Australia Tasmania and Private Forests Tasmania) to identify terrestrial and aquatic values that then allow for the prioritisation of on-ground activities, such as protection of high priority native vegetation in remnants, threatened species, revegetation activities, weed control and rehabilitation works.

Other theories, principles and tools being used by groups in Tasmania are listed below.

Theories and principles

- Landscape-scale conservation planning (Lindenmayer & Fischer, 2006)
- Theoretical approaches from fragmentation ecology
- Focus on protecting larger intact remnants in better condition
- In recent times the focus has been more on retention rather than management per se. Tasmania has seen increased landuse change (especially with pivot irrigator technology), and this has led to accelerated clearance and conversion activities on a large scale
- Connectivity (corridors and stepping stones)
- Climate change adaptation principles (recent)
- Ecological heritage — using reference condition sites to develop regeneration plans that replicate original habitat
- Island biogeography and species-area relationships
- Conservation management models
- Landscape scale ecology
- Ecological thresholds — landscape, site and species
- Target setting approaches — regional, local and site
- Adaptive management principles — restoration ecology
- Conservation significance/vegetation condition
- Species mix to build floristic and structural diversity

Publications

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- *Ecological Management & Restoration* journal.
- *Thinking Bush* magazine, LWA.
- Rivercare Planning processes.
- *Managing and Conserving Grassy Woodlands Guide*, 2004, CSIRO.
- *Ecological Applications* journal.
- *River Research and Applications* journal.
- *Australian Journal of Experimental Agriculture*.
- *Austral Ecology* journal, Blackwell Publishing.
- *Journal of Environmental Management*, Elsevier.
- *Pacific Conservation Biology* journal, Surrey Beatty & Sons.

Tools, courses and events

- Veg Futures conferences
- Regional workshop with 20 native vegetation managers from around state to identify priorities for region
- Use of expert panels — for example, Greening Australia has an ecologist, botanist, landscape based scientist and a riparian specialist on that Expert Panel. This Expert Panel has gone on to produce a Procedures Manual for Greening Australia Tasmania to use when undertaking landscape restoration projects
- *Bush Tracks*, Greening Australia
- Vegetation Exchange, Greening Australia

- *Riverways*, Greening Australia
- Existing data/GIS tools (e.g. vegetation type and extent, threatened species range and potential habitat, strategic reserve design layers)
- Greening Australia has a state based social sharing network that allows staff to have knowledge shared between and within branches
- Workshops and steering committees are an integral part of region- and state-based projects and provide scientific backing for field officers and managers
- Discussions with other regional managers assists in determining which projects have been successful, or which aspects of projects have been effective. Some advice is sought from the Australian Government through facilitators
- Regular meetings with other NRM regions and contact with the Australian Government Biodiversity Facilitator

3. Projects underway that are aimed at achieving 'landscape restoration'

Cradle Coast

- Current Cradle Coast NRM projects have generally been outsourced to other agencies/organisations. These projects were designed and implemented in conjunction with the regions, but mainly based on the skill sets within the relevant organisations. As part of developing a new investment proposal for NHT 3, prior to the election of the new government, these projects were reviewed to determine what outcomes had been achieved and assist in planning future projects. The reviews identified that specific benefits to biodiversity could not be determined, and could not tell whether actions had improved the status of vegetation condition at a regional scale. This meant that Cradle Coast NRM were unable to report against the Management Action Targets or Resource Condition Targets due to a lack of baseline data and inadequate data collection within the projects. Since these reviews, habitat mapping, vegetation condition modelling and ecosystem services projects have been identified as key areas for biodiversity planning. It is hoped that improved knowledge and understanding of these systems will assist Cradle Coast NRM in identifying priority areas and targeting investment effectively.

- Cradle Coast NRM already has significant areas of vegetation reserved in World Heritage Areas, National Parks and State Forest. The management of reserves and condition of vegetation are significant issues for the region. Weed management activities have been a significant part of biodiversity investment in the region to provide a buffer for the reserved areas and to maintain the condition of vegetation by reducing threats.
- The approach adopted by Greening Australia Tasmania for both riparian and remnant restoration and protection in the Cradle Coast region in Tasmania has been to deliver two incentive-based projects to protect these assets, mainly on private freehold land. The overarching approach has evolved over time (projects beginning in 2006) through increased regional knowledge by service provider and direction given by the client. The prioritising of sites uses several ecological criteria in the approval process. Priorities reflect catchment, natural values i.e. threatened species and communities, landscape context, condition/health, and site recoverability where each site is ranked for funding suitability. Funding for fencing is the main incentive given to landholders with the predominant aim to remove stock from remnant and riparian areas. These projects also include minor weed control, minor or targeted in-stream works, revegetation and off-stream watering points. Greening Australia's team of assessors operate on a site-by-site basis, however, several targeted more intensive methods of landholder engagement have been adopted such as letter drops, targeted field days.
- Conservation Action Planning is a formal methodology of conservation planning developed by The Nature Conservancy. It works at a landscape scale and focuses on setting biodiversity priorities, defining and implementing conservation strategies, and measuring success. It is set in adaptive management framework. It has increasingly been used in Tasmania by a number of projects, including NRM South's Biolinks, NRM Climate Change/Greening Australia Tasmania's Bush & Streams project, Greening Australia Tasmania's River Recovery Project and MidLANDscapes, a DPIW/Tasmanian Land Conservancy/Bush Heritage Australia partnership project in the Midlands region.

This will be an important tool for landscape restoration.

- The Protected Areas on Private Land (PAPL) Program has taken a lead role in developing a landscape-scale approach to the identification and protection of biodiversity values in the Midlands Biodiversity Hotspot area. Partners in the approach include the Tasmanian Land Conservancy, Bush Heritage Australia and DPIW. So far the emphasis has been on inventory and conservation planning, and a Conservation Action Plan has been developed for the Upper Macquarie catchment, as a pilot approach for the broader MidLANDscapes project.

North-East

- The North-East Bioregional Network is collaborating with the company Timberland to regenerate bushland and remove pine trees. In places where natural regeneration is not occurring, intervention is used to plant a mix of species and develop habitat to promote increased flora and fauna biodiversity. Tasmania is fortunate in that intact pristine habitat is accessible, providing excellent reference conditions to assist regeneration efforts. An overall philosophy of 'linking landscapes' to protect, retain and restore ecological heritage is being used for this project. North-East Bioregional Network is also undertaking a number of science-based landscape-scale strategic planning sessions. It is being delivered in partnership with the Wilderness Society's Wild Country Program.

South

- Tasmanian River Condition Index — this project will allow the NRM regions and the Tasmania Government to establish benchmarks and monitor and report on the biophysical condition of rivers across the state.
- Conservation of Freshwater Ecosystems Values (CFEV) validation Projects — projects are currently underway to validate the information contained within CFEV. CFEV provides both the Tasmanian Government and the NRM regions with a tool that identifies biophysical values at the state-wide level, allowing for better conservation-based planning and management.

State-wide

- Other projects underway in Tasmania, but for which it was not possible to gain information in the time available, include the work being undertaken by the Wilderness Society on the Wildlands Network Design approach developed in North America; the landscape-scale projects being undertaken by the Tasmanian Land Conservancy; and the Conservation Action Planning workshops run by Greening Australia.
- DPIW hosts the National Gorse Taskforce coordinator. One of the key outputs of this project is to target outlier populations of gorse in an effort to eradicate from regions or municipalities. The project is one of 20 similar Weeds of National Significance projects for which there are seven in total in Tasmania.
- DPIW, as part of an NRM-funded project, has developed a process for identifying salinity hazards across 14 municipalities occurring in the Tasmanian NAPSQ region. Using landscape scale groundwater flow systems, and by overlapping a range of built (roads, buildings), agricultural and natural (native vegetation and wetlands) assets, the potential risk of adverse impacts resulting from salinity can be assessed.
- CFEV — The Conservation of Freshwater Ecosystem Values Project (CFEV Project) is part of the implementation of the Water Development Plan for Tasmania, which aims to promote ecologically sustainable water development opportunities for Tasmania into the future. The CFEV Project has been initiated to identify where important freshwater values exist on Crown and private land. In doing so, the Project will provide a strategic approach with the aim of providing increased confidence on behalf of government, industry and the community that high priority freshwater values are appropriately considered in the development, conservation and management of the state's water resources. The key output of the CFEV Project is the development of a database which acts as a planning and information tool to support the inclusion of freshwater values within a strategic framework for the management of Tasmania's natural resources and integrates with existing planning and regulatory instruments.

- The Tasmanian Farmers & Graziers Association, in partnership with DPIW and the three NRM Regions, has developed a Property Management Systems Framework for Tasmania that will contribute to the achievement of natural resource management outcomes.
- DPIW is currently assessing the potential impact of climate change on Tasmania's biodiversity and possible adaptation measures. This includes identification of important biodiversity assets, landscape connectivity and refugia. This process will inform landscape restoration planning.

4. Research, knowledge and communication gaps — priorities for action

Access to data, and the interpretation of that data so that it is relevant for a particular location was highlighted as a gap by people in Tasmania. The point was made that although some data is accessible, other datasets (depending on the custodian and the complexity) are difficult to access, and this means the overall 'picture' is not as complete as it could be. In cases where data is available, there are issues about whether the use of that data or information is appropriate — all sources of scientific information require some level of interpretation and, as a result, can be prone to unsuitable use or extrapolation, especially GIS data. One interviewee also noted that it is not always clear to see the extent to which the information or data available is relevant or suited to your region, and this is where bridging the gap between science and practice is critical.

As with other states and territories, having data interpreted and specific to the region in which an individual is working, is ranked as the best way to support landscape restoration activities. This is because it enables material to be 'anchored' in the local landscape, rather than a (potentially) quite different one. Scientific papers and publications are relatively easy to access, particularly through organisations such as LWA, however, it is a matter of knowing these resources exist in the first place, and the extent to which their content is transferable to other environments, that often prevents them from being applied.

There is not an equitable distribution within the three NRM regions of individuals with relevant skills in landscape ecology, landscape restoration, GIS, spatial modelling etc. Much of this expertise resides either within the state government where it is centralised, or with consultants that necessarily have a "project" focus. This lack of expertise in regional areas also affects local government and planning and decision-making processes.

Cradle Coast NRM employees felt that the quality of data used for biodiversity management and prioritisation in the region is inadequate and outdated. The level of information is insufficient to be able to determine priority areas for works or priority actions to improve biodiversity. For these reasons, recent strategic planning exercises have identified 'information gathering' and resource assessment as key areas for investment. Areas in which work needs to be undertaken include: habitat mapping to determine priority areas and vegetation types for faunal habitat; vegetation condition mapping to determine which management actions have been most successful and to identify areas that are declining or improving; and quantifying ecosystem services to determine priority areas that need protecting or restoring. Some respondents felt that there is also a need to take a stronger, more pro-active approach to the identification of conservation-based priorities at the regional level. It was suggested that this could be achieved, at least in part, through targeted projects that are funded through the NRM programs. Such work needs to be completed so that the Investment Strategies can be guaranteed of delivering in key areas.

Getting access to expertise was noted as a priority, with some interviewees suggesting that developing partnerships with researchers to build stronger links between activities and tools would be one way to have more scientific input into on-ground efforts. This is happening to some extent within the 'Landscape Logic' work, but is viewed as still being driven by research interests rather than pragmatic regional on-ground needs. The point was made that there is a need to identify how we can involve the scientists in the practice, as well as the practitioners in the science.

As with New South Wales, the issue of unclear organisational roles and responsibilities was raised in Tasmania. Even in such a small state, there are a number of organisations (non-government organisations, universities, NRM regions, local government and state government), all looking at, and trying to understand, how to manage threats and values across landscapes. However, there is little cross-pollination or integration of the thinking and approaches, and whilst there is an awareness of what each is doing, it was reported that most organisations continue to operate in their own 'bubbles', with little connection. With this being a challenge at the state level, the point was made that scaling up to the national level presented even more difficulties.

Specific research is required on:

- Developing techniques and approaches for the assessment of condition at the landscape scale. DPIW has developed a vegetation condition assessment methodology (Michaels, 2006) which has been adopted by a number of NRM programs and projects as a method of measuring outcomes for NRM investment. This method is designed for site level assessment and there are no systematic assessment tools for assessing the condition of Tasmania's natural resources. Assessment of landscape degradation issues such as tree decline, salinity, soil erosion, weed invasion etc. is patchy and infrequent.
- Information on successful and unsuccessful projects from around Australia and the delivery of those projects would also be of great assistance.
- Species selection for revegetation — the message about local provenance is still very strong with community landcare groups etc., and it is not necessarily based on good science.
- Restoration/revegetation under climate change and extended drought scenarios. Information on incorporation of species for new climate scenarios is required. Greening Australia Tasmania is looking at the inclusion of c. 20% of species in the species mix selected for suitability for the modelled future climate envelope of the site, rather than the current one.
- How does one achieve landscape function? for example, planting in recharge areas for salinity — how much, where?

- Tasmania undertook extensive Rivercare planning during NHT 1, but it has been largely discontinued under current programs. Rivercare planning took a catchment-scale approach to strategic planning for the management and rehabilitation of rivers in the state. It was an effective way of bringing groups of landowners together to manage various biophysical aspects of a particular river and its tributaries. A logical progression from Rivercare planning would be to link it with property based planning, especially at a “landscape level”.

5. Key messages

- Project timeframes are too short to achieve landscape restoration goals. The policy frameworks within which landscape restoration activities are being undertaken are mismatched with the time it takes to develop a plan, underpin strategies with science, monitor baseline condition and then implement works. Currently, the pressure is to undertake on-ground works and get results in a few years — this leads to poorly planned projects that generally fail to develop into long-term ‘successful’ on-ground change.
- There is a need for priority setting processes to be managed through partnerships, so that longer-term more holistic projects that achieve multiple, integrated natural resources objectives are funded.
- On-ground resources to undertake landscape restoration are scarce, and it is often difficult to attract volunteers to work in hard to access sites. There is a need to better communicate landscape restoration principles and practice to make it exciting and interesting so that more people get involved and seek to undertake restoration work on their properties.
- Direct contact with scientists is very limited and is it very difficult to access specific and high-level technical expertise (partly due to limited resources, timeframes and lack of knowledge about their openness to being contacted).
- In response to the comment above, one person said that that from the state government’s perspectives, clear pathways for the NRM regions to access biodiversity technical input are available, for example, experts sit on steering committees and also assist with on-ground technical advice. Due to demand for these services, however, the DPIW experts have found it difficult to deal with the resources required to service the needs of three NRM regions, particularly with duplication of steering committees etc. Service agreements between the state government and the regions are, however, in place, and it is through this process that the NRM regions have the opportunity to specify the type of support they require.
- In a climate with little resourcing for research specific to the regions, organisations are reliant either on being able to draw on research from other regions or develop their own approaches which may not have the desired level of scientific rigour.
- Fostering opportunities for sharing tools and approaches, and identifying ways to have more scientific input into or review of what regions are doing was highlighted as important. This needs to be more than papers and publications, and requires people getting together in the same room at the same time. Conferences are important, but they often only scratch the surface. Workshops are useful for exploring things more fully.
- Longer term weed management programs need to be in place to allow the NRM regions and groups to be able to effectively deal with weed management issues at a landscape level. Both the NRM regions and DPIW maintain regional weed management staff and this is a significant step forward. Projects are funded at both the local level as well as regionally based priorities.
- Resources can still be limited for general weed management activities. These activities contribute to landscape restoration and it is often the case that they are “forced” to position their on-ground activities in the context of a broader project (e.g. with a communication component such as producing materials, brochures etc.) when all they want to do is strategic weed eradication.

**Desktop review undertaken by
Siwan Lovett and Jann Williams.**

Desktop review — South Australia

Overview

South Australia has a diverse range of landscapes, from the highly cleared areas in the south-east, to the largely intact rangelands in the north of the state, and woodland systems in the south-west. While work towards restoration of the highly fragmented landscapes found in South Australia has been slow to progress until recent times, serious investment of funding and effort is now being made by both government and non-government organisations. Large-scale connectivity projects are under way in several locations, along with smaller-scale habitat restoration led by university researchers. Innovative projects are also underway on Aboriginal lands, as evidenced by activities in the north-west of the state.

1. Awareness and understanding of 'landscape restoration'

'Habitat restoration' is the term more generally used by those involved in 'landscape restoration' or 'ecological restoration' in South Australia. In April 2007, the Department of Land, Water and Biodiversity Conservation (DLWBC), and the Native Vegetation Council of South Australia hosted a workshop which brought together a broad range of expertise from both government and non-government organisations seeking "to improve biodiversity outcomes of restoration work". The emphasis in this workshop was on "Theoretical frameworks underpinning on-ground works" and "Habitat restoration technical directions". Overall the workshop aimed to strengthen the extent to which science informs best practice in protecting and improving remnants and revegetation areas.

Approximately 100 people participated in this workshop, reflecting the strength of interest in the area, with evaluation comments indicating a desire for more information on actually doing habitat restoration and on clarifying the biodiversity benefits of habitat restoration work.

2. Theories, tools and information being used for 'landscape restoration'

Based on a rapid review of literature available for current landscape restoration projects in South Australia, as well as feedback from individual interviews with key participants, it is clear that a number of different principles and goals drive landscape restoration in South Australia. High among these priorities are restoration of habitat for 'focal' species, restoration of vegetation communities classified as preferentially cleared, and ensuring connectivity between core protected areas to create a comprehensive landscape managed to maintain and enhance biodiversity.

Greening Australia and other non-government organisations place emphasis on the Conservation Action Planning approach developed by The Nature Conservancy, with The Wilderness Society injecting its Wild Country principles into that process. These principles, which seek to address interactivity of species with their habitat; the links between water, vegetation and wildlife; long-distance biological movement; the impacts of disturbance regimes; climate change and variability; coastal zone fluxes; the need to protect landscapes to allow for long-term evolutionary processes; and the geographic and temporal variation in plant productivity across Australia, are used to guide Wild Country work. Through these approaches, Greening Australia and The Wilderness Society are seeking to influence the government's NatureLinks program.

Fire management is another key issue being addressed in the management of native vegetation at the landscape scale in South Australia. Possingham and others have used Population Viability Analysis to assess the likelihood that populations of species such as bandicoots will become extinct in South Australia, within a specified period (say, 100 years) and under different fire management options.

Theories and principles

- Landscape scale ecology and connectivity
- Target-setting at state, regional and local scales
- Government 'No species loss' policy
- Habitat restoration and rehabilitation of preferentially cleared vegetation types
- Meta-population theory
- Focal species

In at least one region, the notion of connecting blocks of vegetation with corridor plantings has largely been superseded to address the fundamental issue of not enough habitat. This puts the region somewhat ahead of many others in Australia, where corridors are still seen as a key element of landscape restoration.

Increasingly in South Australia emphasis is being placed on landscape revegetation to provide carbon offsets, and work is under way within the Department of Land, Water and Biodiversity Conservation to develop a broad framework within which such projects can take account of the biodiversity benefits to be gained from the farm paddock scale, through increases in biomass, revegetation and remnant vegetation protection.

Tools and events

- Notes from 'Unlocking the Biodiversity Potential of Revegetation' workshop, DLWBC
- State Strategic Plan targets, and regional NRM planning targets
- *Bush Tracks*, Greening Australia
- Vegetation Exchange Program, Greening Australia
- Wild Country principles and project science, The Wilderness Society

As in other case study locations involved in this project, people are using a mix of information sources, with academic papers, journals, guidelines, manuals, web-based material and programs such as Greening Australia's *Bush Tracks* and Exchange Program being cited. Direct input from scientists based in Adelaide and those in advisory committee's such as The Wilderness Society's Wild Country Science Council are also used.

3. Projects underway that are aimed at achieving 'landscape restoration'

The SA Department of Land, Water and Biodiversity Conservation is working in collaboration with the SA Department for Environment and Heritage to assist regional NRM Boards in making their contributions to meeting state Strategic Plan targets. In particular, the five major corridors being planned and developed through the NatureLinks program are aiming to have well-established biodiversity corridors "maximising ecological outcomes particularly in the face of climate change" by 2010. Planning processes are under way working with NRM Boards and local communities. These projects are directed to establishing areas where "South Australian species and ecosystems are able to move, survive, evolve and adapt to environmental changes such as climate change". Priority areas are:

- East meets West — stretching from the Western Australian border to northern Eyre Peninsula, and including significant areas of Aboriginal land and of wilderness.
- Flinders and Olary Ranges Bounceback — stretching from the Gammon Ranges to the Flinders Ranges and including the Olary Ranges, piloting management of total grazing pressure on private and public lands.
- Cape Borda to Barossa — encompassing the Yarebilla/Greater Mount Lofty parklands as a basis for the corridor and linking to the Encounter Marine Park; and more recently,
- The River Murray Forest project, which is a large-scale habitat establishment and biosequestration initiative which lies entirely within the planned River Murray-Coorong NatureLinks corridor. Plantings proposed for the 20 kilometre zone on either side of the River Murray, initially from the South Australian/Victorian border to Morgan are seeking to provide reconnection of patches of valuable ecosystems, offsetting greenhouse emissions, promoting establishment of sustainable new industries and assisting in reducing erosion of topsoils.
- An Arid Lands corridor remains to get under way.

- Greening Australia is also an active participant in regional projects in the western part of the Eyre Peninsula and the northern part of the Yorke Peninsula, as well as in the Habitat 141 cross-border project being undertaken jointly with the Victoria Naturally Alliance of groups in western Victoria. The Habitat 141 project is designed to “reconnect nature at a time of climate change”.

Other projects in South Australia identified to have a landscape restoration focus included:

- A study of fire and revegetation management for both biodiversity conservation and asset protection outcomes, being conducted by Rural Solutions SA and the Country Fire Service in the Port Lincoln area.
- A comparative five year study of the costs and biodiversity benefits of species mixes of differing complexity in restoration work on Defence sites in the Murray Bridge and Port Lincoln areas, being undertaken by DLWBC and the Department of Defence. It is intended that this project will result in a “lessons learnt” guide for those doing on-ground work in landscape restoration.
- The Kuka Kanyini Watarru project is underway in the Anangu-Pitjantjatjara Yankunyatjara (APY) lands in north-western South Australia. Kuka Kanyini is a Pitjantjatjara word that, loosely translated, means looking after game animals. Its vision is *‘restoring landscapes, animals, plants, skills, health, pride and knowledge to ones country’*. The project aims to manage country, conserve biodiversity, maintain culture and improve the social, economic and emotional wellbeing of peoples in the APY Lands. It involves the control of feral animals, the protection of valuable water in rockholes, the potential for reintroduction of species including preferred plant and animal species and is based on what Aboriginal people say how the land can function. Western science complements this process.
- A project addressing habitat restoration for the Glossy Black Cockatoo on the northern Fleurieu Peninsula.
- Threatened Species Network habitat restoration work assisting the recovery of the Scrub Wren.

Each of these two latter projects is identified as adopting a strong ‘focal species’ approach, which is being used as an icon around which to build smaller-scale landscape restoration. Each is also seen as a positive example of government agencies, non-government organisations, local community members and scientists coming together to plan and implement the work.

4. Research, knowledge and communication gaps — priorities for action

The Habitat Restoration Workshop hosted by DLWBC and the Native Vegetation Council of SA in October 2007 identified a broad range of issues, knowledge gaps and key messages, which have been distilled and supplemented from the outcomes of literature review and individual interviews. The outcomes of that process are as follows.

Specific research is required on:

- Better understanding ecosystem processes and their application to habitat restoration.
- Providing a clearer understanding of the distribution, status and requirements of key species and the connectivity that best meets those requirements.
- Assessing and incorporating appropriate genetic complexity.
- The use of appropriate disturbance regimes to assist in landscape/habitat restoration.
- Defining appropriate factors for scaling up and down from landscape, to regional to paddock scale, so that work done at each level has relevance to particular situations.
- Applicability of landscape restoration science from one region to another.
- Understanding key factors in achieving community engagement with landscape restoration and ensuring that local knowledge is integrated with technical knowledge.

Other research areas that are needed to implement an effective large-scale restoration program in South Australia were identified as:

- An appreciation of the habitat needs of fauna (area of home ranges, habitat features (floristic, structural), so that we build habitats for biodiversity rather than plant vegetation (and assume it will support the fauna etc).

- A series of good templates that define the temporal and spatial heterogeneity of plant communities (i.e. how different plants are arranged in space and time) with these to be used in setting planting designs and time lines — and also as measuring sticks for how well we meet the habitat requirements/vegetation systems — at the very least it will help set more realistic planting densities and arrangements etc).
- Interim targets and effective monitoring and evaluation of outcomes (appropriate habitat produced not outputs (X hectares of planting) from on-ground works allowing adaptive management.
- Technical aspects of efficient habitat reconstruction (from seed collection, germination triggers to developing the right-shaped trees and spacings etc).

As in other focus areas within this project, the importance of socio-economic factors to both engagement with, and success of landscape restoration work, was a recurring theme.

Key messages

- There is a clear case for habitat/landscape restoration work in South Australia to occur concurrently with the management of remnant habitats, but actions need to be prioritised at state, regional and local levels to ensure wise use of available resources.
- Although the need for good science to underpin on-ground work in landscape restoration is widely recognised among both policy staff and on-ground practitioners, there remains a disconnect between these two elements.
- Involving knowledge brokers with the skills to capture complex science and translate into practical knowledge that can be integrated with on-ground practice is crucial to success.
- Entrenching landscape restoration knowledge into regional NRM plans requires a level of investment and appropriately skilled people not yet achieved. This is a necessary element in achieving on-ground implementation of sound landscape restoration.

Photo Nadeem Samnakay.

- It is important to ensure that clear, measurable goals are set and an adaptive management framework adopted at the outset of landscape restoration projects.
- Disturbance plays a key role in natural ecosystems. The effects of natural disturbance need to be factored into landscape restoration, and in many situations disturbances such as fire, grazing and flooding can be used to manipulate systems for an ecologically desirable outcome.
- Landscape restoration is an intergenerational process, requiring long timeframes. Both programs and their evaluation require long-term support and cannot be achieved within short funding cycles.
- Monitoring of on-ground works needs to be able to address social and economic, as well as ecological objectives.
- Policies, plans and promotional activities should clarify and emphasise the ways on which carbon credit plantings and other NRM work can be implemented to achieve biodiversity outcomes.

Desktop review undertaken by Judy Lambert with input from Jann Williams.



Desktop review — Northern Territory

Overview

Although land use and management pressures have created some problems in the Northern Territory, the landscapes and the natural ecosystems they support remain relatively natural. Traditional Aboriginal uses and pastoralism based on cattle grazing of native vegetation together occupy more than 80% of the Northern Territory. The main management issues are often described as ‘fire, weeds and ferals’, which can all have impacts over extensive landscapes. Total grazing pressure and water point management are also key issues. Even given these somewhat pervasive pressures, the lack of widespread clearing means that the native vegetation in both the arid and tropical savanna landscapes is still relatively intact. As a result perspectives on ‘landscape restoration’ differ markedly from those in more fragmented and relictual landscapes found in other parts of the country.

1. Awareness and understanding of ‘landscape restoration’

While ‘landscape restoration’ is a term familiar to those working in natural resource management in the Northern Territory, its use generally relates much more to maintenance and enhancement of condition than to extent of native vegetation and its supporting systems. With only 3–4% of the Northern Territory in conservation reserves, and almost 50% used for stock grazing of native vegetation, the focus of landscape restoration is largely on ecologically sustainable management of grazing directed to conserving biodiversity. As one interviewee commented “Landscape restoration is used as a term to describe activities which prevent or reverse land degradation and restore land to a balanced sustainable farming or grazing condition”.

Management of fire regimes, in particular, is a tool that can help improve landscape condition, addressing the change in fire timing and intensity that has occurred since the modification of Aboriginal burning patterns.

2. Theories, tools and information being used for ‘landscape restoration’

Based on a rapid review of relevant literature, and agency and university websites, together with feedback from individual interviews with key participants, the key tools and information used in landscape restoration work in the Northern Territory relate to defining threshold-based regional frameworks and guidelines that ensure that biodiversity conservation is achieved. Recent work in the Western Australian rangelands uses broader ‘geo-ecological’ approaches to management of rangelands ecosystems.

Theories and principles

- Thresholds for ecologically sound performance at both enterprise and regional levels may increasingly become part of environmental accreditation schemes (EMSs) for the northern beef industry.
- Fire management principles and practices developed through ongoing research since the early 1990s.
- A functional approach to rangelands, such as those found in central Australia, has been developed by CSIRO. It uses a trigger-transfer-reserve-pulse framework to describe the transfer of water and nutrients to a reserve. This is based on the hypothesis that landscapes function to capture, concentrate and conserve water and nutrients through source and sink areas.
- State and transition models were developed by Westoby and others in the late 1980s to describe rangeland vegetation dynamics. The models distinguish transitional states in which a site may not last for ever, but rather may turn into one or another of the persisting states, depending on incidents while the system is in a transient state. In general, the states are assumed to be more or less stable, so that the system is capable of maintaining itself in a particular state for an extended period of time.

- A considerable body of work exists to guide the distribution of water points in ways that minimise grazing impacts on biodiversity.
- Indigenous 'theories and principles' on landscapes and their management, which bring a very different world view to the table, are beyond the scope of this project but are a particularly important consideration in the Northern Territory.

It was commented by one interviewee that in general "science is not the driver of these projects, but the best projects have a strong science component" which is integrated with local expectations through a process that is collaborative from the outset.

Tools and events

- A workshop was held on 27 February 2008 at Charles Darwin University to establish the NT Applied Landscape Research and Education Network. The ALERN workshop aimed to "encourage and promote discussion between academics and land management stakeholders and practitioners to enable two-way information flow".
- BioGraze fact sheets and other grazing land management materials.
- Greening Australia's Exchange Program.
- Multi-species recovery plans for species recognised as threatened at the national level.
- The Tropical Savannas CRC had a major impact on how science was undertaken and communicated in the Northern Territory and across northern Australia more broadly. It was short-listed in the last round of CRC funding, but was ultimately unsuccessful in its bid. The CRC produced a number of tools and databases, which are accessible through <http://savanna.cdu.edu.au/>. A Future Forum was held in February 2008 to draw the key lessons from the CRC's years of research and collaboration between multiple partners. With the election of a new government, the CRC has now been invited into discussions about its future — so there is a possibility that its life will be extended.
- This trigger-transfer-pulse-reserve concept has been further developed into the Landscape Function Analysis tool, and is now widely applied to the rehabilitation of mine sites in the Northern Territory and elsewhere.

3. Projects underway that are aimed at achieving 'landscape restoration'

The areas involved in the Northern Territory are vast, and the people (research scientists, policy and program staff, and landholders) and resources available are relatively small. Most projects underway have a strong applied science emphasis.

- A study led by Dr Alaric Fisher which is aimed at refining methods for off-reserve conservation of biodiversity in tropical savanna rangelands. One component of this project is on Heytesbury Beef's Pigeon Hole Station in the Victoria River District, where the impacts of different grazing regimes on biodiversity in the paddock are being assessed.
- Several studies by Setterfield, Douglas and others at Charles Darwin University, into the impacts and management of fire, the impacts and management of weeds, invasive pasture species and feral animals, impacts and management of saline intrusion. These include coordinated fire management use at a landscape scale in Kakadu National Park and in Western Arnhem Land.
- A study by Friedel and others at CSIRO Sustainable Ecosystems Alice Springs of the environmental, social and economic costs and benefits of Buffel grass.
- Studies by Woinarski and others for the NT Department of Infrastructure, Planning and Environment, including studies of habitat requirements, conservation status and other aspect of threatened species management.
- Projects demonstrating at the property scale aspects of sustainable Grazing Land Management strategies. These projects are being conducted through the NT Cattlemen's Association and the Centralian Land Management Association.
- Greening Australia is embarking on work, with the support of The Nature Conservancy, to develop large-scale linkages across the savanna woodlands, and to improve water quality, freshwater springs and wetlands through a focus on managing camels and other feral animals.

4. Research, knowledge and communication gaps — priorities for action

The gaps in knowledge are recognised to be numerous, resulting from the scale of the landscapes and the limited resources (both human and financial) available. However, as in the focus locations within this project, participants point to a need to address the social and economic aspects of landscape restoration as a strong priority. As one interviewee commented “While the biophysical research is very important, harnessing the appropriate social, cultural and economic knowledge also plays a key role in north Australia”.

Specific research is required on:

- Effective mechanisms for overcoming the ‘disconnect’ between landscape scale research and what people do on-the-ground at the paddock scale.
- Market-based incentives and what they are doing for biodiversity and landscape restoration.
- Increasing understanding of the interactions between fire, grazing, introduced (invasive) pastures and biodiversity conservation. Some of this work is under way through Charles Darwin University and the NT Parks and Wildlife Commission.

5. Key messages

- On-ground practice is not yet benefiting adequately from research. There is a need to make the research better align with perceived on-ground needs and expectations, especially for pastoral management, Indigenous land managers and local government.
- There is a need for greater involvement of research teams from the early stages of projects and in ongoing ways, to help build the trust needed to enhance uptake. A consistent presence of research team members on the ground doing things with locals is a key. Attachment to country makes this even more important than in southern areas where that direct attachment has been weakened or lost.
- Policy and funding of programs catering to landscape restoration need to better accommodate a holistic approach to caring for country, rather than individual packets of money being available for particular themes.

Desktop review undertaken by Judy Lambert with input from Jann Williams.



Photo courtesy of Greening Australia Capital Region.

5. Conclusions

Landscape restoration is a term that is well known and familiar, yet used in a variety of ways to refer to a diverse range of activities. Overall impressions gained by the research team about the people working in this area, are of individuals who are under considerable pressure to produce tangible on-ground results that meet 'landscape restoration' principles and goals. The 'pressure' is created because, although 'landscape restoration' might be the aspiration, the many constraints that people operate within (time, resources, landholder willingness, unclear objectives, too many theories, tools and approaches to choose from) make it very difficult for them to know exactly how to go about achieving 'landscape restoration' in practice. The following section draws together some of the key findings from the project workshops and desktop studies under four themes. These themes have been used as the basis for the development of recommendations for a second phase of this project.

Planning and goal setting/ implementation/data management

- In discussions with workshop participants and others it was clear that landscape restoration projects with a general vision and ill-defined goals were unlikely to succeed. These projects were characterised by a desire to achieve 'landscape restoration', but little clarity about which theory, approach or process was going to be used, what outcomes were desired or how success could be identified and measured. This tended to result in many different landscape restoration principles being applied, but with on-ground results limited in their contribution to biodiversity outcomes or the recovery of landscapes that have been degraded or damaged. This was frustrating for all those involved in the project, and reflects the lack of easy-to-access 'logic' about which landscape restoration approach might be best suited to which type of project, landscape, or restoration goal.
- It was apparent from the workshop discussions that in some situations, restoration project participants were so wedded to a particular landscape restoration approach (for example, the importance of creating corridors and using local provenance species for revegetation), that they rejected the science questioning whether these approaches were the 'best' in terms of achieving the greatest native vegetation and biodiversity impact for the resources available. This reflects the lack of easy-to-understand information and education about landscape restoration theory and practice. It also shows how difficult it is to counter commonly held beliefs or particular paradigms that people may have been exposed to, and has implications for the type of awareness and communication strategies that are used to educate people sensitively.

- Following on from the previous point, the research team concluded that two things are needed urgently to help lift the practice of landscape restoration in Australia: (1) a checklist of steps that all restoration projects need to follow (similar to that produced by LWA for river restoration projects and based on adult learning principles); and (2) a synthesis available at a well-publicised web location of current principles and knowledge about landscape restoration relevant to Australia. Ideally this would include case studies of past and present restoration projects with links to more-detailed and regionally-relevant materials.
- Of the information that is available, mapped data and mapping techniques were highly valued by all participants. This is an area that would benefit from further investment, as people found maps easy to interpret and apply to their local area. However, there is a great deal of variation in the quality, resolution and presentation of the maps that are currently available.
- A related issue is that people wanted to know what data is available for a particular area, its scale and resolution, reliability, and whether different data layers could be added. People wanted to know whether available data is likely to help in setting priorities or deciding the crucial aspects needed for landscape restoration. A set of metadata listing what is available and its characteristics would be useful.
- There are a growing number of large-scale 'bio-link' projects being funded (Alps to Atherton, Kosciusko to Coast, Gondwana Link etc.) on the basis that they are more likely to achieve landscape-scale change and to conserve biodiversity over the long-term, than other smaller scale projects. However, there is limited science to support investment in these projects, and it is felt that this is a research gap that should be addressed given the emphasis and scale of investment being placed in this type of restoration project. The types of governance arrangements that best support these projects also merits investigation. In terms of gaining community support, these large-scale projects raise awareness and seem to capture the imagination, as people like the feeling that they are contributing to something 'big'.
- Not surprisingly (perhaps), people at the workshops tended to use the science that was undertaken by scientists/research organisations they interacted with. For example, the conservation planning work of Pressey and others was used more in New South Wales because that is where the researchers have been based. It makes sense to some extent to use local science, as it should have greater relevance to your region — but not to the extent of excluding other information that may be relevant. Principles uncovered elsewhere may well have application locally. A few people gave the feeling that they 'knew it all already', which can be a dangerous assumption given that this area of research is generating new knowledge all the time.
- Given the extent to which the Conservation Action Planning process developed by The Nature Conservancy is now being applied to Australian landscapes, it would be useful to examine the ways in which science is being used to underpin its application in various large-scale projects, and to compare its advantages and disadvantages with other approaches being taken by various government agencies in different states.
- The Conservation Action Planning process provides a robust, nationally and internationally relevant framework within which regional groups or others can better plan landscape restoration work. However, as the planning framework is essentially a 'shell', its value to landscape restoration lies primarily in the ways in which it is used and the quality of data entered. Where the Conservation Action Planning tool is populated with sound science, backed up by local knowledge and ground-truthing, it has the potential to be a powerful tool encouraging monitoring and evaluation, and adaptive management of landscape restoration. Greening Australia has recently taken a strategic decision to move towards transforming landscapes rather than simply maintaining its past focus on engaging with others to do local on-ground works. The organisation is using the Conservation Action Planning approach in implementing this shift.

With this comes a significant investment of staff time in bringing more science directly into the work of the organisation. Given that much of Greening Australia's credibility rests with its proven track record of on-ground works and engagement of others, the organisation faces a challenge in maintaining that strength, while also potentially playing an important role in ensuring the bringing together of good science and local knowledge to ensure that landscape-scale projects are strategic in their work.

- Overall, participants stated that they needed more mechanisms for blending science and opportunism in landscape restoration. This 'blending' needed to be done so that information was regionally relevant and able to be applied in 'real life' situations. Planning restoration projects that meet several objectives is becoming a priority, and techniques that can assist this, such as multi-criteria and Bayesian analysis and adaptive environmental management, could be further developed and people trained in their use.

Collaborations and partnerships

- In all the workshop discussions and consultations with people across Australia, the consistent message was that investment needs to be made in understanding the socio-economic influences on landscape restoration outcomes. Despite the wealth of knowledge that has been generated through programs such as the Cooperative Venture for Capacity Building and LWA's Social and Institutional Program, little of this information has been translated and applied in 'real life' situations. Workshop participants did not know how to access socio-economic information, and wanted to have it distilled, synthesised and applied at their local level, so that they could use it in their day-to-day NRM activities.

- There appears to be a major gap between people working on private land and those working on public land. Very few of the workshop discussions were about public land management, yet it is often the national parks and reserves that form the core component of biodiversity conservation. Although National Parks and other areas formally reserved for nature conservation form critical links in the large-scale connectivity projects such as Gondwana Link and Alps to Atherton, there appears to be little value being placed in ensuring organisations interact and exchange information about what is being undertaken in public and private landscape restoration projects. This goes against the reality that whether public or private, the land, native vegetation and biodiversity need to be managed as interacting units, and not in isolation.
- Industries in each region have an influence on the nature of landscape restoration. Examples include the plantation industry in south west Western Australia, and the mining and grazing industries in central Queensland. Being aware of these relationships is important when planning landscape restoration efforts. One industry that could potentially affect landscape restoration activities in all regions in the future is the carbon trading market. There is an increasing focus on 'bio-diverse carbon' which, if it works, could bring fairly large sums of money into restoration (both in terms of condition and extent of native vegetation). This means that the nature and scale of landscape-scale restoration could be quite different in the future.
- The atmosphere at the workshops, and the interviews undertaken for the desktop reviews, revealed a lack of collegiality between some of the organisations working in landscape restoration in each state and territory. Victoria was the 'best' in terms of people interacting freely with each other, which may have something to do with the size of the state and the time they have been working on landscape restoration. The research team felt that the more competitive nature of the 'Caring for our Country' Program could add further to the degree of unease felt between some organisations at these workshops. Depending on how it is rolled out, 'Caring for our Country' has the potential to discourage partnerships rather than foster them.

- Frustration with funding cycles that are unrealistic for the building of partnerships or for achieving landscape restoration outcomes, combined with the lack of continuity between programs and other negative aspects of government policy and programs, is leading some organisations involved in landscape restoration activities to disengage with central and state governments. Instead, other sources of support are being sought, whether from philanthropic organisations, the corporate sector or elsewhere. While this may have short-term benefits to the public purse, it will exacerbate an already growing disconnect between strategic on-ground action and the policy and program environment in which people operate.
- Another issue to emerge is that under the new 'Caring for our Country' arrangements the role of some regional organisations is likely to be diminished. There is no indication yet that regional groups will be asked by the new government to implement their regional strategies and targets, which means that funding could slow down considerably in that area. Non-government and private sector organisations will be taking an increasingly major role in landscape scale activities, and this means that LWA and other groups may need to start forging new partnerships with organisations they have not traditionally worked with.
- Effective collaboration and partnerships are the only way some of the really big scale landscape restoration projects are going to succeed. This means a range of government agencies, non-government organisations, private land managers etc. working together over the long term. During this project, the research team noted different levels of collaboration at the various workshops and, in some cases, an uneasiness between government and non-government organisations — at least at the official level. Given that these partnerships are so important, more attention needs to be paid to investing in group dynamics, running effective projects and ensuring roles and responsibilities of all organisations involved are clearly articulated. This is especially the case when groups are starting to look for major contributions from industry and philanthropic groups to support landscape scale restoration.

Monitoring and evaluation

- Monitoring and evaluation are essential components to consider and incorporate at the planning stage of landscape restoration projects, both to justify past and future investment and to demonstrate to the wider community the value of the work. Without monitoring programs in place, it is not possible to systematically quantify the impact of landscape restoration projects on biodiversity outcomes. The degree of monitoring and evaluation in place in projects that are planned or underway varied considerably. Examples of programs where monitoring has been used successfully as part of an adaptive management framework should help other groups incorporate into their programs.
- Workshop participants and some of those interviewed for the desktop reviews placed emphasis on the mismatch between a need for longer-term monitoring and evaluation both to guide adaptive management approaches to landscape restoration and to sustain on-ground practice, and the short time cycles associated with government funded NRM programs. This mismatch makes it very difficult to achieve and to evaluate long term landscape restoration goals.
- The importance of scale was an issue raised at all the workshops. While landscape restoration projects tend to be planned at a scale of several square kilometres and above, the implementation of these projects occurs at the site scale. How best to identify the correct scale for the task at hand, as well as ways to work effectively across scales, are areas where practitioners require further assistance.



Photo Roger Charlton.

Landholder engagement and local knowledge

- In addition to drawing on science undertaken by institutions in a region/state, there was considerable emphasis placed by workshop participants on drawing out local knowledge held by NRM managers, practitioners and farmers. While this can sometimes be good and reliable information, in some cases it may not be accurate. For example, the researcher Hugh Possingham is concerned by the standard (low) of many people's knowledge in agencies and regional organisations, because they don't have the time to look at the recent international literature. He also believes that undergraduate degrees in Australia are too narrow, which affects the ability of staff to operate across disciplines. A solution put forward by Hugh to both issues, is a professional masters program in conservation science, as well as introducing a system like the engineering sector where all courses in a degree cover a minimum set of material (Hugh Possingham, personal communication).
- The focus most people at the workshops had was on private landholders, almost to the exclusion of any other players/land managers. This is interesting, as from the perspective of achieving landscape restoration outcomes, more attention and thought needs to go into the capabilities, skills and needs of the people working with landholders — the intermediaries. This was not something any of the participants picked up on, and confirms the research team's view that people working in this area tend to focus on the end-users, but not on whether they themselves have the skills to communicate effectively and achieve the outcomes they are seeking to implement. Public land managers are also important players in achieving landscape scale outcomes, however their role in landscape restoration was barely touched on.
- The importance/use of local knowledge is an issue that was raised at several of the workshops. An area where limited work has been done is in the recognition of indigenous knowledge. This issue was strongly supported in south west Western Australia and central Queensland, and was also mentioned by interviewees in the Northern Territory study.



Recommendations

1. Invest in the development of an 'information hub' on landscape restoration. The 'hub' could be hosted on existing sites such as the LWA Native Vegetation and Biodiversity R&D Program or Greening Australia's Vegetation Exchange website. Alternatively, a new site could be established. The information hub will:

- provide a source of good quality, peer-reviewed scientific information collated to emphasise guiding principles and to identify which are likely to be most applicable to particular landscapes and restoration goals;
- synthesise scientific and case study material into a series of fact sheets, guidelines and manuals that address topics identified by end-users;
- provide access to case studies where particular landscape restoration approaches have been applied, and to the landscape restoration reports and other materials produced by other organisations;
- host a community-of-practice on different landscape restoration topics and encourage people to work together and share experiences. An early task would be to develop a checklist of steps that all restoration projects need to include that is based on adult learning principles (similar to that produced by LWA for river restoration projects), and to consider methods for achieving several objectives within one restoration project;

- tailor existing information about landscape restoration for different bio-regions so that people can learn from the work that has been done, and have it link directly to their local environment.
- provide access to an oral history series in which the knowledge and experience of key individuals involved in the development of large-scale landscape restoration projects in differing parts of Australia, capture and showcase their experiences;
- feature local champions and advocates working in 'landscape restoration' so that experiences and approaches can be shared with others;
- host the proposed landscape restoration and science communication 'webinars' and 'lectopia' information sessions (see following recommendations);
- host 'talking to an expert' on-line advice where people can write in with requests for assistance;
- link to organisations undertaking landscape restoration projects;
- manage the landscape restoration project database (see following recommendation); and,
- provide a dynamic, interactive 'hub' that people can turn to when they need assistance, support and motivation to continue the work they are doing in landscape restoration.

2. Develop a framework for integrating the various principles and approaches of landscape restoration, and provide a logic for people to be able to work out which approach is best suited to the work they are doing. Case studies showing how the logic has been applied are required to 'bring it to life'. This will be a key part of the 'information hub' described in Recommendation 1.

3. **Invest in the development of a distance education Landscape Restoration course** (modelled on the River Restoration and Management Course run by Charles Sturt University and funded by the National Rivers Consortium). Distance education enables people to do the bulk of their work at home or in the office, with the residential schools consolidating theory and practice. The residential schools also give people the opportunity to share experiences and build connections with other people working in the area.
4. **Invest in the development of a practical, science communication course** for graduates and people working in academic institutions so that they can learn how to make their science relevant to people working 'on-the-ground'. It is likely that the basis for such a course exists already, for example at the Australian National University, but may not be in a distance education format.
5. **Establish a national database of landscape restoration projects** that will enable people to look at what has been done, see what is underway and make connections to integrate work, rather than operating in isolation. This would use basic information about landscape type and project objectives to enable users to quickly identify projects of interest/relevance to them, and to then use the contact details provided to seek further information about those.
6. **Work with scientists, science communicators and education experts to develop an on-line series of 'information sessions'** using 'webinars' (on-line seminars) and 'lectopia' (lectures on-line with follow up tutorials with the teacher) to cover key topics in landscape restoration. As with all applications of these new approaches to information-sharing, presenters will require some initial training to ensure their sessions are dynamic and engaging in ways that are less critical in face-to-face sessions. This enables people to get access to the science and the scientists, but on-line. This could then be supported by regional workshops and 'train the trainer' courses so that capacity can be built in the regions. The content of these sessions could also cover building effective partnerships, understanding group dynamics, and working together to achieve common goals.
7. **Develop material designed specifically for a policy audience** that clearly articulates the need for a shift in the philosophy of funding programs so that longer-term landscape restoration projects can be undertaken, and relationships built within local communities.
8. **'Mine' the LWA Social and Institutional Research Program and Cooperative Venture for Capacity Building material**, and tailor it for people working in the conservation of native vegetation and biodiversity. Many reports have been written on social engagement and, rather than investing in new research, assess what has already been done and work out ways to make it relevant and accessible for people working in landscape restoration.
9. **Co-invest in projects being undertaken by the Tropical Rivers and Coastal Knowledge Initiative** to tailor findings about how best to engage with and include indigenous knowledge in research and communication outputs. Consider concepts such as the 'quadruple bottom line' with a fourth goal, indigenous wellbeing, to augment the traditional three goals of social, economic and environmental capital.
10. **Develop terms of reference and selection criteria for a Landscape Restoration Prospectus of R&D projects** to address science gaps identified through the workshops and interviews. This prospectus could then be distributed to all those organisations and individuals who participated in the workshops and interviews for this project. Priorities include: methods for long-term monitoring and evaluation, especially of large-scale projects, and greater understanding of the socio-economic factors affecting restoration projects. Overarching the R&D prospectus is the need to develop, accommodate, encourage and facilitate a research cycle that enables the bringing together of different forms of knowledge (scientific/technical, experiential and individual) from the project concept stage through to completion. Projects that bring together researchers and practitioners to share knowledge and work collaboratively should also be encouraged.

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Some URLs of interest

The focus here has been on sites that take you to a broad range of projects and resources.

<http://www.greeningaustralia.org.au/resources/index.html> — this will take you to Greening Australia's Exchange resource website, which includes the link to the Native Vegetation Resource Directories (which are national in scope), amongst other things.

<http://www.ser.org/> — the website of the Society for Ecological Restoration International. This includes a link to the Global Restoration Network, for which an Australian section is currently being developed.

<http://www.aeda.edu.au/> — this URL links to the Applied Environmental Decision Analysis (AEDA) research hub, funded through the Commonwealth Environment Research Facilities programme. AEDA is planning to produce a series of information sheets summarising their research as it comes to fruition.

<http://www.lwa.gov.au/> — the URL for LWA where you can gain access to all copies of *Thinking Bush*, as well as reports and fact sheets on the wide range of research across Australia. In particular, see:

- the products from the Native Vegetation and Biodiversity R&D Program of LWA and the Native Vegetation and Biodiversity Sub-program of Land, Water & Wool; and
- the products from the Riparian Lands R&D Program of LWA and the River and Water Quality Sub-program of Land, Water & Wool.

<http://www.nrmtoolbar.net.au/> — the NRM Toolbar is a set of on-line tools and databases that make it easier for NRM professionals to find and share information.

<http://www.betterbush.org.au/> — takes you to the Better Knowledge Better Bush website, which is providing the science to underpin landscape restoration initiatives in NSW (with relevance to other states in south-eastern Australia) and address gaps in our understanding of native vegetation and its management in agricultural landscapes.

<http://savanna.cdu.edu.au/> — the website for the Tropical Savannas CRC, which has a wealth of information on research undertaken across northern Australia.



Photo courtesy of Greening Australia Capital Region.



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For more information on the program, see <http://www.lwa.gov.au/nativevegetation>

The report can be accessed from <http://products.lwa.gov.au/>

