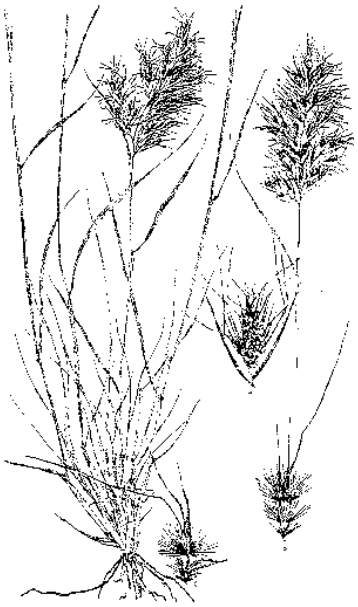
DRAFT

Restoring and Rehabilitating

Whole Native Plant Communities

Workshop



Savannah Room - Western Plains Zoo
Dubbo
5th May 1999

NSW Agriculture

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1.0 Summary

A workshop was held to discuss the possibility of developing a framework for a major native species project focusing on Central and Far Western New South Wales. It was anticipated that this would be a coordinated research and operational based effort within this area in which land users, agency and university staff could begin to approach issues associated with the restoration of entire native plant communities. Central to this idea would be an examination of revegetation processes that would be tailored towards maintaining or encouraging compatible land uses. Thus these plant communities would have a 'restored function' allowing constituent species to persist and regenerate whilst, where appropriate, allowing economic landuse.

Twenty seven participants agreed to set up a management committee consisting of:

Garry Allen (Greening Australia)

Doug Beckers (NPWS)

Ian Cole (DLWC) - ***Co-Convenor***

Darryl Green (DLWC)

Ron Hacker (NSW Agric.)

Charles Huxtable (DLWC)

Cathy Waters(NSW Agric.) - ***Co-convenor***

This committee will have a number of initial functions:

- To develop a proposal for both the Central, and Western and Lower Murray-Darling Far West Catchment Management Committees, NSW Agriculture, Department of Land and Waters Conservation, National Parkes and Wildlife service and Greening Australia which will identify strategies to address major issues prioritised in the workshop, provide information identifying broad research issues and specific projects of high priority which will fill gaps in existing knowledge, as well as recommendations for on-ground implementation of restoration programs.

- To develop an action plan to implement the strategies identified above.

- To develop and co-ordinate teams to write specific funding proposals to secure funding from state and federal organisations before the end of 1999.

- Be responsible for recommending the structure of a future management committee which will oversee the co-ordination of these initiatives.

Such an approach was to have a number of advantages. Firstly, an integrated effort would ensure both a long-term commitment to ecological studies as well as more efficient use of existing expertise scattered between various universities and government agencies. Information from this co-ordinated effort would also provide on-going assistance to Catchment Management Committee's, and assist in developing regional vegetation management plans under the Native Vegetation and Conservation Act.

2.0 Workshop Outcomes

2.1 Establishment of revegetation priorities

The areas where this initiative is to focus include the central and far western areas of New South Wales and the north west slopes and plains. Issues of biodiversity and conservation will be of importance in the eastern areas, for the western areas, revegetation programmes will largely centre on expansive pastoral areas. Priority landuses within these areas that require treatment include:

(i) Pastoral areas

(ii) Conservation/preservation of wildlife habitat

(iii) Major disturbances (roadsides, mining industry)

(iv) Beatification

2.2 Identification of key issues

2.2.1 Resource value

The economic value of restoration of plant community function is an issue which has been left unaddressed within the Australian conservation arena. Production and environmental economics are tied together as the maintenance of biodiversity and its relationship to ecosystem function will determine the long-term sustainability of any landscape use. The lack of bio-physical data prohibits economic modelling of the consequences of not undertaking restoration programs and therefore should be seen as a priority area of work to enable a definition of the resource value of native vegetation.

The establishment of links between production and environmental economics would also provide the basis for structuring the sharing of costs associated with revegetation programs.

Issue 1

Economic benefits of restoration/rehabilitation of native ecosystems

Project opportunities: A preliminary approach to economists should be made to determine the current situation (activities and initiatives) within this area of "bio-economics", local expertise within this field as well as types of biophysical data that need collecting to better enable the consequences of undertaking/not undertaking revegetation programs to be understood.

2.2.2 Ecological studies:

Native plant restoration ecology, or the repair of damaged native ecosystems is an area that remains untouched within Australia despite increasing enthusiasm from land managers (Mortlock, 1999, Waters and Monsen 1999; Marschke 1996; Silcock and Johnston 1993) and a legislative requirement to preserve native plant communities (Native Vegetation and Conservation Act, 1997). Currently the lack of information on fundamental aspects of restoring original plant communities or revegetating strategies that attempt to create self-perpetuating native ecosystems means that any revegetation programs are based on, at best, guesswork.

Issue 2

Choosing appropriate restoration endpoint's

Project opportunities: Choosing an appropriate restoration endpoint will be linked to the restoration goals. Do we need to consider using reference or comparison sites to assess restoration success ? What we use as measures for an endpoint (e.g. presence/absence of a species vs. absolute abundances) may determine the evaluation of restoration success. Ecological stability does not necessarily imply the system is static, so how then do we decide to measure restoration success? What are some of the tools needed for assessing biological variability (biodiversity) on restored site ?(Palmer *et al.* 1997). Guidelines for establishing rehabilitation objectives also need to be developed. For example, in rangeland areas a full restoration program may be required, in cropping areas, the restoration required may only be partial whereas grazing areas may need some 'emergency repairs' to the ecosystem.

Issue 3

Biodiversity and restoration ecology

Project opportunities: Biological diversity is central to any plant community ecology studies. In order for a restoration program to be cost effective it is important to determine the minimum numbers and types of species required to restore plant community function. Do we need to consider enhancing diversity , restoring functional groups or combinations of species, or is the re-introduction of a particular species all that is required ?

Issue 4

Species distribution and scale of variation

Project opportunities: For most of our native species any revegetation program will involve sourcing seed from wild stands. This will raise concerns for the genetic purity of seed lots. Genetic purity is associated with a growing interest in knowing the provenance of germplasm, based on the assumption that local seed is better adapted to local conditions than non provenance seed. A recognition of morphological variation and the distribution patterns for a given species along with an understanding of its breeding system will give some information as to the potential impact of using or not using seed sourced locally (Coates and van Leueen 1996). Guidelines for both the delineation of provenance as well as the situations in which provenance may bee to be applied need to be developed.

Issue 5

Restoration and natural disturbance regimes

Project opportunities: How do fire, flood and grazing enhance biodiversity, or impact on a restored plant community? Consideration of both temporal and spatial aspects of disturbance will be important as will an understanding of the level of manipulation required to mimic natural disturbance regimes.

Issue 6

The role of succession and dispersion in restoration

Project opportunities: Do we really need to accelerate the natural successional process or can we rely on *in situ* succession to operate efficiently ? If succession theory allows one to be able to predict the path of restoration then it may be a powerful tool for revegetation programs e.g. the timing of seeding programs to control the rates of restoration. We do not have a good understanding of the roles that colonising sources, rates of movement and the sequences of species introductions play in restoration success.

2.2.3 Seed production:

Despite the recent release of a number native grass cultivars, no commercial quantities of seed are as yet available as the industry struggles with problems of commercial seed production and processing of seed and debris (Loch *et al.* 1996). For native grasses and tree species seed is primarily sourced through opportunistic harvesting of seed from wild stands (Mortlock 1999; Waters *et al.* 1997; Loch and Whalley 1997). Whilst sourcing seed from wild stands has a number of advantages (being able to collect a broad range of species necessary for revegetation of entire plant communities as well as offering the potential to collect seed of local origin), seed supply is inconsistent due to it's seasonal nature and seed lots are of varying quality (Waters 1999). We have little understanding of the management of wild stands for seed production or under which climatic conditions viable seed is set. There are also no clear guidelines for the harvesting of seed material from areas in a manner which does not adversely affect local plant populations.

Issue 7

Management of wild and sown stands for seed production

Project opportunities: For some native species traditional management strategies could be employed to optimise seed collection from either wild or sown sites. Responses to fertilising, strategic weed control and irrigation, burning and grazing can assist in the manipulation of seed yields and should be determined for key species.

The development of a "quick form" test would assist in determining the timing of harvest. This test would involve a physical assessment of the proportion of mature seed and consideration of past local seasonal conditions to determine the most appropriate time to harvest. Again this could be determined for key species which are of importance regionally or locally.

Issue 8

Strategic approach to harvesting seed

Project opportunities: A regional strategic approach to harvesting native seed would provide a means of alleviating some of the seed supply problems. For example, on a regional or locality basis, areas potentially useful as a future seeds source could be located for future use. This may involve the use of Rural Lands Protection Board areas, roadside areas or areas on privately owned land. The use of geographical analysis (Jones 1997) could also be employed in the identification of these areas. The identification of high-priority collection areas using these techniques could also assist in choosing the most preferred plant material for re-seeding programs in terms of using material that is best adapted to a restoration site.

Seed of native species needs to be considered as a scare resource and damage to existing remnant populations avoided. Currently, native seeds are viewed as a free resource for the collection and its collection is benign. Protocols for the collection of native seed need to be determined and implemented through the Native Vegetation and Conservation Act (1997). Rights to seed collection, whether bushland reserves or National Parks could be best restricted to one or several license holders. On private land a royalty could be paid to the landholder providing an incentive to maintain the resource.

Seed harvesting opportunities tend to be unpredictable and therefore difficult to manage. The development of a mechanism for determining windows of opportunity for harvesting wild stands would assist in increasing the likelihood of successfully harvesting seed. The provision of dedicated staff and machinery for harvesting would also ensure that these opportunities are not missed. This would need to be incorporated into a strategic plan for seed collection.

Issue 9

Seed quality and storage

Most of the observed establishment problems with native species, begins with inadequate knowledge of germinable seed. The number of germinable seeds per kilogram of seed material should be the minium criteria from which sowing rates are determined. There is often a high proportion of chaffy material in seed lots (in particular, native grass seeds) which, for some situations, will need to be separated from the seed. Processing and collection techniques to minimise this material need to be determined. Seed dormancy is another problem with native species. Pre-treatment of seeds, sowing in a season best suited to the biology of the species and the sowing procedures need to take into account dormancy mechanisms. Kings Park (Western Australia) and University of Queensland (Australian Centre for Mining Environmental Research) are actively and intensively involved in these areas of research Any project within New South Wales should therefore be linked to this existing research.

2.2.4 Seeding and planting technology:

Issue 10

Optimal conditions for seed placement

Project opportunities: Seeding technologies need to be developed which create optimal conditions for germination and establishment. These technologies need to be low cost so that the low input value of native species is maintained. Technologies should also, ideally, involve the use of minimum disturbance.

3.0 List of Participants

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4.0 References

Coates, D.J. and van Leeuween, S.J. (1996). Delineating seed provenance areas for revegetation from patterns of genetic variation. Proceedings of the second Australian workshop on Native Seed Biology for revegetation. Eds. S.M. Bellairs and J.M. Osborne, Newcastle, 11-12 October 1996. Australian Centre for Minesite Rehabilitation Research.

Jones, T.A. (1997). Genetic consideration for native plant material. Proceedings: Using Seeds of Native Species on Rangelands. Society for Range Management 50th Annual Meeting Rapid City, South Dakota, Feburary 16-21.: 22-25.

Loch, D.S., Johnston, P.W., Jensen, T.A. and Harvey, G.L. (1996). Harvesting, processing, and marketing Australian native grass seeds. New Zealand Journal of Agricultural Research. 39, 591-599.

Marschke, G.W. (1996). The emerging importance of Australian native species on New South Wales coal mines. Proceedings of the second Australian workshop on Native Seed Biology for revegetation. Eds. S.M. Bellairs and J.M. Osborne, Newcastle, 11-12 October 1996. Australian Centre for Minesite Rehabilitation Research.

Mortlock, W. (1999). Native seed in Australia. A survey of collection, storage and distribution of native seed for revegetation and conservation purposes. A report to the FloraBank project. Canberra.

Native Vegetetaion Conservation Act (1997). New South Wales.

Palmer, M.A., Ambrose, R.F., and Poff, N.L. (1997). Ecological Theory and Community Restoration Ecology. Restoration Ecology. 5 (4). 291-300.

Silcock, R.G. and Johnston, P.W. (1993). Establishing new pastures in difficult environments - do we expect too much ? Tropical Grasslands, 27, 349-358.

Waters, C.M., Loch, D.S. and Johnston, P.W. (1997). The role of native grasses and legumes for land revegetation in central and eastern Australia with particular reference to low rainfall areas. Tropical Grasslands, 31, 304-310.