

The Southern Queensland Biodiversity Network presents:

Proceedings of the 2002 Southern Queensland Biodiversity Conference

Edmund Park Training and Leisure Centre 26-27 September 2002

Edited by Bruce Boyes and Chantelle Ducret

Publication data

Boyes B.R. & Ducret C.C. (eds) (2003). *Proceedings of the 2002 Southern Queensland Biodiversity Conference*. Southern Queensland Biodiversity Network, Gatton.

Published by the Southern Queensland Biodiversity Network, PO Box 408, Gatton, Q, 4343.

Printed and distributed with the generous assistance of Gatton Shire Council.

- © (proceedings) Bruce Boyes 2003.
- © (authored contributions) the author or authors stated in the heading of each paper.

Apart from any use as permitted under the Copyright Act 1968, no part of this publication may be reproduced by any process without written permission from Bruce Boyes, PO Box 408, Gatton, Q, 4343; or in the case of authored contributions, from the stated author or authors.

Disclaimer

The Southern Queensland Biodiversity Network, the editors of the publication and the contributors to this publication disclaim all liability for any error, loss or consequence which may arise from the use of this publication. Statements made in this publication do not necessarily reflect the policies of the Southern Queensland Biodiversity Network or any other organisation, group, association, government agency or individual.

Contents

Introduction	5
Biodiversity Planning	9
Keynote Presentation The Common Nature Conservation Classification System Peter Young, Senior Principal Biodiversity Planning Officer, Biodiversity Planning Branch, Queensland Environmental Protection Agency	
Regional Vegetation Management Planning in South East Queensland Paul Harris, Department of Natural Resources & Mines	17
EPA/QPWS Parks and Forests Planning Approach to Community Engagement and Implementation of the South East Queensland Forest Agreement Elizabeth King, Environmental Protection Agency	21
Empowering the Community Through Project Green Nest Rick Galbraith & David Manning, Crows Nest Shire Council	26
The National Action Plan for Salinity and Water Quality: Implications for Natural Resource Management Dan Murray, Griffith University Nathan Campus	30
Weeds: Our Second Greatest Threat to Biodiversity	33
Keynote Presentation Environmental Weeds - The Second Greatest Threat to Biodiversity Dr. John Swarbrick, President, Friends of Escarpment Parks, Toowoomba	34
Current Control Methods for Priority Environmental Weeds Trevor Armstrong and Tom Anderson, Alan Fletcher Research Station	39
Pest Management Plans - Working With the Community Rick Galbraith & Ray Weis, Crows Nest Shire Council	45
The Management of Lantana in the Helidon Hills Henk Hagedoorn, Helidon Hills Landcare Group	49
Management of Madeira Vine in Dwyer's Scrub Conservation Park Jim Kerr, Spinach Creek	51
A Time and Place for Everything Veronica Schilling, Gatton Shire Council	52

Conservation and Restoration Efforts	57
Keynote Presentation Measuring and Evaluating Restoration Success Dr. Grant Wardell-Johnson, Senior Lecturer, School of Natural and Rural Systems Management, The University Of Queensland Gatton Campus	58
Can Eucalypt Plantations Contribute to the Maintenance of Fauna Diversity on the Farm? Adrian Borsboom, Queensland Parks and Wildlife Service	63
Ecosystem Services Research for the Lockyer Valley Helen Ross, Richard Brown, Ockie Bosch and Hugh Possingham; The University of Queensland	75
Soil Biodiversity - The Base of the Pyramid of Life on Earth Mrs. V.D. Burnett, "Rathburnie Estate"	83
Recovery Actions for Endangered Species Corchorus cunninghamii Shannon Parr, Brisbane Forest Park	97
Adaptive Management of <i>Acacia perangusta</i> in Relation to Fire and Timber Harvesting <i>Jodi Rees, Queensland Parks and Wildlife Service.</i>	104
Environmental Defence Training Caroline Edwards, Department of Defence	111
An Approach for Maximising the Benefits of Glen Rock Regional Park: Adaptive Management Haig Allalemdjian, Heath Gibson, Bryan Grant, Nigel Kimball, Jonathan Powell, Travis Robinson and Amy White, The University of Queensland	116
People and Biodiversity	119
Keynote Presentation Communities and Participation in Biodiversity Recovery: Working From the Inside in to Inside out Dr. Ingrid Burkett, Lecturer, School of Social Work and Social Policy, The University Of Queensland	120
Community Participation - Lessons Learned in the Helidon Hills Graham Burkett, Helidon Hills	136
Quollity Challenges Michael Gregory, Queensland Parks And Wildlife Service	140
Risks or Threats to Biodiversity Russell Turkington, "Twin Hills View"	147

Appendix A - Overview of 2000 and 2001	4 = 4
Conference Proceedings	151
Overview of 2000 South-East Queensland Biodiversity Recovery Conference: Taking Biodiversity Conservation "From Vision to Reality"	152
Overview of 2000 Southern Queensland Biodiversity Recovery Conference: Biodiversity - the Big Picture	156
Appendix B - Conference Participants	161

Introduction

The 2002 Southern Queensland Biodiversity Conference & Skills Course

Bruce Boyes, Conference Convener, PO Box 408, Gatton, Q, 4343.

Biodiversity Conference

The 2002 Southern Queensland Biodiversity Conference, the 3rd annual, was an initiative of the Southern Queensland Biodiversity Network. The organisation of the conference was facilitated by a funding contribution from the Queensland Environmental Protection Agency, with additional funding and in-kind assistance provided by Gatton Shire Council, Laidley Shire Council and the Lockyer Catchment Association (LCA) Inc. The conference was held on 26-27 September 2002 at the Edmund Park Training and Leisure Centre, located south of Laidley in the Lockyer Valley.

Conference presentations centred on four primary themes:

- 1. Biodiversity Planning.
- 2. Weeds: Our Second Greatest Threat to Biodiversity.
- 3. Conservation and Restoration Efforts.
- 4. People and Biodiversity.

Biodiversity Skills Course

The conference was followed by a biodiversity skills course on 28-29 September 2002. The skills course program comprised eight workshops:

- 1. Introduction to biodiversity conservation, levels of biodiversity, rare and threatened species.
- 2. Understanding and using the Regional Ecosystem (RE) classification system.
- 3. A focus on flora conservation.
- 4. Networks, linkages and information sources.
- 5. A focus on fauna conservation.
- 6. Conservation mechanisms, processes and initiatives.
- 7. Managing fire for biodiversity conservation.
- 8. Managing grazing for biodiversity conservation.

The Southern Queensland Biodiversity Network

The Southern Queensland Biodiversity Network is an informal network that encourages and assists the conservation of the rich biological diversity of the South-East Queensland and Brigalow Belt South Bioregions through sharing knowledge, promoting understanding and fostering innovation. Our vision for biodiversity in Southern Queensland is...

By the year 2050, the whole community is working together to sustain biodiversity (and its contribution to our quality of life) by sharing knowledge, respect, commitment and responsibility.

The Network holds an annual conference in a different location each year, hosting the conference in partnership with organisations that are recognised biodiversity conservation leaders.

Conference location and venue

The 2002 Southern Queensland Biodiversity Conference was held at Edmund Park Training and Leisure Centre, a registered Land for Wildlife property located south of Laidley in the Lockyer Valley. Too many conferences are priced beyond the means of landholders and community group members. These people do not attend, and their important perspectives are left out of the decision-making. The use of the excellent low-cost facilities at Edmund Park Training and Leisure Centre meant that conference fees could be kept very low, and as a result the conference attracted a large number of landholders and community group members.

Conference proceedings

These conference proceedings provide a wealth of information that will be invaluable to anyone involved in any way in the conservation of Southern Queensland's highly significant biodiversity.

The conference papers represent the diversity of participants at the conference. Many of the writers have had no experience writing scientific papers, and many of the papers thus do not conform to accepted standards for scientific papers. However, no attempt has been made to sanitise the papers, and nor should it be, because biodiversity conservation success will only result from plans of action that embrace the diverse experiences of landholders, government bodies, scientists and community groups.

Overviews of the proceedings of the two previous conferences (2000 and 2001) can be found in Appendix A of these proceedings. Full copies of the 2000 and 2001 proceedings can be purchased from the Lockyer Catchment Centre, ph. 07 5465 4400.

Acknowledgements

The efforts of many people contributed to the success of the 2002 Southern Queensland Biodiversity Conference. The Southern Queensland Biodiversity Network would like to thank:

• The Queensland Environmental Protection Agency/Queensland Parks and Wildlife Service, Gatton Shire Council, Laidley Shire Council and the Lockyer Catchment Association (LCA) Inc. for facilitating the organisation of the conference. The Queensland Environmental Protection Agency/Queensland Parks and Wildlife Service provided a \$4,000 funding contribution; Gatton Shire Council provided a \$500 funding

contribution and the printing and distribution of these proceedings; Laidley Shire Council provided the printing and distribution of conference fliers; and the Lockyer Catchment Association provided the printing of conference booklets and office and administrative support.

- **Nigel Kimball** for his outstanding efforts in the role of Assistant Conference Coordinator.
- Graeme Burkett for his fantastic job coordinating the audiovisual equipment.
- Chantelle Ducret for assisting with the editing of these proceedings.
- **Dr. Jeremy Thompson** for his Special Guest Presentation.
- Keynote presenters **Peter Young, Dr. John Swarbrick, Dr. Grant Wardell-Johnson** and **Dr. Ingrid Burkett** for their excellent presentations.
- All of the conference presenters for a great range of perspectives on biodiversity conservation.
- Mike Gregory from the Queensland Parks and Wildlife Service, Greg Siepen from The University of Queensland, Geoff Anderssen from the Lockyer Catchment Association, and Nigel Kimball from the Southern Queensland Biodiversity Network for giving up their time to lead skills course workshops.
- John and Julie Woods and staff from Edmund Park Training and Leisure Centre
 for their well-managed conference venue and demonstrated commitment to biodiversity
 conservation.
- Vince Capone from Edmund Park Training and Leisure Centre for his outstanding catering.
- Gayle Drabsch, Geoff Anderssen and Patti Grant from the Lockyer Catchment Centre for staffing the check-in desk and running many errands.
- Heather Murray and Debbie Beitz from the Lockyer Catchment Centre for managing the conference finances and processing registrations.
- Matthew Gower and Chantelle Ducret for their outstanding efforts in assisting with car parking, moving furniture and equipment, and many other necessary jobs.
- The many willing volunteers who helped out by chairing conference sessions and moving furniture and equipment.
- Everyone who attended the conference for their enthusiasm, participation and commitment to the conservation of Southern Queensland's biodiversity.

Biodiversity Planning

Keynote Presentation

Peter Young, Senior Principal Biodiversity Planning Officer, Biodiversity Planning Branch, Queensland Environmental Protection Agency

The Common Nature Conservation Classification System

Peter Young, Senior Principal Biodiversity Planning Officer, Biodiversity Planning Branch, Environmental Protection Agency, PO Box 155, Albert Street Brisbane, Q, 4002.

Introduction

Biodiversity is a term that encompasses the full spectrum of variety in nature. In philosophical terms it has intrinsic values. It also helps to sustain our quality of life. This highly practical and tangible aspect of biodiversity tends to be taken for granted or not properly taken into account for a complex array of reasons one of which is access to, and availability of meaningful information. The term information is used here to describe data that has been subject to analysis and interpretation to meet a specific objective.

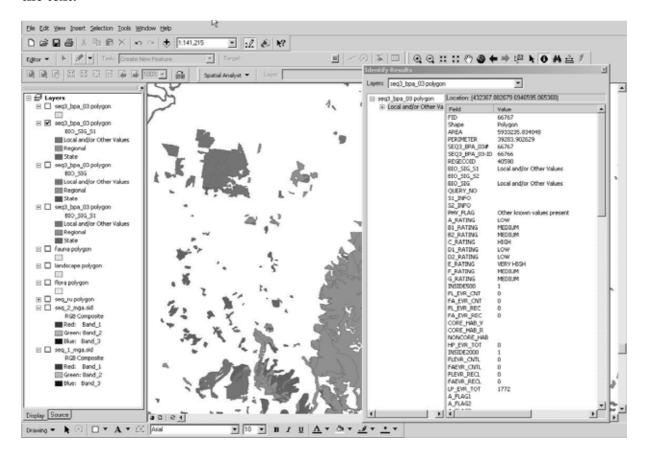
Information about biodiversity presents a challenge in an area the size of Queensland. This is because data are always in short supply, our understanding of how ecosystems function is incomplete and the relative value of biodiversity at any particular location has proved difficult to measure using approaches that meet with wide acceptance.

The Common Nature Conservation Classification System (CNCCS) (Chenoweth EPLA 2000) was developed as a tool to help overcome some of the issues associated with delivery of information. The Western Region Organisation of Councils (WESROC) that takes in the area inland of the Gold Coast - Noosa coastal strip and west to the Great Dividing Range had a key role in its development. It aims to present land managers and decision-makers with information about biodiversity, including its relative importance at any point, that is consistent and defensible. A major feature of the method that sets it apart from other methods that are available for assessing biodiversity is that it emphasises that biodiversity exists throughout the landscape. It has been designed to run using data that are readily available for

large areas but has the flexibility to incorporate more sophisticated data and to deal with smaller geographic areas.

In the foreseeable future it appears there will be a demand for public access to good quality biodiversity information. This is occurring as a consequence of the trend for natural resource management and planning (NRM) to be tackled at the local to regional scale through community government partnerships (eg Murray-Darling Basin Ministerial Council 2001). The CNCCS could play a key role in meeting some of the requirements for information in NRM.

Figure 1. An example of how information generated by the CNCCS can be presented and interrogated using computers. The mapped information in the centre of the screen is a small part of the information produced for Southeast Queensland. For reference it shows an area between Gatton State Forest, the large remnant at the top and the Little Liverpool Range, the large remnant on the far right hand side. The columns on the left contain a legend while the table on the right contains a summary of the relative importance of each of the values contained in one of the polygons shown on the map. Note that very small polygons representing remnants of 1-2 ha are included in the analysis which can lead to a "spotty-looking" map of significant areas, as discussed in the text.



Much of the work required to translate the draft paper-based version of the CNCCS into a working prototype that makes extensive use of the analysis and mapping tools available in a Geographic Information System occurred during the development of the draft Southeast Queensland Nature Conservation Strategy (EPA 2002 in prep.). An example of the mapped output of the CNCCS for an area close to the conference venue in the Laidley Creek Valley is

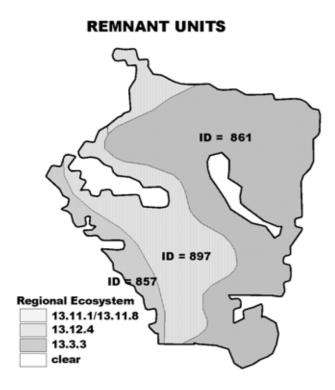
presented in Figure 1. It shows remnant vegetation in the selected area with each map unit being classified into one of three biodiversity significance classes based upon the features or values they contain. The box to the right of the mapped information contains a summary of the values present and their relative importance for one of the map units.

Now that the CNCCS has emerged from the prototype phase and is being applied by the EPA and some local governments within Southeast Queensland, a brief evaluation of the method is timely. It is based upon feedback and comments from a wide range of users and potential users.

The criteria

The CNCCS contains a standard set of criteria for describing and mapping biodiversity values and explicit rules for evaluating their relative significance. The individual areas that form the basis for assessment and mapping are polygons from the Queensland Herbarium Regional Ecosystem (RE) mapping and are known as remnant units (Figure 2). The criteria selected reflect contemporary thinking in biodiversity conservation. To paraphrase Peter Mackay of WESROC they can be very broadly summarised as either features which are scarce or that have become scarce and features that are of good quality.

Figure 2. An example of three remnant units within one tract. The tract corresponds to a continuous patch of remnant vegetation mapped by the Queensland Herbarium. It is surrounded by non-remnant vegetation which may be cleared country, regrowth or a mixture of both. A non-remnant area is also contained within the remnant (the long thin white area). According to the mapping, four Regional Ecosystems are present within the three remnant units. For example, the polygon with ID = 861 contains Regional Ecosystem 13.12.4; ID = 897 contains a mixture of 13.11.1 and 13.11.8; and ID = 857 contains 13.3.3.



The criteria include:

- Occurrences of endangered and of concern regional ecosystems.
- Verified point locations (with buffers of several hundred metres) of endangered, vulnerable and rare taxa. The method allows for refined levels of information, in particular the conversion of buffered points into Habitat Suitability Maps indicating the actual habitat of taxa based upon expert field knowledge or predictive modelling.
- Wetlands.
- Occurrences of REs that are rare in a subregion where rare is defined as less than 300 ha
 in extent (the subregions are those defined by the EPA in Sattler and Williams 1999) or
 have been depleted by clearing in a subregion or are poorly conserved in a sub-region
 (defined as <10 % pre-clearing extent in reserves). All terrestrial REs are included
 irrespective of status along with mangroves and coastal wetlands and, further inland,
 vegetation fringing watercourses and wetlands large enough to be mapped.
- The relative size of patches or tracts (Figure 2) in fragmented landscapes.
- Condition or integrity.
- The relative diversity of ecosystems.
- The extent to which the remnant unit borders or buffers waterways, wetlands and endangered REs.
- The extent to which a remnant unit is connected to other remnant vegetation.
- Areas with special flora and fauna values including taxa endemic to a region; wildlife refugia (including areas which will not be cleared because they have low land capability for agriculture); disjunct populations; geographic limits of taxa; high species richness; relictual populations; atypical or unusual species composition arising from factors such as geological variation; artificial waterbodies that have significant functions for species; high density of hollow-bearing trees; breeding or roosting sites used by a significant number of individuals.
- Corridors and links between tracts, and stepping-stones.
- Areas that are important in terms of landscape function and health including patches of regrowth.

Rating each value and assessing the overall significance of a remnant unit

Each value present in a remnant unit is given a relative rating of low, medium, high or very high. A technical reference group established for the CNCCS developed the rules for assessing the rating of each criteria as well as rules for determining an overall relative significance for each remnant unit. The overall levels of significance include:

- State = very high.
- Regional = high.
- Local = medium.
- Not thresholded = low.

They are based upon the combination of values present and their ratings. The individual criteria are assessed by automated analysis using a computer and expert and local knowledge.

Data, data integration and mapping

The data sources used or referred to in the CNCCS include regional ecosystem mapping, fauna and flora data from formal databases, wetland mapping (where available), digital topographic and geology maps and local and expert knowledge.

Data integration and presentation is carried out using a Geographic Information System (GIS). Mapped outputs include overall significance and the individual values. Maps are supported by tables that allow users to determine all of the values present within any specified area.

Road test

The features of the CNCCS that have met with wide acclaim include:

- Fills a void in the demand for this type of information.
- Emphasis on continuous nature of biodiversity rather than just "hotspots".
- Standard set of criteria presented and used.
- Use of local and expert knowledge.
- Facility to produce maps quickly.
- Can burrow down to look at each value as well as the overall significance of any area.
- Isn't confined to the broader regional scale but can be adapted to smaller areas such as a shire, provided that the broader scale information that helps to define an overall context is available.

The aspects of the CNCCS that have drawn queries, and a suggested response to each include:

1. What do state and regional significance imply?

By indicating areas of state, regional significance and local significance, the CNCCS is flagging areas considered to represent a priority for maintaining biodiversity in the context of bioregions, subregions and at the local scale.

2. The rules for assigning level of significance are arbitrary.

The use of any approach that goes beyond description to assigning a level of overall importance or significance, of necessity, has to make value judgements which in the case of the CNCCS were developed by a reference group over a considerable period of time.

3. The maps are "spotty-looking" in places and how can this be useful for conserving biodiversity (refer to Figure 1 for more information)?

Some computer-based biodiversity assessment methods especially ones used for identifying areas suitable for conservation reserves contain a step in which clustering of areas into larger blocks of country occurs. However, the CNCCS is not just looking for hotspots or large areas as it is attempting to reflect the way biodiversity values are currently distributed across the landscape.

There are several ways of approaching the consideration of isolated patches that are identified by the CNCCS as significant - areas that are isolated and found to be in poor condition may not represent a realistic proposition for conservation in the future; conversely, there may be opportunities for maintaining and enhancing some small isolated remnants that are significant through restoration activities.

4. Variation in size of the remnant unit.

The remnant units are based upon Herbarium maps and individual polygons vary considerably in size. However, the main issue in considering biodiversity features is whether the polygon is mixed in terms of the ecological communities it contains ("heterogeneous polygons") rather than size. The mapping for Southeast Queensland is gradually being upgraded in conjunction with local governments. In time heterogeneous polygons will be upgraded and ultimately each remnant unit will describe relatively uniform patches of country.

5. Quality of information and scale.

It is acknowledged that scale will always limit any assessment that integrates information across relatively large areas. However, base information compiled at 1: 50 000 or greater is being incorporated for coastal parts of Southeast Queensland and local and expert knowledge provide additional information that can be highly detailed. Some local governments in Southeast Queensland are building upon the regional scale assessment and using the CNCCS to provide information suited to detailed on-ground planning.

6. What about the parts of the map that are mapped as non-remnant vegetation.

Areas that are not mapped as remnant vegetation by the Queensland Herbarium can be incorporated into the CNCCS if relevant information is available. Examples are good quality regrowth of a priority ecosystem or disturbed habitat containing EVR taxa, especially ecological communities such as thinned grassy woodlands.

7. More values should be included in the CNCCS.

Some of the criteria in the CNCCS have not been fully addressed to date due mainly to the lack of comprehensive data. There have also been recommendations for including other values especially some that fall within a broader definition of "nature conservation" rather than biodiversity.

The CNCCS includes landscape function as a criterion which can incorporate:

- Wetlands and riparian areas and buffers.
- Areas with a high susceptibility to land degradation.
- Areas important for unchannelled overland flows.
- Areas important for the management of water tables (recharge/discharge).
- Areas with a high susceptibility to salinity.
- Corridors.

Some of these arguably relate more to other aspects of NRM than to biodiversity and have not been addressed to any extent to date. However they could be incorporated through a cooperative approach with other NRM data providers.

Concepts such as wilderness, scenic amenity or other mappable landscape elements such as soils and geological features have not been explicitly addressed in the work that has been completed. There are no immediate plans to incorporate any of these values.

Summing up

The CNCCS represents major progress in presenting information about biodiversity across large areas. Once output is available for a region or subregion it can also be used to assess smaller areas such as a shire. It works successfully on a limited number of data sets but can incorporate more sophisticated levels of information. It does not pre-suppose any changes in land use or land management and as such would appear to be ideally suited to feeding information into any planning where information about biodiversity is a basic requirement.

References

Chenoweth EPLA (2000). Common Nature Classification System, Version 99709, December 2000. Chenoweth EPLA and the Western Subregional Organisation of Councils (WESROC), Brisbane.

Environmental Protection Agency (2002) (in prep). *Regional Nature Conservation Strategy for South East Queensland 2001 - 2006.* Report prepared by the Regional Nature Conservation Strategy Advisory Group. Environmental Protection Agency, Brisbane.

Murray-Darling Basin Ministerial Council (2001). *Integrated Catchment Management in the Murray-Darling Basin 2001-2010: Delivering a sustainable future.* Murray-Darling Basin Commission, Canberra.

Sattler, P. S. & Williams, R. D. (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency and National Parks Association of Queensland Inc., Brisbane.

Regional Vegetation Management Planning in South East Queensland

Paul Harris, Regional Coordinator Vegetation Management, Department of Natural Resources & Mines, PO Box 573, Nambour, Q, 4560.

Regional vegetation management planning in South East Queensland

- Boring stuff.
- Some more boring stuff.
- Some green stuff.
- Some blue-sky stuff?
- No time for Questions...?

Role of Regional Vegetation Management Committees

- Prepare advice and recommendations to the Minister.
- To draft a regional code for clearing.
- To link with existing planning.
- To be a mechanism for community involvement.

Purposes of the Vegetation Management Act 1999

To regulate clearing to:

- (a) preserve the following -
 - (1) remnant endangered regional ecosystems:
 - (2) vegetation in areas of high nature conservation value and areas vulnerable to land degradation; and
- (b) ensure that the clearing does not cause land degradation; and
- (c) maintain or increase biodiversity; and
- (d) maintain ecological processes; and
- (e) allow for ecologically sustainable land use.

Approach

- A committee of stakeholders and community representatives working as a team.
- Frank, open debate, agreement on, practical, commonsense approach on what the community is willing to bear...
- A balance for social, production and environment...economically sustainable conservation!!!
- Within the legislative boundaries.
- A plan the committee owns.

Membership of the Brisbane Valley Working Group

- Margo Canavan & Warren Drynan AgForce.
- Robert Smith and Simeon Lord Local Government.
- Mark Enright Timber.
- MaryLou Gittins Qld Dairy Organisation.
- Bruce Lord Landcare/Catchment Management.
- Ray Hawley Qld Fruit & Vegetable Growers.
- Royalin Denning Qld Timber Board.
- Des Boyland Wildlife Preservation Society.
- Bruce Boyes Toowoomba & Region Environment Council.
- Russell Turkington Community.
- John Murton Community.

Main topics

- Landscape and property outcomes.
- Regional tree clearing code wetlands, watercourses, clumps and corridors, erosion, salinity, acid sulphate soils, land capability, forestry/cultural heritage & amenity values on state land.

Main outcomes

- Recommendations for weeds, thinning, fire management, length of permits, urban land, fees etc...
- Targets for NRM.
- Priority areas for investment (eg salinity, nature conservation).
- Strategies for implementation.
- Recommendations for compensation/incentives/land stewardship support...etc.

Main gains for environment?

SIGNIFICANT GAINS ON THE STATE POLICY FOR...

- 30% retention of remnant vegetation = landscape cap on clearing.
- Protection of significant wetlands.
- Ensuring viable networks of wildlife habitat.
- Protection of watercourses.

But what if there's not much clearing going on in SEQ?

Priority areas for investment for nature conservation...

- Endangered REs.
- Priority regional REs.
- Areas of special biodiversity value.
- Largest tracts of vegetation.
- Most viable remnants.
- Areas with rare/threatened plants and animals.
- Regional & catchment wildlife corridors.
- Riparian vegetation.
- Coastal lowland vegetation.
- Increasing scale of \$ based on retention, active management and enhancement...

New positions for biodiversity...

- Recent presentation of mandatory controls for biodiversity/nature conservation.
- Not well received by rural sectors and landholders.
- My worry.
- Still undergoing *analysis*...

Not the silver bullet for sins of the past/present...other key concerns

- Property rights not addressed freehold tenure.
- Equity how to share the cost of protecting and managing the land for public good conservation.
- Compensation/incentives now & ongoing management.
- Greater certainty eg length of permits.
- Thickening/thinning.
- Biodiversity outcomes public good conservation duty of care and who pays?
- Consultation with the community.

- Accuracy of the mapping.
- 'Wrong answer' responses from Brisbane.

Progress & timelines

- Commenced May 2001.
- 1st initial draft Aug 2002.
- Aim present draft to Minister February 2003.
- Public advertising and consultation March May 2003.
- Present final draft to Minister June 2003.

EPA/QPWS Parks and Forests Planning Approach to Community Engagement and Implementation of the South East Queensland Forest Agreement

Elizabeth King, Assistant Manager (Terrestrial), Parks & Forest Planning, Environmental Protection Agency, PO Box 155, Albert Street Brisbane, Q, 4002.

Background

Queensland Parks and Forests comprise more than 10 million hectares widely distributed across the state, ranging from isolated areas of less than a hectare surrounded by urban development, to remote contiguous areas of more than a million hectares. Prior and current use are also widely variable, as are future pressures. As well as long term, highly focussed and influential community interests, the issues of access, management and use associated with local Parks and Forests are increasingly of key interest to wider and local community interests and often bear significant relationships to local community social and economic aspirations. Parks and Forests are also foci for Indigenous interests, including concerns and aspirations, and Native Title issues.

On 16 September 1999 the Queensland Timber Board, conservation groups and the Queensland Government signed the South East Queensland Forest Agreement (SEQFA). The SEQFA provided for the cessation of timber harvesting on approximately 425,000 hectares of state forests, timber reserves and Land Act reserves and for their addition to the conservation reserves system.

To assist in the transition of these state forestry lands to a Protected Area tenure under the *Nature Conservation Act 1992* (NCA) an interim holding tenure (forest reserve) was created in October 2000. Forest reserve will only last for 5 years; therefore a final Protected Area tenure needs to be allocated within that period.

While the lands remain in forest reserve the Queensland Parks and Wildlife Service (QPWS) will manage them under the same provisions of the *Forestry Act 1959* as applied prior to the transfer to the holding tenure. That is, the tenure of forest reserve allows current uses and management to continue until a Protected Area tenure is allocated.

These steps constitute the tenure allocation process - a process that will determine the most appropriate classes for these protected areas, whether that is national park (scientific), national park, national park (recovery), conservation park or resources reserve. The forest reserve tenure is subject to a five-year sunset clause, which clearly establishes its interim status and allows sufficient time for the allocation of tenures to be completed.

The situation

QPWS is responsible for the administration of the NCA and the management of Protected Areas in Queensland. For lands now held as forest reserve under the NCA, QPWS is the responsible agency for transferring these lands into a suitable tenure.

The SEQFA was an agreement between three groups (timber, government and conservationists). Policy direction on other issues including native title, beekeeping, recreational use, foliage collection and cattle grazing were not addressed as part of the agreement.

Parks require statutory management plans reviewable within 10 years of completion; management plans are highly desirable for Forests. Minimum statutory requirements for Parks management plans require two phases of public notice and comment. Parks have generally been planned on an individual basis, with limited community engagement other than a legislated 'public approval' process. While intended approaches to Forests planning emphasised community engagement, the focus for Forests has been trialing comprehensive, rationalist planning systems suitable for an intended bulk roll out rather than a program of onground planning.

From 2000, Parks planning introduced a new approach in the implementation of the South East Queensland Forests Agreement. This approach provides economies and efficiencies of scale, incorporates community involvement and facilitates agreements with Indigenous interests.

Imperatives

Among the primary imperatives to adopting a new approach to protected area planning are:

- 1. Need for community/political support from as early as possible in each process: real resolutions are often contentious therefore informed support is desirable.
- 2. Need to resolve complex issues in an evolving policy context: community engagement can be counterproductive if processes are not realistically understood, or if competitive positions are fixed.
- 3. Need for informed involvement: effective community advice and long term credibility often requires establishing a common knowledge base and overcoming contemporary mythology about the resource and management issues.
- 4. Need to make decisions on inevitably incomplete data: decisions and management are givens, a planning framework needs to consolidate best available data, define and promote essential data and provide for influence of future data.
- 5. Need to deliver outcomes quickly and efficiently: political deadlines, overall program workloads and participant 'burn-out' compel processes with as few demands on time and effort as possible.

6. Need to focus on essential issues and outcomes: no process will address all issues, essentials are an immediately workable framework and defined future actions and directions.

Primary rationale

Planning is a process with both outputs and outcomes that guides people through change. Planning processes are transitory and must be managed as such - they attach and detach from both stakeholders and day-to-day management at tactical points in time, but should never be considered as a continuing element of management. It is essential that they seek to affirm working relationships that will continue, and as far as possible build partnerships meeting the clearly defined needs of the key continuing players.

Planning processes need to be conducted appropriately and relevantly to the community involved. While key elements may be consistent, flexibility is essential and must correspond to varying political, social and physical circumstances.

Effectiveness relies largely on the success of a planning process to balance and integrate 'top down' and 'bottom up' imperatives. In practice, these are often proposals from the former, and grassroots issues for the latter, instigating the need for change.

Key elements

- Wide spatial scale units (subregions) v. 1 Park or Forest at a time;
- 'In-built' community consultation and engagement v. minimal statute-required process;
- Focus on strategic direction setting within which local management operates flexibly v. documentation of characteristics, focus on immediate goals and fine scale decision-making;
- Plans to be 'best possible for now' v. striving for 100% right in detail;
- Emphasis on skilled core project teams integrated with local management on tight timelines v. individual projects; and
- Project teams directly supported by key technical 'mine-sweeping' specialists.

Core planning process

Establish a cohesive framework including:

- High level awareness and agreement on outcomes and process with peak bodies;
- Determine key community stakeholder interests that will add value to the planning projects, focusing on actual knowledge of the local issues; and
- Identify individual interests significantly affected by the likely outcomes, and develop strategies for contact and management complementary to the planning processes.

Planning processes should then be maintained within this framework:

- Define sub-regions based on stakeholder 'catchment';
- Assemble available data in a presentable form;

- Convene working groups representative of key stakeholder interests, ensuring that each group is large enough to bring in all key interests, but small enough to allow effective interaction between the interests;
- Develop group dynamics to an effective working relationship, including informed expectations and mutual recognition of interests;
- Establish overall parameters of the task;
- Establish 'givens' for outcomes and working relationship;
- Define stakeholder interests:
- Develop and negotiate 'best fit' resolutions;
- Gain targeted information if necessary;
- Seek consensus or define differences and reasons: and
- Provide feedback on outcomes.

Typical process

To deliver tenure advice, draft management strategies and supporting documentation for Parks and Forests areas, between 6 and 12 months has proved necessary, with an average of 8 months start to finish.

Typically, groups comprise 25-40 representatives, and involve on average six formal meetings, 2 field trips and 3-4 special purpose meetings with sub-groups.

Planning teams usually comprise a Senior Planner and a Planner, with specialist support from an Indigenous Coordinator, GIS/cartographic specialist and a Recreation Planner, with close involvement of the Planning Manager or Principal Planner primarily on policy issues and facilitation. In addition, local field management is engaged in most meetings and liases directly with the planning team in all stages.

Typical format of the process is:

Meeting 1: Introduction, establish givens, form common purpose and field further issues.

Meeting 2: Presentation of available information from planning team.

Meeting 3: Contribution of information from community interests.

Field trip to orient and form context for information.

Meeting 4: Amalgamation of information from all sources and form continuing

management context.

Meeting 5: Draw out proposed options.

Meeting 6: Refinement and decision on options.

Conclusion

For the implementation of the South East Queensland Forests Agreement, the above planning process has been an effective way of engaging a broad range of community representatives. The process allowed opportunities for community representatives to discuss tenure and management opportunities and provide advice to Government on the best available information that had been collected and shared through the process.

Empowering the Community Through Project Green Nest

Rick Galbraith & David Manning, Land Resources Officer, Crows Nest Shire Council, PO Box 35, Crows Nest, Q, 4355.

Empowering the community through Project Green Nest

Crows Nest Shire is one of the fastest growing rural local governments in Queensland and is facing a number of issues that have the potential to significantly impact on the natural resources of the Shire. Accelerating urban development, restructuring of the dairy industry, ongoing drought, expansion of horticultural production and a strong economic development push all have the potential to have a contribute to a decline of the Shire's natural resources if managed unsustainably.

Crows Nest Shire has developed an innovative natural resource management (NRM) program that strives to involve the whole community - rural, lifestyle and urban residents - in the sustainable management and enhancement of the Shire's natural resources. The Shire's NRM program represents a \$1.25 million investment over two years in our community's future including \$334,000 from the Natural Heritage Trust and over \$900,000 of funds and in-kind contributions by the Crows Nest Shire community, Crows Nest Shire Council and State Government agencies.

There are two major components of the Shire's comprehensive NRM program:

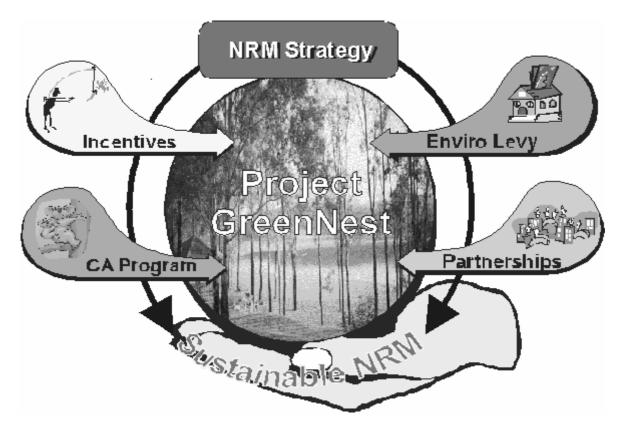
- 1. Natural Resource Inventory (NRI) project.
- 2. Project Green Nest.

Natural Resource Inventory Project

The NRI project is compiling a range of natural resource information for the Shire that can be used at the property scale, including updated remnant vegetation maps, land resource areas (LRAs), good quality agricultural land (GQAL) and geology along with landscape modelling. Supporting the inventory will be a handbook or manual that will provide technical information to landholders to support and guide their management decisions with the ultimate aim of sustainable natural resource management. This information will be publicly available on the completion of the project in a number of formats - hard copy, CD Rom and web-based.

Project Green Nest

Building on the NRI project is Project Green Nest that is taking a holistic approach to sustainable natural resource management in Crows Nest Shire. Project Green Nest has several components that are represented in the following illustration.



A NRM Strategy was developed through consultative processes with the Crows Nest Shire community and stakeholders. This strategy provides guidance for the overall direction of the project (the strategy can be viewed at www.cnnet.com.au/nrm/strategy/default.htm) and is coupled with incentives, an environmental levy, conservation agreement program and community partnerships.

NRM Strategy

The strategy addresses six key NRM areas:

- 1. Pests.
- 2. Nature conservation.
- 3. Water.
- 4. Land use & management.
- 5. Tourism.
- 6. Air quality, energy efficiency, renewable energy and waste management.

Contained within the strategy is an implementation process, comprising four elements: implementation processes for the action plans; communication, education and awareness program; landholder funding assistance programs; and a work plan.

Incentives

A range of incentives has been developed to encourage and support land holders and managers in the sustainable management of natural resources under their control. Included in the incentives are: landholder NRM Grants; access to the NRM work crew; rate rebates;

technical support; and provision of local provenance plants from the Crows Nest Shire community nursery.

Funding is provided through the Landholder NRM Grants program for a range of on-ground actions with an emphasis on activities being undertaken in the context of overall property management rather than focusing on single issues in isolation such as weed control. The sorts of activities that funding can be provided for are: fencing of remnant vegetation; riparian works; revegetation activities; bushland rehabilitation; provision of off-stream watering points; native pasture rehabilitation and some strategic soil conservation works.

The fully equipped NRM work crew consisting of a supervisor and three to five trainees is available to work with landholders to undertake a range of NRM activities. Individual trainees are also able to work with landholders on specific projects such as fencing of high conservation areas of remnant vegetation, tree planting and bushland rehabilitation.

Rate rebates are available for landholders entering into the conservation agreement program. A sliding scale of rebates is available depending on the type of agreement entered into, conservation significance of the property and classification of the vegetation under the Vegetation Management Act.

Technical support and advice can be accessed by landholders to support their sustainable land management efforts. This can be, for example, maps of remnant vegetation and identified wildlife corridors, local plant species lists and advice on methods of environmental weed control.

Quality local provenance plants are available from the Crows Nest Community Nursery assist landholders undertaking tree-planting projects for wind breaks, bushland rehabilitation, wildlife corridors and salinity management.

Conservation Agreement Program

A three-tiered Conservation Agreement Program (CAP) has been introduced to support, encourage and recognise the conservation efforts of landholders. The elements of the CAP are:

- 1. Land for Wildlife a voluntary legally non-binding program delivered in partnership with the Queensland Parks and Wildlife Service.
- 2. Voluntary Conservation Management Agreement whereby a landholder enters into an agreement with Council and in return receives a rate rebate. The management agreement normally has an agreed time frame for its operation, for example 5 years.
- 3. Voluntary Conservation Covenant (VCC), which as the name suggests is binding and registered on the property title. The VCC provides for the protection of significant natural or conservation values of the property even if the property changes ownership.

Environmental levy

Initial seed funding for Project Green Nest was obtained from the Natural Heritage Trust (NHT). To continue the work of Project Green Nest beyond the life of NHT funding, an environmental levy was introduced. This was a major achievement for a rural council and is fully supported by the ratepayers of Crows Nest Shire. In the order of \$100,000 will be raised on an annual basis with funds raised from the levy being reinvested back into the community.

Funds will be used to support the NRM work crew, landholder NRM grants program and rate rebates. This program is designed to run for the foreseeable future.

Partnerships - sustaining the team

One of the most important parts of Crows Nest Shire's NRM program is the aspect of community partnerships. Without these partnerships, the opportunities for achieving sustainable natural resource management are greatly diminished. These partnerships are being created and maintained through ongoing community consultation that values and respects input by community members. Landcare and Catchment Management groups are being actively involved in a two way process. The benefits of this are that groups can have input into a range of Council activities and policies that reflect their needs, whilst Council is able to provide assistance to organisations to undertake works that benefit the whole community (the so called public benefit) as well as themselves. Individuals are encouraged to provide comment, ideas and feedback on the whole NRM program so that it continues to reflect community needs rather than being imposed on the community.

What hasn't worked well for Project Green Nest?

- Lack of full time project officer to drive project.
- Difficulty in fully utilising available NHT funds.
- Getting people to think beyond weeds.
- Lots of small projects no large ones.
- Could be better & more strategically focused (will be achieved over time as the project matures).

Project Green Nest achievements

- Widespread community acceptance.
- Increasing on ground actions.
- Real farmers becoming involved.
- Stimulating interest and activity in Shire landholders.
- Changing landholder perceptions.
- NRM is now core Council business.

The National Action Plan for Salinity and Water Quality: Implications for Natural Resource Management

Dan Murray, PhD Scholar, Griffith University Nathan Campus, Q, 4111.

Background

In conjunction with Queensland's recent Natural Resource Management (NRM) legislative reforms (i.e. *Integrated Planning Act 1997*, *Vegetation Management Act 1999*, and *Water Resources Act 2000*) the introduction of the National Action Plan for Salinity and Water Quality (NAPSWQ) has contributed to the creation of a new policy environment for NRM. This policy environment is characterised by delivery of NRM at the regional scale, reliance on partnership agreements with key stakeholders for implementation and the increasing involvement of the Commonwealth Government. These changes have a large impact on the way biodiversity is managed in the rural landscape. This paper examines implementation of the National Action Plan in Queensland to identify the opportunities and barriers these reforms pose towards improving NRM, and through this the management of biodiversity.

The National Action Plan

In October 2000, the Commonwealth Government released the National Action Plan for Salinity and Water Quality, its response to address the issue of salinity across Australia. The stated goal of the National Action Plan is to motivate and enable regional communities to use coordinated and targeted action to:

- Prevent, stabilise and reverse trends in dryland salinity affecting the sustainability of production, the conservation of biological diversity and the viability of our infrastructure; and
- Improve water quality and secure reliable allocations for human uses, industry and the environment.

To achieve this the National Action Plan recognises the need to address the difficult issues of land-use change, farming techniques and increasing the availability of water in our rivers for environmental purposes. To identify and implement the changes required a regional approach has been adopted. In this Regional NRM Bodies, made up of predominantly community members, are responsible for the development and implementation of Regional NRM Plans. The goal is for these Regional NRM Plans to provide a holistic approach to NRM within the catchment by coordinating the multitude of planning processes and activities currently being undertaken.

The National Action Plan targets 20 regions throughout Australia with four such regions (called Priority Action Regions) in Queensland, including:

- 1. Lockyer/Bremer/Upper Brisbane/Burnett/Mary.
- 2. Fitzroy/Burdekin.
- 3. Condamine/Balonne/Maranoa.
- 4. Border Rivers.

Implications

The National Action Plan changes to the way NRM is undertaken in terms of the institutional arrangements governing NRM. These changes include the involvement of the Commonwealth Government, devolution of responsibility for NRM to non-government Regional NRM Bodies and the requirement to develop and implement a single NRM plan for each region. The National Action Plan also introduces changes to the process by which NRM is undertaken.

In investigating these changes a number of opportunities and barriers towards improving NRM were identified. Opportunities included:

- Addressing natural resource issues at an more ecologically appropriate scale;
- Collecting more detailed baseline information to form the basis of natural resource decision making;
- Improved community engagement;
- Improved coordination of planning processes through the development of a single Regional NRM Plan;
- Development of a more strategic and holistic approach to NRM through the setting of Regional Targets; and
- Regional scale of the approach encouraging the development of strong relationships between stakeholders.

Barriers to NRM include:

- Increasing involvement of the Commonwealth Government and the devolution of responsibility to Regional NRM Bodies may create uncertainty over who is the driver of the process and conflict over roles and responsibilities;
- The National Action Plan demonstrates a lack of co-ordination with existing approaches (e.g. Draft Basin Management Plan and Draft Integrated Catchment Management Strategy);
- Potential for conflict as Regional NRM Bodies work across jurisdictional boundaries of multiple agencies and tiers of government;
- Multiple scales for planning processes hindering integration;
- Increased competition and conflict between stakeholders as funding becomes available; and
- The need for increased information sharing and working cooperatively with other stakeholders may require shifts in the attitudes of individuals and organisations.

A reoccurring theme in capitalising on these opportunities and overcoming these barriers is the importance of establishing strong relationships between stakeholders. It is expected that regions with strong relationships between government, community and industry stakeholders will be well placed in developing and implementing Regional NRM Plans, enabling a coordinated (rather then a fragmented) approach to important issues such as biodiversity conservation, weed management etc.

Weeds: Our Second Greatest Threat to Biodiversity

Keynote Presentation

Dr. John Swarbrick, President, Friends of Escarpment Parks, Toowoomba

Environmental Weeds - The Second Greatest Threat to Biodiversity

Dr. John Swarbrick, President, Friends of Escarpment Parks, 15 Katoomba Crescent, Toowoomba, 4350.

There will be three main n topics within this brief address:

- 1. Biodiversity depends on habitat diversity.
- 2. European activities have on balance been beneficial to Australian biodiversity.
- 3. Environmental weeds limit habitat diversity and need to be controlled.

Biodiversity depends on habitat diversity

Obviously.

Different organisms require different habitats - and different amounts of these habitats depending on the resource needs of the organism and the amount of these resources provided by the habitat.

Small organisms only need small areas of suitable habitat - ants, skinks, caterpillars. Large amounts of these habitats lead to large populations and increased predation. So it is better to have small areas.

Large organisms need large areas of suitable habitat - Wedge tail Eagles, Dingoes, Black Cockatoos.

The area needed depends also on the resource richness of the habitat - resource rich areas support more of each organism or support each organism in a smaller area.

Habitat - living space - must provide all resources needed. This may vary throughout the life of the organism, with its varying yearly cycle. Shelter, food or nutrients, moisture, breeding sites, mates, pollinators, mycorrizhae, propagule transporters etc.

So to increase biodiversity we need to increase habitat diversity - and to extend habitats beyond their natural range.

Remember that habitats come in all guises - land surfaces, subterranean, freshwater, marine, internal to plants, internal to animals.

Artificial or human modified habitats suit many organisms as well as or better than natural habitats.

European activities have on balance been beneficial to Australian biodiversity

One of the general rules of ecology is that changing the habitat benefits some organisms and disadvantages others.

Much angst has been aired about the loss of natural ecosystems and the number of mammalian extinctions in Australia. These are natural processes because we are part of nature. The same things have happened throughout the world and throughout history - they are only clearer here because our written history is so short.

Aboriginal Australians caused massive changes in the landscapes and thus in habitat, but not in recorded time. They also caused many extinctions, but again not in recorded time. Many of the landscapes, the floral associations and the faunal associations that Europeans found across Australia two hundred years ago were Aboriginal artefacts.

Do not blame our Aboriginal antecedents for this - they were only doing what any sensible culture does - living to the limit to which its resources can be exploited by its technology. They would have been fools (and unsuccessful fools) not to have done so - and they were not unsuccessful in their management of Australian landscapes.

The advent of Europeans brought - and continues to bring - new technologies, and hence new ways to alter the landscape. These too advantage some organisms and disadvantage others.

New food sources (through new crops, weeds, pasture plants and ornamentals), vastly expanded water sources (dams, bores, artesian water), vasty increased movement of organisms about Australia (Society for Growing Australian Plants, trains, cars), sewage farms, municipal rubbish tips, parks, gardens, airfields, etc. have all increased resources for Australian organisms and moved them to new areas that some can exploit.

Towns and cities are major centres for native biodiversity. Animals, plants, insects etc thrive in cities for the same reasons that we do - resources, shelter, mates.

This area is more fully explored by Tim Lowe in his recent book 'The New Nature' (Penguin Books Australia Ltd, 2002).

But there are always losers when habitats change. Europeans have brought:

- New competitors for native animals and birds (rabbits to bilbies, dingoes to thylacines, African mynahs to lorikeet nesting holes);
- New predators for native animals (foxes, cats); and
- New competitors for native plants environmental weeds.

Environmental weeds limit habitat diversity and need to be controlled

Naturally occurring Australian ecosystems were greatly altered by Aboriginal fire management, but there seems to have been very little movement of plants and no apparent introduction of new plants to the continent other than a few by Macassan traders to the north coast.

Unlike their Papuan/New Guinea neighbours, Aboriginals were not farmers. Perhaps basically because of climatic uncertainty - El Nino/La Nina - but this did not stop other cultures that live in comparable areas developing sophisticated irrigated agricultural systems.

Over the last two hundred years several thousand plant species have been introduced to southern Queensland, for cropping, pasture, ornament, drugs, shade. Most have not found the environment suitable, and persist only in cultivation.

Others have found suitable habitats, escaped, and either persisted or multiplied in natural/semi-natural ecosystems. Environmental weeds - the second greatest threat to natural biodiversity after land clearing.

Some people think that native plants are naturally superior to introduced plants and will outgrow them. Not so. Native plants have suites of grazers and pathogens; introduced plants have often escaped theirs - left them at home.

When an introduced plant finds a habitat it likes, it rapidly spreads. So it must have suitable nutrients, soil texture and pH, mycorrizhae, light levels, temperatures and seed dispersers, and must also be free from serious endemic and introduced grazers and pathogens.

In Southeast Queensland we have at least 200 such species (Batianoff & Butler, 2002):

- 64% introduced as ornamentals;
- 21% agricultural/pastoral;
- 5% aquarium; and
- Others various or unknown.

The number for southwest Queensland is unknown, but probably smaller.

The top 10 environmental weeds in southeast Queensland are in order of importance:

- 1. Lantana.
- 2. Groundsel bush.
- 3. Mother-of-millions.
- 4. Cat's-claw creeper.
- 5. Madeira vine.
- 6. Climbing asparagus.
- 7. Chinese celtis.
- 8. Camphor laurel.
- 9. Broadleaved pepper tree.

10. Salvinia.

All are deadly enemies of native bushland. But your local weeds are often not in the top ten, for example pavonia in Toowoomba's Duggan Park.

Impacts of environmental weeds

Impacts vary with the weed's ability to shade out native plants. Complete chokers - lantana, cat's-claw creeper, Madeira vine, Chinese celtis, camphor laurel, broadleaved pepper tree and salvinia. All form monocultures that completely smother all native plants except existing eucalypts and other trees, which are prevented from germinating. Cat's-claw creeper and Madeira vine smother even the largest native trees as well as forming mats on the ground.

The results of this are:

- Death of most native plants, their associated fungi, insects and bacteria (all part of native biodiversity);
- Prevention of regeneration by shading;
- Loss of viable propagules from soil so that even when you control them little native vegetation comes back;
- Loss of food for native animals and birds
- Loss of shelter, breeding sites etc.;
- Altered soil chemistry (especially organic matter and nitrogen-associated with altered fire regimes); and
- Altered fire regimes often unable to burn because no grasses or other ground fuel, lantana fire tolerant.

Control

Obviously biological control is best. But competes for funds with agricultural, pastoral, forestry and waterway weeds. Biological control programs for:

- Lantana: insects unsuccessful, rust disease possible;
- Groundsel bush: insects partially successful;
- Mother-of-millions: new rust disease hopeful; and
- Salvinia: insects successful.

What would southeast Queensland be like without lantana?

Control is difficult in bushland because of neighbouring native plants. Glyphosate a very suitable herbicide - soil inactivated, virtually non-toxic, non-corrosive, non-flammable, does not smell, no colour, cheap, and widely available.

All chemical methods are very labour intensive - but effective as the best we have apart from biological control and fire:

- Uproot (disturbance good);
- Cut stump;

- Stem inject; and
- Basal bark (Access, Garlon, Starane in diesel smelly).

Always try to prevent spread. Priorities for control are:

- New invasions monitor always and control at once;
- Reproducing trees; and
- Then less affected areas.

Fire is an excellent method in bushland:

- Promotes fire dependent and fire tolerant species;
- Kills fire sensitive species;
- Reduces organic matter air soil surface;
- Reduces soil nutrients; and
- Stimulates regrowth.

References

Batianoff G.N. & Butler D.W. (2002). Assessment of invasive naturalized plants in southeast Queensland. Plant Protection Quarterly 17 (1) 27-34.

Current Control Methods for Priority Environmental Weeds

Trevor Armstrong (Agronomist) and Tom Anderson (District Experimentalist), Alan Fletcher Research Station, NRM, 27 Magazine St., Sherwood, Q 4075.

Abstract

An environmental weed is a plant, not endemic to the area, which dominates local habitat, reduces biological diversity, threatens native flora and fauna but does not necessarily affect the economy. A priority environmental weed is a plant that requires priority research needs and is determined by the SEQ Environmental Weed Strategy Group. A list of priority environmental weeds is tabulated, with preferred label and or trial control details. The weeds listed without label or trialed control details indicate information gaps requiring future trials.

Introduction

Creek banks, beach dunes and nature reserves are often the only remaining remnants of native bushland, particularly in suburban areas. These sensitive areas are under constant pressure from our activities. Of great concern are the impacts of invasive exotic plants. The deliberate, careless dumping of garden rubbish spreads many of these weeds. Aggressive exotic plants reduce the biodiversity of native plants, fish, birds and insects. In recent years, people have become alarmed at the destruction done to bushland by invasive weeds and control of these plants has been a high priority.

Methods

Control methods

Many environmental weeds are only a problem where grazing is no longer managed - allowing monocultures of smothering vines to take over. Manual and mechanical control methods such as a mattock, brush cutter, slasher or bulldozer have advantages and disadvantages. Fire can be a helpful control method in certain situations. Classical biological control has merit but sadly is not a high priority for most weeds in bushland reserves. Herbicides are man made tools of farming; they offer the only practical and selective method of dealing with some weeds. It has been estimated that for every dollar spent on herbicides, four dollars in profit is returned to the farmer. For the same reason, herbicides will continue to be an important part of any bushland weed control strategy, especially when funding is scarce. Integrated weed control combines two or more of these methods in succession and gives the best1ong-term management solution.

Safeguards

In Australia, the National Registration Authority (NRA) regulates pesticides. Before any product is registered for sale it must pass technical assessment for toxicology, efficacy,

environmental impacts, residues, molecular breakdown pathway and occupational health. The Chemicals Review Program periodically recalls product already on the market for further testing to ensure that they meet modem standards.

The NRA scheme is all encompassing and is recognised as one of the most rigorous safeguards in the world. Pesticide technology is constantly improving; we have come a long way since the 1950's. People like Rachel Carson, Eve Hillary, the Green and Organic movement have all played important roles in rectifying past errors. Today, anyone who buys or uses a pesticide in Australia can be assured that it is safe, posing no risk to the operator, public, environment or overseas trade when used according to the labelled directions.

Contractors

Many of the weeds listed in Table 1 are resilient and survive repeated control attempts. People frequently have unrealistic expectations of herbicide products and often overlook the fact that plants have developed efficient survival strategies to overcome natural disasters such as drought, fire, flood, insects, pathogens and herbivore damage. In most cases, a weed is susceptible to only one specific herbicide. A common mistake is the use of inappropriate products. There are many reasons for using the wrong product, including poor advice, incorrect weed identification, or just because it's the cheapest product. The best way to avoid poor results is to engage a professional contractor.

A contractor has many benefits, such as:

- Fully licensed and insured;
- Knowledge and experience;
- Sound understanding of weed biology;
- Not bound to one product;
- Shift responsibility for outcomes; and
- Overall efficiency of benefits greater than costs.

Control techniques

Foliar spraying

Here, the product is diluted with fresh or salt water (one part herbicide to 100 or 250 parts water or greater are used). However, bore water or hard water may not be compatible with the product. The solution is then sprayed over the foliage to the point of runoff. The method is most suited to shrubs, grass and dense vines less than 6m in height. The advantages include quickness and economy, whilst the disadvantage is the potential for spray drift and non-target damage.

Cut stump

A chainsaw, axe, brush cutter or machete is used to cut the plant down, and then a herbicide solution is sprayed or painted onto the stump. Two operators working as a team are needed to do it correctly - one cutting and the other spraying the stumps as soon as possible. A delay of more than 15 seconds for water based herbicides and 1 minute for diesel soluble herbicides, between cutting and spraying will give poor results. Secateurs, machete, chainsaw or brush

cutter can be used with a knapsack, paint brush or window squirter to apply the chemical. This method has the appeal of removing the weed immediately.

Stem injection

This involves placing herbicide directly into the plants' stem tissue. Traditionally this is done with an axe and the herbicide is placed into the axe wound immediately after each cut. The method is very effective if less than 3cm is left between axe cuts around the stem circumference.

A Queensland equipment manufacturer "Sidewinder Injection Systems" based at Noosaville has made a backpack injector that uses an electric drill and screw nozzle to inject chemicals under high pressure. The system is a hypodermic syringe for trees. Trial results have shown that when using the sidewinder, the amount of chemical used can be reduced by up to 50 times compared to other methods. The sidewinder is regarded as the most environmentally friendly technique, especially when plugs are used to seal injection points.

Basal bark spraying

Basal bark spraying involves mixing an oil soluble herbicide in diesel and spraying the full circumference of all trunks at their base. It is a very effective technique, usually killing difficult-to-kill weeds at any time of the year, so long as its bark is not wet or too thick for the diesel to penetrate. This work is often best performed by contractors. Because it is so effective, basal bark spraying is a good way to tackle difficult situations such as steep banks and inaccessible areas.

Conclusion

Integrated weed management combines two or more control methods to give the best long-term management solution to unwanted plants. It is important to assess the conditions of the site (including density and height of weed infestation), stage of plant growth, knowledge, experience and equipment available in order to determine which control strategy you are to apply.

Control measures for priority environmental weeds are summarised in Table 1. Each of the 20 methods of control includes application technique, herbicide, and rate of herbicide in solvent and/or mechanical removal. Utilising this information correctly will help achieve long-term management of the listed priority environmental weeds.

This information is the best available to the authors at the time of writing.

Acknowledgements

The expertise and experience of Paul Shortis, George Diatloff, Rod Wood, Randal Richardson, Greg Wagner and Joan Redgrave have been a great help in compiling this information. Rebecca Breaden assisted with the presentation.

Table 1. Control methods for priority environmental weeds.

Common Name	Scientific Name	Means of	Control method		Comments	
		reproduction	Label	Trial result		
Agave	Agave spp.	Plantlets	14 , 15	4a, 10	Carefully	
African Tulip Tree	Spathodea campanulata	Seed, suckers		1, 12	1 needs follow up on suckers	
Asparagus (basket)	Asparagus aethiopicus var. sprengeri	Seed	10	5 , 10, 11, 13	Needs follow up	
Asparagus (climbing)	Asparagus africanus	Seed	10	5 , 11	Needs follow up	
Balloon Vine	Cardiospermum grandiflorum	Seed		1, 9	Slash before	
Balsam	Impatiens spp.	Seed, vegetative		9 , 11		
Blue Morning Glory	Ipomoea indica	Vegetative	9	9		
Brazilian Cherry	Eugenia uniflora	Seed		1, 20		
Broad-leaved Pepper Tree	Schinus terebinthifolius	Seed, suckers	6, 7	1, 4	Best when red berries present	
Broad-leaved Privet	Ligistrum lucidum	Seed	1	10		
Cadaghi	Corymbia torrelliana	Seed	4			
Camphor Laurel	Cinnamomum camphora	Seed	1, 4	6		
Canna Lily	Canna indica/C. edulis	Tubers, seed				
Cat's Claw Creeper	Macfadyena unguis- cati	Tubers, seed	1, 3	2, 8	Slash before	
Chinese Elm	Celtis sinensis	Seed	6	1		
Coastal Morning Glory	Ipomoea cairica	Vegetative	9	9		
Cocos Palm	Syagrus roffmanzianum	Seed		17		
Corky Passionfruit Vine	Passiflora suberosa	Seed, vegetative		1 , 11		

Common Name	Scientific Name	Means of	Control metho	od	Comments
		reproduction			
Dutchman's Pipe	Aristolochia elegans	Seed, vegetative			
Easter Cassia	Cassia pendula	Seed		1, 20	
Fishbone Fern	Nephrolepis cordifolia	Bulbs (vegetative),		10	
		spores			
Glory Lily	Gloriosa superba	Tubers, seed		9	Respray necessary as tubers regrow
Golden Rain Tree	Koelreuteria elegans	Seed		1, 12	
Indian Hawthorn	Rhaphiolepis indica	Seed			
Japanese Honeysuckle	Lonicera japonica	Vegetative, seed			
Madeira vine	Anredera cordifolia	Tubers, seed	7	1, 2 , 3, 6	Needs follow up
Mexican/Japanese	Tithonia diversifolia	Seed	18	9, 10	Don't use 3
Sunflower					
Mother-in Laws	Sansevieria trifasciata	Seed, sucker		11	
Tongue					
Ochna	Ochna serrulata	Seed		1, 6	
Purple Succulent	Callisia fragrans	Suckers		11	
Running Bamboo	Phyllostachys spp.	Suckers		1	
Singapore Daisy	Wedelia trilobata	Seed, vegetative	10		Must add wetter
Small-leaved Privet	Ligistrum sinense	Seed	1	10	
Umbrella tree	Schefflera actinophylla	Seed		1, 4, 12	
Wandering Jew	Tradescantia albiflora	Stolons. seed,	19	16	
		tubers			
White Moth Vine	Araugia hortorum	Seed		11 , 1, 8, 18,	
				20	
Yellow Bells	Tecoma stans	Seed	20	3	

Key to control

Most effective method is in bold font.

- 1. Cut stump with Glyphosate 360® diluted at 1:1 water.
- 2. Cut stem under solution of Glyphosate 360® 1:1 for 15 seconds.
- 3. Foliar spray to point of runoff with G1yphosate 360® diluted at 1:100 (10 ml/L water).
- 4. Sidewinder injections of Glyphosate 360® undiluted (10 ml per 15 cm stem diameter).
- 4a. Sidewinder injections of metsulfuron-methyl (Brush-off®) diluted at 2g/L water.
- 5. Cut stump, then apply neat diesel on the whole crown.
- 6. Basal bark spray 35 ml Starane200®/L diesel
- 7. Foliar spray 5 ml Starane 200®/L water.
- 8. Foliar spray 4 ml Kamba 500®/L water
- 9. Foliar spray 2,4-D amine 4 ml/L water.
- 10. Foliar spray 10g Brush-off® + 100mL BS1000®/100L water.
- 11. Dig out crown.
- 12. Stem inject Glyphosate 360® at 1:1 with water.
- 13. Cut stump and apply neat diesel to whole crown.
- 14. Foliar spray 20g Brush-off® + 100mL BS1000®/100L water.
- 15. Foliar spray 3L Starane 200®/100L diesel.
- 16. Foliar spray 500mL Starane 200® + 5g Brush-off® + 100 mL BS1000®/100L water.
- 17. Cut off below the lowest branch.
- 18. Foliar spray 350mL Grazon DS®/100L water.
- 19. Foliar spray 1.5L Starane200®/100L water.
- 20. Basal bark spray/cut stump 1L Access®/60L diesel.

Pest Management Plans - Working With The Community

Rick Galbraith & Ray Weis, Stock Routes Inspector, Crows Nest Shire Council, PO Box 35, Crows Nest, Q, 4355.

Pest Management Plans - Working with the community

Crows Nest Shire has worked with the local community in the development of a comprehensive natural resource management program for the Shire to assist in achieving sustainable management of the Shire's natural resources. To assist this work, a Natural Resource Management (NRM) Strategy was developed to guide activities in a number of key areas, including weeds and pest animals. The NRM Strategy for weeds and pest animals has three desired outcomes being:

- 1. To achieve community recognition of the extent and impacts of the weed and pest animal problem in Crows Nest Shire.
- 2. To prevent the introduction of any further weed and pest animal species into Crows Nest Shire.
- 3. To effectively manage existing weed and pest animal species to minimise their impacts.

An outcome of the strategy has been the development and implementation of a Pest Management Plan, which, although required by State Government legislation, actively sought community participation to achieve a workable plan that met the needs of the community.

Pest Management Plans are:

- A planning process for the control of identified pest species both plant and animal;
- Achieved in partnership with the community;
- Targeted at high priority pests (which includes declared and environmental); and
- Operate at two levels, whole of Shire and individual property.

The Shire Pest Management Plan seeks to achieve a number of outcomes, which although on the surface may seem to be aimed at controlling and eradicating weeds, has the potential to achieve important biodiversity conservation outcomes. Key issues addressed in the plan are:

- Motivation and inspiration of the community to manage pest issues effectively;
- Identification and management of pests (both declared and environmental pests);
- Provision of timely and useful information;
- Building and maintaining effective community partnerships; and
- Developing a code of practice to guide management of Council controlled lands.

Assistance

The Shire Pest Management Plan emphasises cooperation, encouragement and motivation of the community. Measures that have been put in place to achieve this are:

- 1. Herbicide assistance scheme landholders can apply to Council for replacement of herbicide used to control pest plants on the roadsides adjacent to their properties.
- 2. Landcare Group assistance Landcare and Catchment Management Groups in Crows Nest Shire can request assistance from Council to carry out pest management activities on public or private land. Assistance that can be provided includes:
 - Labour assistance from Council's Natural Resource Management (NRM) Work Crew;
 - Use of herbicide and spray equipment;
 - Use of other equipment and materials; and
 - Technical advice.
- 3. Education and awareness timely provision of pest management educational materials, conducting pest management awareness raising activities, raising awareness of plants that could become environmental weeds and suggesting suitable native alternatives, regular news media items, property management planning information, etc.

How does a Pest Management Plan work?

At a Shire level, the Pest Management Plan guides Council's pest management activities, listing declared and environmental pests, outlining the process to be used when dealing with pest problems, landholder roles and responsibilities and action plans for treating high priority pest species.

Pest Management Plans at a property level are a highly effective partnership approach to dealing with pest problems and achieving positive outcomes in a cooperative and constructive manner versus the big stick legislative approach (which can be used as a last resort if need be). The Property Pest Management Plan (PPMP) is developed cooperatively between Council and the landholder and comprises a number of steps:

- 1. Landholder consultation to develop a common understanding of each other's position and the approach that is going to be used in dealing with the problem.
- 2. Understanding the biology of the pest so that the most effective forms of control can be used (for example targeting vulnerable times in the pests life cycle).
- 3. Treatment/control measures that take into consideration landholder philosophy, ability to undertake works and ensure that potential for the pest to spread and affect neighbouring properties is minimised. Council needs to be satisfied that the treatment/control measures will be sufficient to control the pest in a timely and effective manner.
- 4. Agreed work plan so all parties have a clear understanding of what activities will be undertaken and who will be responsible for them. It also provides the basis for monitoring of treatment works.
- 5. Quarantine zone may be required for highly invasive weeds or those that may be readily spread (for example by livestock, machinery, etc such as Giant Rats Tail Grass).

The experience to date has been that Council has developed very effective partnerships with landholders in treating pests that previously would have been treated under duress and achieved limited results.

Catchment Action Plans

Where practical the Shire Pest Management Plan is being implemented in conjunction with Catchment Action Plans for each of the five Landcare and Catchment Management Groups operating in the Shire. Council is working closely with these groups to achieve effective pest management throughout the Shire in a coordinated and strategic manner. Each Landcare and Catchment group has identified priority pest species for their area of coverage. Crow's Nest Shire Council has undertaken to support Group activities where appropriate with devolved grant funds, technical support, advice and work crews.

These catchment action plans, while very simple provide a foundation for developing more detailed action plans in the future on a catchment basis with community groups. As this relationship continues to develop and evolve, there will be opportunity to accomplish strategic biodiversity conservation outcomes in key areas. An example of a catchment plan developed with the Emu Creek Catchment Group is shown below.

Species	Comments
Giant Rats Tail Grass	High priority weed. Work with landholders to contain and eradicate from private and public lands.
Privet	Contain and control in a strategic manner.
Cats Claw Creeper	Need to identify effective methods of control and promote to landholders in the area.
Boxthorn	Significant amount of work undertaken to date. Continue to eradicate from catchment area.
Velvety Tree Pear	Enforce control on affected properties.
African Lovegrass	Raise landholder awareness of weed potential of Lovegrass and strategies for management and control.

Practical application of a Property Pest Management Plan

An infestation of Giant Rats Tail Grass (GRT) was identified on a rural property. This infestation existed prior to the purchase of the property by the current landholder. There was a time delay in the positive identification of the GRT, which allowed a season of seeding to occur before attempts of control were implemented. The landholder's management actions, aspirations and philosophy were non-traditional and caused neighbouring landholders some concerns due to the potential for the GRT problem to spread.

Council in conjunction with local Landcare group attempted to implement a control program aimed at eradicating GRT - the so-called big stick approach. The actions suggested by Council & Landcare were not acceptable to landholder and the initial process used was not conducive to a successful outcome.

A cooperative approach was then embarked upon which led to an effective working relationship being developed with the landholder. This resulted in a property pest

management plan being developed, which took into consideration the plants biology, and landholder's management and aspirations. This cooperative approach to developing a PMP involved the landholder, a chemical company representative, Shire's Stock Routes Supervisor and NRM Officer.

The pest management plan has been successfully implemented by the dedicated actions of the landholder (an older woman who spends approx 2 hours per day working on problem) supported by Council and the local Landcare group. This has reduced infestation from a major concern to a manageable level.

The Management of Lantana in the Helidon Hills

Henk Hagedoorn, Helidon Hills Landcare Group, PO Box 2, Helidon, 4344.

Chemical attack

Background

At the end of 1999, an application for funding for the Helidon Hills Lantana Control Program was submitted to the Threatened Species Network (TSN) Community Grants Program. The application was submitted on behalf of the Helidon Hills Landcare Group by the Lockyer Watershed Management Association, as part of a larger biodiversity recovery project. In February 2000 an amount of \$11,900 was obtained from TSN.

Operational activities

In the application a time frame was set out as follows:

1. Start: March 2000.

2. 1st Finish: Nov. 2000.

3. 2nd Finish: Dec. 2001.

Weedmaster Duo® (Glyphosate) was chosen as the herbicide. Also backpack sprays, loppers, gloves, masks, etc. were purchased and the landholders tore into the work with great enthusiasm.

Various control methods were employed such as:

- 1. Slashing and spraying the regrowth.
- 2. Cut stump, swab with Weedmaster Duo®.
- 3. Foliar spraying at various stages in the life of a lantana bush.

Many different results were obtained, some good and some not so good. We tried to follow "the rules" as much as possible, but found that a droplet foliar spray at double the recommended strength when the lantana is in a "stressed" condition gave the best result. This is contrary to expert advice.

17 landholders with a combined property area of 2,945 ha are taking part. Of this area an estimated 418 ha are lantana infested. Some 111 ha have been treated so far and we have used 495 litres of Weedmaster Duo®.

Roadside spraying was also carried out with the assistance of Gatton Shire Council who supplied a spray vehicle and a driver. We supplied the volunteers to spray and also supplied the chemicals.

Future directions

The Helidon Hills cover an area of: 33.420 ha

The freehold component is: 21,000 ha

The Forest Reserve component is: 11,320 ha

The lantana control program area is: 2,945 ha, or 8.8%

How are we going to encourage and get the remainder of the landholders involved? As you can see from the above figures the largest single landholder is the government (Queensland Parks and Wildlife Service) covering one-third or 11,320 ha. We were informed that they have no funds for lantana control apart from the 6-7 year cycle of fuel reduction.

Where are we going?

I wish to thank all of the landholders taking part in this program for their enormous efforts and let us note that we cleared 111 ha or 0.003% of the total area. We will continue what we are doing and will endeavour to get the rest of the landholders involved in this program.

Biological attack

Background

Through the WESROC (Western Sub-Regional Organisation of Councils) On-Ground Nature Conservation project, the Helidon Hills Landcare Group was able to obtain funding for lantana biological control work. For this an amount of \$9,188 was obtained.

Operational activities

An exciting time lay ahead of us. Selecting suitable spots, having special dome tents made up from shade cloth, looking for suitable bushes to place the domes over etc. Then the long expected day came: the release of the bugs. It was very exciting and we had great expectations as a lot of preparation work had gone into it. *Aconophora compressa* and *Falconia intermedia* were released on 3 selected properties. This happened back in November 2001.

The results were that they all disappeared without a trace. They became food for the local natives (ants?).

Future directions

Michael Day from Alan Fletcher Institute has now a rust available that may be suitable for release. One catch: warm/moist weather. Well, we haven't had any of that lately.

Soooo...waiting we do until that magic day will finally come.

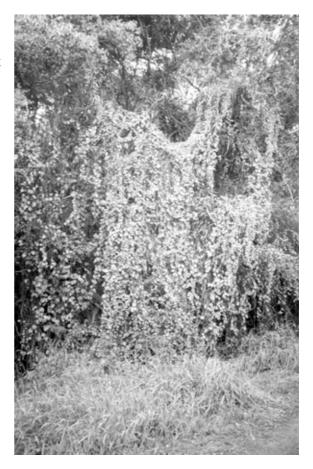
Management of Madeira Vine in Dwyer's Scrub Conservation Park

Jim Kerr, 248 Spinach Creek Road, Fordsdale, Q, 4343.

We have lived adjacent to the Dwyer's Scrub property since September 1983. Since that time, with strong lobbying by the Lockyer Watershed Management Association and other local people, it has been set aside as a Conservation Park to conserve local biodiversity - in the form of 100 acres of softwood scrub thereon, white cypress pine, silver leaf iron bark & narrow & broad leaf open iron bark eucalypt woodland complexes. Softwood scrub in this region covers less than 5% of the original extent pre European settlement. In 1983, the main weed species affecting Dwyer's Scrub were *Lantana camara* and invasive, introduced grasses such as green panic.

Since 83, we have seen Groundsel, Mother-of-millions and Cats Claw Creeper, Johnstone Grass, Narrow-leaf Privet and possibly the most destructive, an explosion of Madeira vine, such that now more than 80% of Dwyer's is infested. It has become particularly bad in the last 5 years. As one walks along the access road, Madeira hangs like green curtains from the tall canopy on either side. In the last year or so, it has been spreading down Spinach Creek below the park, following fence lines and moving up gullies.

Madeira forms an underground tuber from which a vine grows. The tuber can grow to be quite large (60cm +) and has the ability to withstand drought and fire and can grow very rapidly when the conditions are at its liking. The vine grows into the canopy which blocks off light and breaks branches eventually killing the tree and opening up the scrub to more infestation. We feel it is really the eleventh hour for Dwyer's, and if some form of control is not found soon, the scrub will be lost.



The Tuber is difficult to kill chemically. I have recently dug tubers out of Spinach Creek flats and found that the tuber is brittle and breaks easily, even a small piece if left has the ability to grow into a new plant. The Lockyer Catchment Association (LCA) has recently received Natural Heritage Trust Envirofund assistance to carry out Madeira vine herbicide trials, which we hope will come up with an application method that successfully kills the tubers.

A Time and Place for Everything

Veronica Schilling, Director Planning and Environment, Gatton Shire Council, PO Box 82, Gatton, Q, 4343.

"A Time and Place for Everything" was written by Veronica Schilling, Director Planning and Environment, Gatton Shire Council, and was performed at the Conference by Gatton Shire Councillors and Council Officers. "A Time and Place for Everything" is a different way of conveying the serious messages about weeds.

Narrator:	Sometime in the early 1800's in a garden not far from you
Veronica:	{Snipping around the lantana pot}
veromea.	There you go my little darling - grow strong and healthy in my garden.
	Soon we will be rid of that pesky gum tree and these tiresome native
	grasses.
	{move over to the gum tree}
	There we go - another one ringbarked and ready to turn it's toes up. I am
	so glad we brought such beautiful plants: the roses, lantana, camphor
	laurels to this barren land. The pet rabbits will be so much happier seeing
	the green panic and couch grass take hold. It will take years before this
	garden resembles the beautiful one we left behind. But never mind - we
	will persist and flourish!
Narrator:	Now 150 years later the farmers face a new dilemma. Sitting on the porch
	at the local pub two farmers discuss their daily grind in managing their
	land
Dave:	Hello mate, how are you going?
Steve:	Been busy these last few weeks around the farm, I tell you.
Dave:	Yeah - what are you doing?
Steve:	Trying to clean up some feral lantana down the back paddock.
Dave:	Yeah? How have you got time to do that and still make a living growing
	lucerne?
Steve:	Well mate, the way I see it - it's like this. I can't really afford not to
	clean the stuff up. It chokes out the native grasses, spreads like crazy
	and doesn't really help stop the erosion in the unlikely event we see
	some rain.
Dave:	Who would of thought - Steve the environmentalist! Mate if those guys
	down at the EPA could see you now!
Steve:	Well - I might talk tough but this land is all we got and I just wanted to do a
	bit to make it worth leaving to the boys.
Dave:	Yeah - I know what you mean. Used to be a time when we got some
	support from the State Government to clean up lantana and other weeds
	on the place. Those herbicide subsidies used to help a bit and mean that
	you could just go out when you had spare time and clean up the bad spots.
	Now there isn't much help around.

	Harry
Butler you know.	
Dave: Yeah!	
Steve: Yeah - don't I know it. I used to clean up the weeds out of the fro	•
place along the side of the road. Now, what with the cost of the l	DP 600
and the liability issues I'm not game to work outside our block.	
Dave: What ever happened to that Council bloke who used to come aro	und from
time to time and help out a bit with the weeds?	1.
Steve: Oh, he's still around, but his funding got cut and now you don't	
much as you used to. Someone should tell the government the	weeds
didn't stop growing just because they cut the funding	Cantra
Dave: Lucky there's a few guys I know down the Lockyer Catchment	Centre
who can give a person a bit of advice. Steve: Yeah, and I see that Gatton Shire Council are now charging an	
Steve: Yeah, and I see that Gatton Shire Council are now charging an environmental levy. I hope some of that money will make it ba	
landholders to give US a bit of help in doing some on-ground	
Dave: I reckon if we see that Mayor, Jim McDonald we should put the s	
to him.	uggestion
Steve: Yeah, I got a couple of other good ideas on how they could do son	me
improvements around the place. I mean let's face it; lantana is on	
the problem plants we need to get rid of in the Valley. There's	J
Clockwood, Cottonbush, Mother of Millions and Tiger Pear too.	
Dave: Don't forget the Tobacco bushes growing wild in the creek banks	and
hillslopes.	
Steve: When you think about ALL the feral plants and ALL the local government.	vernments
in the state it really is time they got serious about the problem de	on't you
think??	
Dave: I reckon - otherwise there won't be enough farming land left to ke	eep a
small bird alive, let alone keep the country fed.	
{Enter Jim}	
Jim: G'day boys! How's it going?	
Steve: You know - a farmer's day is never done.	C.
Dave: Yeah - never enough hours to do everything that needs to be done	
was just telling me how he's been trying to clean up the lantana o	n ms
place - you know, improve the environment.Jim: Really? I never thought of you as being environmentally conscious.	ue? How
have you been getting rid of it?	us: 110w
Steve: Well first we tried burning it , but that was a bit hit and miss. The	en I ont
Bill in with his dozer to push it out , but between the seeds re-spr	_
and the sticks and roots re-shooting it seemed to grow stronger that	_
The frost knocked it around for a while but that didn't get rid of i	
went back to the DP 600 when it was really green after that last ro	
rain and gave it a good dose. That's worked best last time we trie	
Jim: Really? You wouldn't give some of those bugs a go? What do the	
them again	-

Dave:	You mean like biological control beetles that bore into the leaves and stems or suck at the stems. I tried them once but couldn't get them to breed up fast enough to knock the bushes over. Then the winter came and the buggers all died off!
Steve:	Yeah - not very bloody reliable them beetles . No, the chemicals aren't too bad if you put them on at the right rate and at the time they will do the most damage.
Jim:	Fair enough - I'll leave the farming to the farmers. Is there any way we can give you a bit of help down at the Council?
Dave:	Funny you should mention it, we were just saying before how we used to get subsidized chemicals from the blokes at the depot and Wal used to come out and see us from time to time and give us some help to keep the pests down. Any chance we could get some help like that from that \$20 environmental levy?
Jim:	Sounds like a fair thing. We've got the staff looking into it now and should get a report back for the next Council meeting . I'd be happy to take your idea to Council to consider when they discuss it. I'll get Veronica to do some investigating on how we can set it up and what sort of costs there would be.
Steve:	Well while your putting that program together, you better make sure that it isn't a one hit wonder. All sorts of weeds have got a strong toehold in the Valley and it is going to take more than a one or two year program to make any sort of significant headway.
Jim:	Yeah - that's a fair enough point. I guess the main idea of the environmental levy was to secure on-going funding for specific works. We also wanted to get out and talk to people about the kind of projects we can do which will really make a difference. I'm sure you boys would have some suggestions.
Dave:	Yeah - I've got a few ideas
Steve:	Me too - I was a bit worried that green levy thing was going to go to stuff like buying more bush and killing more trees making reports to hold up a bookshelf somewhere.
Jim:	No - there's a heap of good information in our area about a lot of environmental problems . We just wanted to make sure we got some clear priorities and a bit of a plan of attack rather than trying to re-invent the wheel.
Steve:	What about taking the issue a bit further afield?
Dave:	Yeah - there isn't much point us cleaning up our area if seeds still wash
	down the mountain from Toowoomba or blow in over the range from Boonah.
Jim:	Boonah. Well, I hadn't given it that much thought I guess. But you have a point. We probably wont get rid of it all for a long time but I could talk to the other Mayors at SEQROC and try to get them to tackle the issue. That would make a fair dent in the state problem. And those guys represent a lot of votes when it comes to dealing with the State Government. I think we could make a real difference!
Jim: Dave: Steve:	Boonah. Well, I hadn't given it that much thought I guess. But you have a point. We probably wont get rid of it all for a long time but I could talk to the other Mayors at SEQROC and try to get them to tackle the issue. That would make a fair dent in the state problem. And those guys represent a lot of votes when it comes to dealing with the State Government. I think we

Jim:	Well boys - now that we've sorted that out I reckon it's time to go whet the whistle, don't you think.
Steve & Jim:	I reckon.
Narrator:	And so - having brought peace and happiness, and perhaps a weed free future to the Valley, Dave, Steve and Jim head into the bar for a couple of cold oneswhile the memories of the damage done by Veronica in bringing the lantana, the camphor laurel and the other weeds fade into an amber haze. The success of the tentative steps made today will echo through time and be judged by those currently learning to finger paint at the Gatton Kindy.

Conservation and Restoration Efforts

Keynote Presentation

Dr. Grant Wardell-Johnson, Senior Lecturer, School of Natural and Rural Systems Management, The University Of Queensland Gatton Campus

Measuring and Evaluating Restoration Success

Dr. Grant Wardell-Johnson, Senior Lecturer, School of NRSM, The University of Queensland Gatton Campus, Q, 4343.

Abstract

Monitoring is the process of repeated assessment of the condition of a resource and is an integral component of adaptive management. Restoration takes place as part of a dynamic system where progress towards 'recovery' can be altered by management regimes. Therefore every monitoring event should be a learning experience, which can lead to change in management actions for improved outcomes. As restoration plantings have diverse goals, monitoring is most effective where objectives have been set and criteria established against which success might be judged. Hence, cost and time as well as accuracy and precision are important components of the monitoring process. I outline some examples of biodiversity research in restoration that can contribute to the development of effective monitoring programs. The presentation will include examples ranging from a case study for quantifying biodiversity values of reforestation, to taxon-free assessments of rainforest recovery that can nevertheless inform the restoration process. How the restoration process interacts with social and financial considerations must also be part of the process. It is more important to have both commitment and a willingness to learn and collaborate than it is to be an 'expert' for monitoring and evaluation to inform restoration efforts.

Introduction

Measuring and monitoring the effectiveness of prescriptions

There are many situations when you don't need to monitor. For example, in restoration when you don't mind how your restoration develops or if you don't feel you need to learn anything

from your restoration efforts. You also don't need to monitor if you don't mind costly and unpleasant surprises.

So, what is monitoring. Simply put it is the process of repeated assessment of the condition of a resource. Monitoring can allow more profound understanding of the environment, provide an early warning system, save money and help to plan actions.

In setting up a monitoring program it is very important to determine the objectives of the program and the timeframe within which you expect results of your restoration. These objectives may be associated with cover, weediness, species richness, some level of similarity to the 'original' or otherwise defined condition or the presence of specific attributes.

Thus, monitoring is part of an adaptive management program. Adaptive management 'Treats management policies as experiments that probe the responses of ecosystems as human behaviour changes' (Lee 1999). Monitoring thus fits within a management framework and is part of the management process (Hockings 2000).

So, how do you monitor the condition of a resource? What should you measure? It depends a lot on what you want to achieve. There have been many approaches established to measure biophysical health. For example, David Tongway and colleagues from CSIRO Sustainable Ecosystems have established a procedure for assessing the biophysical functioning of landscapes using information acquired at two nested scales. They divide the hill slope into zones that either tend to gain mobile vital resources such as water, organic matter and propagules (which they call patches) or lose them (interpatches). At this scale, they describe well-functioning landscapes as retentive of resources, whilst dysfunctional landscapes 'leak' resources out of the system. At a finer scale, they use 11 visually assessable indicators to assess the functional status of the soil in each patch and interpatch. As each indicator has a process-based interpretation, these indicators can be turned into emergent properties reflecting soil stability, infiltration of rainfall and nutrient cycling that have relevance at the hillslope as well as the patch scale. They have determined very good relationships between emergent properties and the variables they represent and good agreement across a range of landscape types.

David Tongway and John Ludwigs work provides a neat example of a system that can be used to monitor condition at any pointing time or used as a regular monitoring tool. It tells much about process. Frequently, restoration practitioners also want to know about the particular elements of the biota that they are seeking to return to a site. It can be very difficult to decide which particular elements should be being monitored and how to go about it. Carla Catterall and colleagues from the Rainforest CRC, Griffith University and The University of Queensland presented a methodology for measuring a range of biota (e.g. Wardell-Johnson *et al.* 2002, Catterall *et al.* in press). The structure of the vegetation has a major influence on the biota present at a site. This group has also presented an outline of the approach used to measure forest structure in relation to restoration recovery (Kanowski *et al.* in press). A variation of this work has been carried out by Grant Wardell-Johnson and students at The University of Queensland (e.g. Royle 2002).

Processes such as seed predation and herbivory can also be part of a monitoring program. In addition, regular photographic assessment can also form part of a monitoring program.

A successful assessment of ecosystem condition requires: adequate data, a clear conceptual framework, and proper research and analysis techniques (Yazvenko & Rapport 1996).

Effective monitoring of forest health within an adaptive framework requires: systematic monitoring to detect the unexpected, careful design to enable explicit application of the precautionary principle as a learning experience (see Lee 1999), replication and repeated measures, and an indication of the magnitude of change detectable through the measurement process.

Adherence to prescriptions does not in itself fulfill the requirements of a precautionary approach because no measurable standards are set for response variables such as population viability of rare biota or patterns in the structure of assemblages. It is plausible that the standards could be followed and yet, for an unforeseen factor, a species could be lost, or a biotic community changed. Thus it is critical that research and monitoring accompany these prescriptions to ensure the viability of selected indicator species and assemblages, and that the prescriptions be modified if necessary. There have been several species proposed by various authors for detailed monitoring to assess ecosystem health. It will also be necessary to monitor vertebrate, vascular plant, and those selected invertebrate assemblages for which expertise is available to allow judgment on impacts of disturbance. Quantitative standards for monitoring in relation to precaution in such matters are given by Calver (in press) and Calver et al. (1999) and included references. Wardell-Johnson et al. (2002) provides a methodology for quantitative assessment of assemblage patterns. Moreover, the publication of yield forecasts and quantity removed at a local level will also be necessary to monitor sustained yield in a given area.

Environmental Management Systems (e.g. ISO 14001 guidelines) must focus on actual outcomes rather than simply be process-oriented. Otherwise it is possible to have an EMS, which faithfully captures unsustainable environmental management (see Geno 1999). Furthermore, evaluations of success will have to be sensitive to the actions taken.

Conclusion

As monitoring programs that are designed to detect the unexpected are expensive, broad involvement in the forest management process is necessary. This will require a collaborative, multidisciplinary and inter-institutional approach to scientific research and monitoring as recommended by Wardell-Johnson & Horwitz (2000). A constructive approach to information collection and its publication and wide dissemination is essential to ensure scientific rigor in research and monitoring for ecosystem health. In turn, a more general cooperative dialogue could be established between civil communities concerning public land management.

References

Abbott, I. & Christensen, P. (1994). Application of ecological and evolutionary principles to forest management in Western Australia. Aust. For. 57:109-122.

Calver, M. C. (in press). The precautionary principle and ecosystem health: a case study from the Jarrah Forest of South-western Australia. In: Rapport, D. J., Lasley, W. L., Rolston, D. E., Nielsen, N. O., Qualset, C. O. & Damania A. B. (eds.), Managing for healthy ecosystems, CRC/Lewis Press, Florida.

Calver, M. C., Dickman, C. R., Feller, M. C., Hobbs, R. J., Horwitz, P., Recher, H. F. & Wardell-Johnson, G. (1998). Towards resolving conflict between forestry and conservation in Western Australia. Aust. For. 61:258-266.

Calver, M. C., Hobbs, R. J., Horwitz, P. & Main. A. R. (1996). Science, principles and forest management: a response to Abbott and Christensen. Aust. For. 59:1-6.

Calver, M.C., Bradley, J. S. & Wright, I. W. (1999). Towards scientific contributions in applying the precautionary principle: an example from Western Australia. Pac. Cons. Biol. 5: 1-10.

Conservation Commission (2002). A new forest management plan for Western Australia: Discussion paper January 2002.

Ehrlich, P. (1996). Conservation in temperate forests: what do we need to know and do? For. Ecol. Manage. 85:9-19.

Geno, B. J. (2001). Competing Forestry management paradigms in Australian State Forests. In: Lawrence, G., Higgins, V. and Lockie, S. (eds.), Environment, Society and Natural Resource Management: theoretical perspectives from Australasia and the Americas, pp 198-211, Edward Elgar, Cheltenham.

Goodland, R. (1995). The concept of environmental sustainability. Ann. Rev. Ecol. Syst. 26: 1-24.

Lee, K. N. (1999). Appraising adaptive management. Conserv. Ecol. 3(2): 3. [online] URL: http://www.consecol.org/vol3/iss2/art3

Lindenmayer, D. B. & Franklin, J. F. (2000). Managing unreserved land for biodiversity conservation: the importance of the matrix. In: Craig, J. Mitchell, N. & Saunders D. A. (eds.), Conservation in production environments: managing the matrix, pp. 13-25. Beatty and Sons, Chipping Norton, NSW.

Roe, J. S. (1852). Report of an expedition under the surveyor-general, Mr J S Roe, to the south-eastward of Perth, in Western Australia, between the months of September, 1848, and February, 1849, to the Hon. the colonial secretary. J. Roy. Geog. Soc. Lond. 22:1-57.

Seydack, A. H. W. (2000). Theory and practice of yield regulation systems for sustainable management of tropical and subtropical moist natural forests. In: von Gadow, K., Pukkala, T. and Tome, M (eds.), Sustainable Forest Management, pp 257-317. Kluwer Academic Publishers.

Wallace, W. R. (1965). Fire in the jarrah forest environment. J. Roy. Soc. W.A. 49:33-44.

Tongway, D.J. (1994). Rangeland Soil Condition Assessment Manual. CSIRO, Melbourne, Australia.

Tongway, David and Hindley, Norman (1995). Assessment of Soil Condition of Tropical Grasslands. CSIRO Division of Wildlife and Ecology: Canberra, Australia.

Wardell-Johnson, G. (2000). Responses of locally endemic and regionally distributed eucalypts to moderate and high intensity fire in the Tingle Mosaic, south-western Australia. Aust. Ecol. 25 (4): 409-421.

Wardell-Johnson, G. & Nichols, O. (1991). Forest wildlife and habitat management in southwestern Australia: knowledge, research and direction. In: Lunney, D. (ed.) Conservation of Australia's Forest Fauna, pp. 161-192. Royal Zoological Society of NSW, Mosman.

Wardell-Johnson, G. & Horwitz, P. (2000). The recognition of heterogeneity and restricted endemism in the management of forested ecosystems in south-western Australia. Aust. For. 63 (3):218-225.

Wardell-Johnson, G., Hewett, P. J & Woods, Y. C. (1991). Retaining remnant mature forest for nature conservation: a review of the system of road, river and stream zones in the karri forest. Proceedings of a workshop on the redistribution of road, river and stream zones. Department of Conservation and Land Management, Perth.

Wardell-Johnson, G., Kanowski, J., Catterall, C. P., Proctor, H. & Reis, T. (2002). Measuring the restoration of rainforest biodiversity: a case study in research design, and its implications for establishing monitoring frameworks. In: Boyes, B. (ed.), Biodiversity - The Big Picture. Proceedings of the South-east Queensland biodiversity Recovery Conference, pp 72-81. Southern Queensland Biodiversity Network.

Yazvenko, S. B. & Rapport, D. J. (1996). A framework for assessing forest ecosystem health. Ecosyst. Health 2:40-51.

Can Eucalypt Plantations Contribute to the Maintenance of Fauna Diversity on the Farm?

Adrian Borsboom, Senior Ecologist, Sustainable Forestry Sciences Unit, Queensland Parks and Wildlife Service (QPWS), Level 2, Block C, 80 Meiers Rd, Indooroopilly, Q, 4068.

Background

Reducing forest-clearing rates through legislation and public education and awareness programs is not enough to ameliorate the impact of habitat loss on wildlife diversity. Restoration is also required and will play an increasing important role in future land management. Establishment of commercial plantations of eucalypts on cleared farmland is a potential opportunity to contribute to the restoration of wildlife diversity on the farm. In southeast Queensland alone, 330,000 ha is available for farm forestry (Anderson and Halpin, 2001). Under the South East Queensland Forest Agreement, 5,000 ha of hardwood sawlog plantations are planned for establishment by June 2003 (DPI, 2001).

Surveys and informal feedback from Queensland landowners involved in the establishment of farm forestry plantations (Harrison et al., 2001; Sewell, 2000; Ashley Sewell, pers. comm. and Neil Halpin, pers. comm.) indicate that either wildlife or environmental values are important considerations in establishing these plantations. However, until recently there had been little research in Queensland or for that matter in Australia, on the potential contribution of farm forestry plantations to the maintenance or restoration of vertebrate fauna diversity on the farm. A limited study conducted 10 years ago at Warrill View in south-east Queensland, surveyed for vertebrates and selected invertebrate species in ungrazed unburnt single species agroforestry plots and mixed species shelter belts (White, 1992; Borsboom, 1993; Hug, 1993). The Warrill View plantings, which were about two years of age when surveyed, were not significantly different in native vertebrate species diversity to the adjacent lightly grazed pasture (Borsboom, 1993). The study found the highest native vertebrate species diversity was recorded in nearby lightly grazed semi-cleared eucalypt forest (Borsboom, 1993). In north Queensland, trees planted to restore links between native forest blocks showed a trend towards increasing ground mammal abundance and species diversity in plantings up to five years of age (Tucker, 2000). Tucker (2000) also referred to unpublished data by A. Jansen indicating a rapid colonization of these restoration plantings by birds. There is currently a study underway examining how biodiversity and ecological function is restored on cleared land under various revegetation programs (Kanowski, 2001). The study has sites in north Queensland, south-east Queensland and north-east New South Wales.

Eucalypt plantations and vertebrate diversity

This paper draws on results from a recently completed study in south-east Queensland that measured vertebrate fauna diversity in various age Gympie messmate (*Eucalyptus cloeziana*) plantations and compared this with fauna diversity in selectively logged eucalypt forest and

cleared, grazed improved pasture (Borsboom *et al*, 2002). The study was sponsored by the Queensland State Government and the Rural Industries Research and Development Corporation (RIRDC). The results of this study show that single-species eucalypt plantations under 11 hectares in area and regardless of age, can make a significant contribution to vertebrate fauna diversity on the farm. The plantations surveyed ranged from 4 months to 40.5 years of age and from 1.5 to 10.5 hectares in area. The 18 sites surveyed (11 in plantations), were either within 100 m of or linked by some form of forest corridor to native forest. On 16 of the 18 sites there were two summer and two winter vertebrate fauna surveys, on the remaining sites there was one winter and one summer survey.

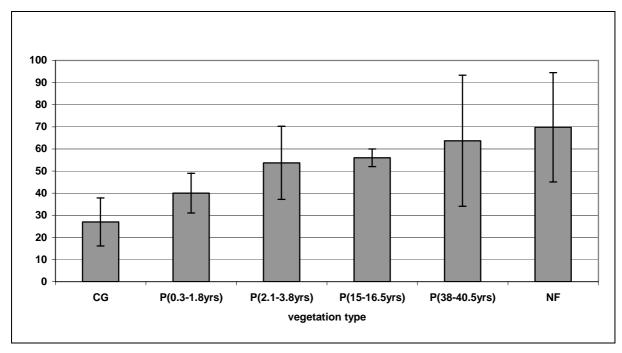
Vertebrate species diversity

A total of 175 vertebrate species were recorded in the Gympie messmate plantations (Table 1). All vertebrate types (i.e. amphibians, reptiles, etc.) were recorded in the plantations, and included rare, threatened, beneficial and potential pest species. Of the 175 species recorded 100 were birds. The plantations regardless of their age had significantly more vertebrate species recorded than cleared, grazed, improved pasture (Figure 1 and Table 2). Vertebrate species diversity was highest in the oldest plantations. Table 3 lists the most commonly recorded native and introduced vertebrate species in the plantations for each vertebrate type. Of the native species only two birds, the grey fantail and the silvereye were recorded on all eleven plantation survey sites, as was the introduced cane toad. Two rare reptiles, one rare frog and one vulnerable frog were also recorded in the plantations (Table 4).

Table 1. Number of vertebrate species recorded on the 11 Gympie messmate plantations in south-east Queensland.

Taxa	Number of Species
Ground Mammals	20
Bats	12
Arboreal Mammals	3
Birds	100
Reptiles	19
Amphibians	21
All Species	175

Figure 1. Mean number of vertebrate species (native and introduced) for each vegetation type. Three replicates per vegetation type, except NF with four and P(15-16.5yrs) with two. The 95% confidence limits are shown, except P(15-16.5yrs) where a standard error is marked. Two winter and two summer surveys per site except sites NF3 and NF4 with only one winter and one summer survey each.



CG = cleared, improved, grazed pasture. P(age class) = Gympie messmate plantation. NF = selectively logged eucalypt forest.

Table 2. Significance levels for the t-test comparisons of mean number of vertebrate species for the six vegetation and plantation types. F-test for equal variances was conducted for each comparison to determine the appropriate t-test.

Vegetation type	P(0.3- 1.8yrs)	P(2.1- 3.8yrs)	P(15- 16.5yrs)	P(38- 40.5yrs)	NF
CG	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
P(0.3-1.8yrs)		< 0.05	< 0.05	< 0.05	< 0.05
P(2.1-3.8yrs)			n.s.	n.s.	n.s.
P(15-16.5yrs)				n.s.	n.s.
P(38-40.5yrs)					n.s.

CG = cleared, improved, grazed pasture. P(age class) = E. cloeziana plantation.

NF = selectively logged eucalypt forest.

Table 3. The most commonly recorded species for each vertebrate type on the eleven Gympie messmate plantation fauna survey sites.

Vertebrate Type	Species	Common Name	No. Sites Recorded On
Native amphibian	Limnodynastes peronii	striped marshfrog	9
Introduced amphibian	Bufo marinus	cane toad	11
Reptile	Lampropholis delicata	eastern grass skink	9
Bird	Zosterops lateralis	silvereye	11
	Rhipidura fuliginosa	grey fantail	11
Bat			
Arboreal mammal	Petaurus norfolcensis	squirrel glider	2
	Petaurus sp.	squirrel or sugar glider	2
	Trichosurus vulpecula	common brushtail	2
		possum	
Smaller native ground mammal (<3 kg)	Melomys burtoni	grassland melomys	6
_	Antechinus flavipes	yellow-footed antechinus	6
	Isoodon macrourus	northern brown bandicoot	6
Smaller introduced	Mus musculus	house mouse	9
ground mammal (<3 kg)			
Larger native ground mammal (>3 kg)	Macropus rufogriseus	red-necked wallaby	7
Larger introduced ground mammal (>3 kg)	Vulpes vulpes	fox	2

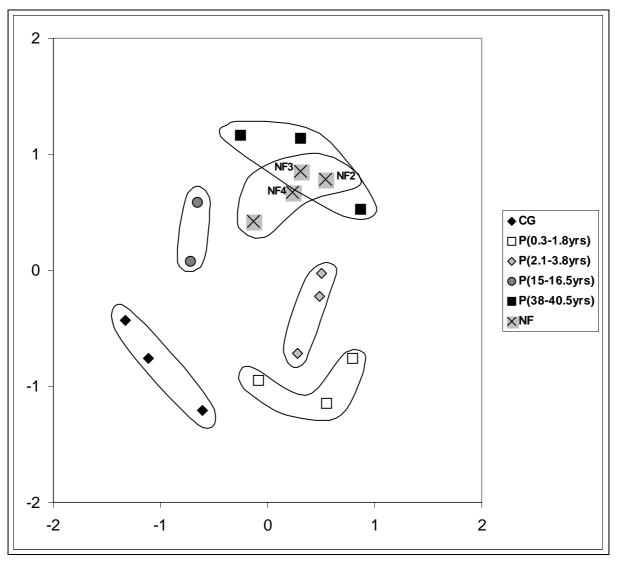
Table 4. Vertebrate species recorded on the 11 Gympie messmate plantation survey sites that are listed in Queensland as either rare or vulnerable to extinction.

Species	Common Name	Qld Status
Crinia tinnula	wallum froglet	Vulnerable
Litoria brevipalmata	green-thighed frog	Rare
Eroticoscincus graciloides	elf skink	Rare
Ramphotyphlops silvia	blind snake with no common name	Rare

Vertebrate species composition changed with plantation age. The ordination presented in Figure 2 is one way to visually compare the complexity of changes and similarities in vertebrate species composition on the survey sites. The ordination shows that species composition was similar on the set of survey sites for each vegetation type and plantation age class (each set of sites is circled in Figure 2). It also shows that the plantations were distinct in species composition from the cleared, grazed, improved pasture, the older the plantation the more the species composition approached the composition in selectively logged native forest. The 38-40.5 year old plantations had a vertebrate species composition that partly overlapped with the vertebrate species composition of selectively logged native forest. Of the 175

vertebrate species recorded in the plantations, 38 were only recorded in the 38-40.5 year old plantations and 66 only in the plantations 0.3-16.5 years of age.

Figure 2. Two-dimensional ordination of vertebrate fauna species recorded on the 18 survey sites. Ordination stress 0.23.



CG = cleared, improved, grazed pasture. P(age class) = E. cloeziana plantation.

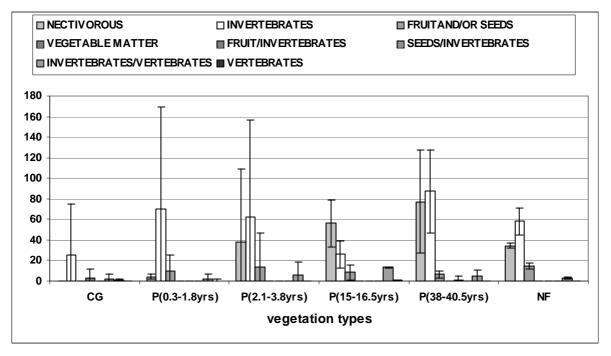
NF = selectively logged eucalypt forest.

Bird and rodent abundance

Only for birds and rodents were survey results adequate to make some comparison of abundance. Birds recorded were assigned to a diet guild and bird abundance in these guilds compared (Figure 3). However, bird numbers in four of the diet guilds were still too low for statistical comparison. Absent from the cleared, improved, grazed pasture sites were fruit and/or seedeaters, fruit/invertebrate feeders, nectar feeders and vertebrate feeders. Birds with either vegetable matter, fruit/invertebrate or seed/invertebrate diets were either absent or in low numbers on all plantation sites. Compared to the 0.3-1.8 year old plantations, there were significantly more nectivorous birds in the selectively logged eucalypt forest (t = 15.197 p < 0.001) and the 38-40.5 year old plantations (t = 6.278, t = 0.01). Invertebrate and invertebrate/vertebrate feeding birds were significantly more abundant in the 38-40.5 year old

plantations compared to cleared, improved, grazed pasture (t = 4.161, p < 0.05; t = 3.741, p < 0.05). Fruit and/or seed feeders were significantly more abundant in selectively logged eucalypt forest compared to the plantations 38-40.5 years old (t = 3.454, p < 0.05). Total bird numbers were significantly higher in the 38-40.5 year old plantations compared to cleared improved, grazed pasture (t = 6.897; p < 0.01) and the plantations 0.3-1.8 years of age (t = 3.243, p < 0.05).

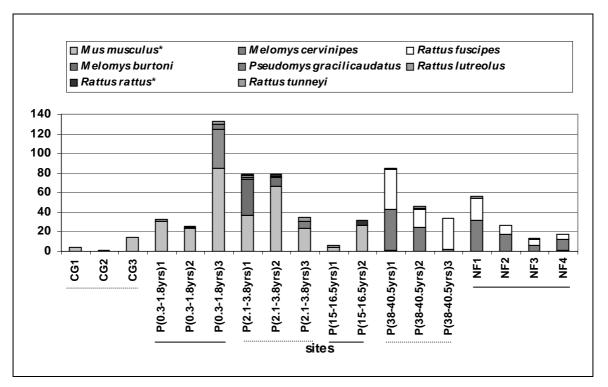
Figure 3. Diet guild breakdown of mean bird abundance for all vegetation types. Three replicates of each vegetation type, except P(15-16.5yrs) and NF2 with two. The results from four sets of two surveys per plot (two winter and 2 summer survey sets). The 95% confidence limits marked, except for P(15-16.5yrs) and NF with standard errors.



CG = cleared, improved, grazed pasture. P(age class) = E. cloeziana plantation. NF = selectively logged eucalypt forest.

Eight rodent species (6 native, 2 introduced) were trapped during the survey period and Figure 4 compares abundance of each species between survey sites. The introduced house mouse (*Mus musculus*) was the most abundant rodent species, but was virtually absent from the Gympie messmate plantations 38-40 5 years of age and selectively logged native forest. Plantations where house mouse numbers were high had a well developed grassy understorey. Where house mouse numbers were low the understorey tended to be either shrubby or the grasses short. The two most common native rodents were the fawn-footed melomys (*Melomys cervinipes*) and the bush rat (*Rattus fuscipes*). The abundance of both species was not significantly different between the plantations 38-40.5 years of age and the selectively logged native forest (t = 0.93, p.0.4); t = 1.473. p.0.2). Both rodents showed a strong preference for sites with a structured, shrubby understorey. This contrasts with two other native rodents, the grassland melomys (*M. burtoni*) and the eastern chestnut mouse (*Pseudomys gracilicaudatus*), which like the house mouse showed a preference for sites with a well developed grassy understorey.

Figure 4. Rodent abundance for the eight rodent species trapped on the 18 study sites. Totals a cumulative total of captures from two winter and two summer trapping periods, except sites NF3 and NF4 with only one winter and one summer trapping period. Recaptures each survey period excluded.



* = Introduced rodent species. CG = cleared, improved, grazed pasture. P (age class) = *E. cloeziana* plantation. NF = selectively logged eucalypt forest.

Vertebrate species richness and plantation habitat attributes

A series of habitat measurements were taken on the vertebrate fauna survey sites during the survey period. For full details of the habitat attributes measured and the analysis thereof see Borsboom *et al*, 2002. Pearson correlation coefficients were calculated that compared the number of vertebrate species recorded on the eleven Gympie messmate plantations with various plantation attributes (Table 5). The plantation attribute with the highest significant positive correlation with the number of vertebrate species present was percentage vegetation cover above 1.8 m (r = 0.81). There was no significant correlation (r = -0.13) between plantation area (within the range of 1.5-10.5 ha) and the number of vertebrate species recorded. The most significant negative correlation with vertebrate species present was the number of grass, sedge and herb species in the understorey (r = -0.67).

The plantations 38-40.5 years old had the highest density of birds and the highest number of vertebrate species recorded in plantations. These older plantations had a well-structured shrubby understorey compared to the grassy understoreys of the younger plantations. Compared to these younger plantations they had:

- Fewer grass species;
- Fewer combined grass, sedge and herb species;
- More combined stump and log biomass;

- More plants with a maximum height of 1.8-3 m;
- More plants with a maximum height above 1.8;
- More plants with a maximum height above 3m;
- More plants with a maximum height above 5m;
- More plants with a maximum height above 15m;
- A higher percentage of leaf litter cover than plantations under 3.8 years of age; and
- A higher percentage of vegetation cover above 1.8 m than the plantations under 3.8 years of age.

The 38-40.5 year old plantations were also ungrazed, had good connectivity to native forest, no evidence of frequent hot burns and had received minimal management since there establishment and initial tending and thinning during about the first four years following planting. However, the relative importance of each of these habitat attributes and management practices to the high vertebrate diversity in these older plantations was not determined.

Table 5. Pearson correlation coefficients and their statistical significance for vertebrate species recorded on the eleven Gympie messmate plantation survey sites versus various plantation attributes. Attribute range in brackets. ns = correlation not significantly different from zero.

Plantation Attribute	Correlation Coefficient	Probability (p) of H_0 : $\rho = 0$
Age (0.3-40.5 years)	0.68	p < 0.05
Area (1.5-10.5 ha)	-0.13	ns
Plantation tree mean height (2.6-42.5 m)	0.73	p < 0.05
Plantation tree mean diameter at 1.3 m (0.95-46.00 cm)	0.74	p = 0.05
% litter cover that includes thinning trash on plantation sites (1.4-60.2)	0.55	ns
% vegetation cover in 0-25 cm height class (34.8-71.4)	-0.42	ns
% vegetation cover in 25-50 cm height class (3.7-41.4)	-0.40	ns
% vegetation cover in 50-180 cm height class (0.4-28.4)	-0.27	ns
% vegetation cover above 1.8 m (5.3-78.8)	0.81	p < 0.01
Log and stump biomass $(0.00000-0.01047 \text{ m}^3/\text{m}^2)$	0.52	ns
Native plant species (30-93)	0.36	ns

Introduced plant species (2-55)	-0.57	ns
Tree, palm, shrub, vine, parasitic and orchid species (16-84)	0.65	p < 0.05
Tree and palm species (2-37)	0.69	p < 0.05
Grass, sedge and herb species (11-92)	-0.67	p < 0.05
Grass species (4-26)	-0.53	ns
Density of plants whose maximum height is 1.8-3 m (50-1833 plants/ha)	0.64	p < 0.05
Density of plants whose maximum height is 3-5 m (0-983 plants/ha)	0.16	ns
Density of plants whose maximum height is 5-8 m (0-575 plants/ha)	0.49	ns
Density of plants with a maximum height of 8-15 m (0-850 plants/ha)	0.48	ns
Density of plants with a maximum height above 1.8 m (417-3933 plants/ha)	0.69	p < 0.05
Density of plants with a maximum height above 3 m (250-2433 plants/ha)	0.68	p < 0.05
Density of plant with a maximum height above 5 m (50-1700 plants/ha)	0.78	p < 0.01
Density of plants with a maximum height above 8 m (0-1283 plants/ha)	0.72	p < 0.01
Density of plants with a maximum height above 15 m (0-950 plants/ha)	0.52	ns

Plantation management to maintain or enhance vertebrate diversity

Planning considerations

To maintain or enhance vertebrate diversity in a plantation requires a degree of planning. Consideration needs to be given to:

- The siting and design of the plantation;
- The species to be planted;
- How the plantation is established;
- How the plantation is managed during its growth stage;
- Time from planting to harvest;
- How the timber harvesting is carried out; and
- Land use following timber harvesting.

Management recommendations

Not all of the management recommendations listed below on how to maintain or enhance vertebrate diversity in plantations are based on the results of the study by Borsboom *et al.* (2000). The management recommendations should also not be seen as exhaustive. The recommendations are:

- 1. Establishing the plantation on previously cleared land (e.g. pasture) with direct and wide connectivity to native forest.
- 2. Where multiple-age plantings are planned ensure plantings of different age are planted along side each other.
- 3. Planting native species (even single species plantations contribute significantly to vertebrate species diversity).
- 4. Minimal ground disturbance when planting, ensuring logs and stumps are retained (e.g. push logs into every second row so access to trees is not hindered).
- 5. Excluding stock or managing grazing pressure to allow a complex shrubby understorey to develop rapidly.
- 6. No removal or burning of thinning and pruning debris (If this debris impedes plantation access place in every second row along with the logs and stumps pushed there during plantation establishment).
- 7. A groundcover maintenance program that encourages the rapid development of a complex shrubby understorey (this will probably require the exclusion of fire from the plantation, a fire break around the plantation and limiting slashing to every second row for access purposes).
- 8. Setting up bat boxes and/or animal nest boxes on poles within the plantation (To maintain access for plantation maintenance and harvest, place boxes away from plantation trees and along the rows into which the logs have been pushed and the shrubby understorey has been encouraged).
- 9. Maximizing the time between planting and harvest (e.g. growing timbers for saw-logs or poles rather than wood chip); Minimizing understorey disturbance during timber harvesting.
- 10. Staggering timber harvesting so no more than 50% of the plantation is harvested in any two year period (this is a simple process in multiple-age plantings).
- 11. Replanting immediately after timber harvesting.

In some instances these management recommendations may not be appropriate. For example, the black rat (*Rattus rattus*) is a major pest in macadamia orchids and will use structurally complex vegetation adjacent to an orchid as refuge habitat (White *et al.*, 1997). In such circumstances it would be more appropriate to keep the farm forestry plantation groundcover very low and sparse. However, the best outcome for vertebrate diversity would have been setting up the farm forestry plantation and the macadamia orchid far enough apart so any black rats living in the farm forestry plantation were no longer a threat to the orchid. This example shows the importance of planning where the plantation will be established in relation to adjacent landuse (current and planned).

Further Reading

For information on animal usage of bat boxes in farm forestry plantations in south-east Queensland see Smith and Agnew (2002). There are also a number of general publications available on nest boxes (*e.g.* Comben, P., 1995). The Rural Industries Research and Development Corporation (RIRDC) are currently developing a book in their agroforestry guideline series on the importance of tree plantings to biodiversity on the farm, how the benefit of trees to biodiversity can be maximised and case studies to support management recommendations. The RIRDC web site is http://www.rirdc.gov.au.

References

Anderson, M. and Halpin, N. (2001). Private Forestry Plantation - Joint Venture Scheme. Second Managing and Growing Trees Training Conference, Queensland October 1998. Pp 413-416 in Proceedings of the Second Managing and Growing Trees Training Conference, 18-21st October 1998. Department of Natural Resources and Mines Queensland. (Published on CD or available via CeesPubs@nrm.qld.gov.au).

Borsboom, A. C. (1993). An assessment of the Landcare program's shelter belts and forest blocks as wildlife refuges at the DPI Animal Genetics Centre, Warrill View. Unpublished report, Queensland Forest Service.

Borsboom, A.C., Wang, J., Lees, N., Mathieson, M. and Hogan, L. (2002). Measurement and integration of fauna biodiversity values in Queensland agroforestry systems. Rural Industries Research and Development Corporation (RIRDC) publication 02/44 (available in a pdf format on http://www.rirdc.gov.au).

Comben, P. (1995). Wildlife boxes for Brisbane and south-east Queensland. Booklet BK28-1 June 1995 (ISBN 0-7242-6500-7) by the Queensland Department of Environment and Heritage (Now the Queensland Environmental Protection Agency).

DPI (2001). Plantation Hardwoods: a new hardwood plantation initiative for South east Queensland. DPI south east Queensland hardwood plantation program brochure and registration of interest form.

Harrison, S.R., Herbohn, J.L., Emtage, N. and Smorfitt, D.B. (2001). Landholder attitudes to farm forestry and incentive schemers in north Queensland. Second Managing and Growing Trees Training Conference, Queensland October 1998. Pp 406-412 in Proceedings of the Second Managing and Growing Trees Training Conference, 18-21st October 1998. Department of Natural Resources and Mines Queensland (Published on CD or available via CeesPubs@nrm.qld.gov.au).

Hug, L. (1993). Birds, butterflies and odonata at Warrill View Farm. Unpublished report, Queensland Forest Service.

Kanowski, J. (2001). How is biodiversity and ecological function restored to cleared land under different types of revegetation. Presentation at the Researchers Workshop 2001 "restoration practices and processes in rainforest landscapes", Rainforest CRC Program 5 rehabilitation and Restoration, Griffith University, Queensland, July 10th 2001.

Sewell, A. (2000). Treecare Program 1/7/90 - 30/6/00. Unpublished Report. Queensland Department of Natural Resources.

Smith, G.C. and Agnew, G. (2002). The value of "bat boxes" for attracting hollow-dependent fauna to farm forestry plantations in south-east Queensland. Ecological Management & Restoration 3(1): 37-46.

Tucker, N.I. J. (2000). Wildlife colonisation on restored tropical lands: what can it do, how can we hasten it and what can we expect? Pp 279-295 in Elliott, S., Kerby, J., Blakesley, D., Hardwick, K. Woods, K. and Anusarnsunthorn V. (Eds), Forest Restoration for Wildlife Conservation. International Tropical Timber Organisation and The Forest Restoration Research Unit, Chiang Mai University, Thailand.

White, N.E. (1992). An assessment of the use of native forest planting and remnant vegetation by koalas (Phascolarctos cinereus) at the Animal Genetics Centre, Warrill View. Unpublished report to Queensland Forest Service.

White, J., Wilson, J. and Horskins, K. (1997). The role of adjacent habitats in rodent damage levels in Australian macadamia orchids. Crop Protection 16(8): 727-732.

Ecosystem Services Research for the Lockyer Valley

Helen Ross, Richard Brown, Ockie Bosch and Hugh Possingham; The University of Queensland.

Contact: Prof. Helen Ross, School Of Natural and Rural Systems Management, UQ Gatton Campus, Q, 4343.

The research team includes Ian Beitz, Ken Keith, Brad Jorgensen and Beryl Rajbhandari from UQ;

and Andrew Davidson and Bruce Boyes from the Lockyer Catchment Centre.

Imagine a future in which a healthy environment supports a healthy economy and high quality of life, and landholders have new sources of income that help them look after this environment. Imagine tree-covered, biodiversity-rich hills made financially viable for their landholders by carbon payments from companies, contracts with a water authority to deliver clean water downstream, and a biodiversity bonus coming from the State or National purse. Imagine crops on the flatter land benefiting from natural pest management from the local biodiversity and designed plantings. Imagine farmers readily contributing a service payment to the other landholders providing those habitats, in recognition of what they are saving in artificial pesticide costs. Now imagine this scenic landscape, and its opportunities for bird, plant and animal watching, proving an attraction for small-scale ecotourism and farm-stay businesses. In this imagined future landscape, maintaining 'natural assets' such as tree cover and biodiversity would become financially viable, and landholders would enjoy a mixed set of incomes making them less vulnerable to the market and climatic risks associated with a single source of farm income. Hopefully small farms could remain more viable than at present, keeping the social fabric intact.

How would we create such an economy? A market could be created for clean water, in which downstream users and an urban water authority pay upstream landholders, through a broker or collective, for managing the environment in such a way that clean water is delivered. This might save an urban water authority substantial cost in upgrading treatment plants. State and Federal governments might create a fund to reward those landholders who manage their land to foster biodiversity, since biodiversity is recognized as a national interest. An integrated pest management cooperative might also develop to 'buy' natural pest management from the landholders providing habitat for useful predator species (birds and insects). Small tourism and recreation businesses based on the scenery and thriving biodiversity could be supported through state and local government initiatives to remove any barriers to these land uses, and provide marketing and capacity building.

Is this far-fetched? Not really. Carbon trading, the notion that large polluting companies can pay others to plant trees to absorb carbon, is already developing internationally. The precedent for water authorities purchasing clean water from a catchment is also established. In 2002 the Commonwealth government provided funding for pilot studies in 'market based instruments', and will do so again in 2004.

First, however, the concepts need to be explored. Thorough preparation needs to be undertaken to establish the feasibility and financial viability of such new forms of investment.

Several Australian research teams have started the task of identifying 'ecosystem services', instances in which the natural assets of our environments provide particular services to society, for instance as inputs to agricultural production or water supply. This involves ecologists identifying the landscape processes involved, and economists developing new economic methods for valuing these processes.

Our research team is conducting preliminary studies towards developing long-term research on ecosystem services in the Lockyer Valley. We combine experience in ecology, social research, resource economics, ecology, geographic information systems (GIS), and working with stakeholders. We are working closely with the Lockyer Catchment Centre, which started research on the potential for market based instruments in 2002 and is interested in continuing to develop these concepts.

The Lockyer Catchment

The Lockyer Catchment (area 2,954 km²; mean annual rainfall 700-1200 mm; population 26,000) provides an ideal case study for quantifying ecosystem services. It covers approximately one quarter of the Brisbane River catchment, and directly drains into Moreton Bay. The economic productivity of its alluvial soils is enhanced by underground water reserves derived from aquifers fed by the fractured elevated basalt and sandstone land systems. However, as a consequence of intensive agricultural development, less than 5% of the original native vegetation on the fertile soils (predominantly *E. tereticornis*) remains, often in poor condition (K. Taylor unpub. data). In contrast, the lower to mid slopes of the elevated sandstone and basalt systems have 30-40% vegetation cover; however, its condition is variable due to a history of clearing, logging, grazing disturbance and more recent low-density rural subdivision disturbance. The vegetation on the higher elevated escarpments is largely intact.

The catchment's capacity to sustain production in the long term is under threat from a number of serious land and water issues, including stressed water resources, declining irrigation water quality, dryland salinity, landslip and hillside erosion, stream siltation and soil compaction (Shaw 1979; LRMG 1994; LCCC 2001). These are all direct or indirect consequences of vegetation removal and degradation (Shaw 1979; LRMG 1994; Andrew Davidson, pers. comm., June 2001). For example, upland vegetation elements play a significant role in the recharge of the alluvial aquifers (Shaw 1979) and, hence, the long-term economic productivity. Similarly, clearing on lower and midslopes has resulted in saline outbreaks and rising salinity in groundwater and soils, especially on the margins of the alluvial plains. The ecosystem services of lowland remnant vegetation are not as well understood. Many remnants are in poor condition, and in urgent need of rehabilitation and restoration. However, it is likely that they provide an important role in groundwater hydrological processes, as well as habitat for invertebrate populations beneficial to crop pollination and pest control. Finally, the ecosystem services provided by local vegetation elements extend beyond the catchment boundaries to include maintaining water quality (especially suspended sediment load) in the lower Brisbane River Catchment and Moreton Bay (Tibbets et al. 1998). These external services need to be factored into the quantification and valuation of ecosystem services of local vegetation elements.

Aims

Our current research project is designed to establish foundations for a large research program to establish the value and roles of vegetation in regional ecosystems, as an important

contribution towards a management framework for creating and maintaining a sustainable rural system in the Lockyer Valley and to national efforts to establish the science of valuing ecosystem services.

The current project aims to:

- Develop a strong collaborative base with Lockyer Valley and broader stakeholders;
- Create an inventory of the Lockyer Valley's natural assets, and their condition;
- Identify the ecosystem services and their roles as inputs to production and maintenance of the natural assets; and
- Commence development and testing of cutting edge approaches to integrated economic, ecological and social valuation of ecosystem services.

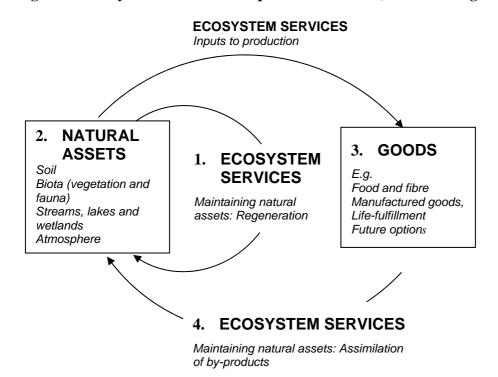
Future projects will continue this work in more detail.

Conceptual framework

The ecosystem service approach is different from other approaches to natural resource management because of the focus on managing natural assets for the values they provide rather than focusing on the problems that arise from inappropriate natural resource management. It highlights the interdependence of ecological processes and the need to adopt holistic management strategies that are capable of adapting to address uncertainty (Binning et al. 2001:6).

The project uses the conceptual framework of Binning et al. (2001) which illustrates the roles of Ecosystem Services in maintaining natural assets and in supporting the production of goods of value to the community involved.

Figure 1. Ecosystem services conceptual framework (After Binning et al, 2001).



Research activities

Combining interests

Our first priority, in 2002, was to consult widely within and beyond the Lockyer Valley, to identify common interest with local governments, local people and organisations, state agencies, and other research teams. We think it important to identify how our research project could help others in their initiatives, and to tailor our work accordingly.

By working collaboratively with key stakeholders, the project will help them in making informed choices about conservation for greater social, economic and environmental benefits through a more strategic, pro-active integrated approach to national vegetation restoration programs. We hope the project will also lead to an improved appreciation of the role native and planted vegetation plays in delivering economic and environmental sustainability for Australia; better landscape design and restoration technologies, knowledge and skills. This should enable planning on a landscape (whole of catchment) scale to enhance ecosystem services, and assist community groups to target their on-ground works more effectively. Improved knowledge and practices from the project will add significant value to national vegetation programs, and to practices fostering community engagement in natural resource management.

At the same time we are establishing a network of relevant staff in state and federal agencies and organisations (CSIRO, DNR, DPI and EPA). Cooperation and agreement to exchange advice and findings has already been established with all key research teams engaged in ecosystems services research nationally.

Zoom lens

In this first project, we are taking a whole of catchment view, and a more detailed look at two small subcatchments, one upland, and one which combines upland and lowland areas including intensive irrigated cropping. These will give a holistic view of what natural assets exist, in what condition, what 'ecosystem services' they provide, and how local people view them.

Then we are looking (in 2003) at a specific issue, the delivery of clean water to Brisbane's water supply, which links to sediment, erosion, riparian management, and potentially other environmental and economic issues.

Social dimensions and economic analysis

We are conducting informal and formal interviews in two subcatchments, to find out how local landholders recognise and appreciate natural assets and any ecosystem services coming from these. Lockyer Catchment Centre interaction with landholders, such as consultation activities towards development of the National Action Plan for Salinity and Water Quality, also contributes to the picture of how landholders view aspects of the environment.

Soon we will conduct a set of 'focus groups', a type of group interview, to explore landholder perceptions of natural assets and ecosystem services further. This will build towards a 'choice modelling' survey, which will enable us to ask about some environmental, economic and policy preferences for the future, and attribute economic values to these. This type of information will help decision-makers of all types, from landholders to local and State

governments to businesses, to consider the public acceptability and financial and logistical viability of new management options.

Inventory and assessment

This step will identify and integrate relevant information already held in scientific, local government and local knowledge forms, using a systems approach/framework based on activity-linkages among the categories below.

Natural assets

A comprehensive GIS-based inventory of the biophysical resources (natural assets) of the Lockyer catchment will be developed by:

- 1. Defining the data requirements for meeting project objectives.
- 2. Developing a meta-data directory of secondary data sources such as State Land and Tree Study (SLATS), the Common Conservation Classification System (Chenoweth and Moore, 2000), Queensland Herbarium remnant vegetation mapping, data available acquired by local councils and the Catchment Centre. Key biophysical data sets sought include: (i) topography; (ii) soil and water resources and their condition; (iii) vegetation communities, cover/density and condition; (iv) land use and land tenure.
- 3. Critically evaluating these data according to their capacity to meet project objectives, and identify additional data requirements. It is expected that additional data on vegetation condition may be required.

Goods produced

The Lockyer Valley is strategically located west of Brisbane, and supports one of the most important agricultural industries in southeast Queensland, valued at \$120 m per year (LCCC 2001). Agricultural industries include horticulture, cropping and grazing, with vegetable, grain and fodder crops grown on the fertile alluvium and grazing on the lower and mid-slopes. The size and value of the different industries in the Lockyer Valley will be determined by accessing shire level data held by the Australian Bureau of Statistics.

Social profile

A social profile of the Lockyer Valley will be developed through local inquiry and socioeconomic statistics derived from agricultural and population censuses. It will form part of a systems analysis which identifies the human dimensions of relationships between Ecosystem Services and economic and social 'goods' produced. These are:

- Activities eg farming, recreation, which form systems links between natural assets and goods produced; and
- Social capital, including demography, social infrastructure, organizations and their networks, social networks and their bases, and how these inter-relate with activities.

Where possible this data will be entered in the GIS.

Identifying the ecosystem services and their roles.

We will list the possible Ecosystem Services from the natural assets identified above, using the findings of other existing ecosystems research projects as a basis for adaptation to Lockyer Valley systems and situation.

We will then categorise these using the conceptual framework above, as:

- Ecosystem Services which form inputs to production of the goods identified above (eg pest control, maintenance of soil health, water filtration, erosion control in vegetable production);
- Ecosystem Services which maintain the natural assets (eg regeneration through nutrient cycling, maintenance of native habitat); and
- Ecosystem Services that maintain natural assets by assimilating by-products of the goods produced (eg assimilation of carbon dioxide from industry by vegetation, detoxification of chemicals by micro-organisms).

We will identify how these ecosystem services are related to the condition and integrity of the natural assets (eg intact, overgrazed, disturbed).

Valuing the ecosystem services

In this project we take a comprehensive view of 'valuing', as including economic, social and ecological values. The approach uses new-generation economic techniques which are capable of integrating these dimensions of value.

This project will lay the foundation for economic valuations in later research phases by conducting a series of Focus Group meetings (a specialised type of group interview) with each of the stakeholder groups, and undertaking a pilot survey to compare values of different options for landscape futures.

Issues identified so far

A number of issues have started emerging in our consultations. Natural assets which are important to stakeholders include:

- Surface and ground water quantity for agriculture, stock, quality of life;
- Ground water quality (salinity);
- Sediment and water quality delivery from the Lockyer Valley to Brisbane River and Moreton Bay;
- Biodiversity;
- Scenery;
- Natural pest management, and
- Riparian areas.

Policy issues include:

• Landholder cost structures (farming finances, sharing costs of providing biodiversity and good management);

- Environmentally appropriate subdivision policies for local governments;
- Assisting the development of tourism, and other economic activities based on natural assets; and
- The potential for a market arrangement between Lockyer Catchment and Brisbane water management.

All of these require further investigation as the research continues.

In the current project we will make progress towards collecting and analysing primary and secondary data, and testing of tools for valuing ecosystem services. In subsequent studies we intend to improve the valuation tools, and work towards a practical framework for integrated vegetation management. We hope the knowledge produced will help organizations and communities in the Lockyer to safeguard the ecosystems and services.

It is important to note that this research team will not be attempting to create new economic and policy instruments for management of natural assets and ecosystem services ourselves. Our role is to develop an information base that others can use to develop these instruments. We appreciate the opportunity to share thinking with the Southern Queensland Biodiversity Network, and look forward to more interaction with many of its members.

Acknowledgements

We thank Andrew Davidson and Bruce Boyes of the Lockyer Catchment Centre, the Gatton, Laidley and Esk Shires, the Environmental Protection Agency, and the recent Scenic Amenity Study (Forest Images et al. 2002) for their interest and assistance.

References

Binning, C., Cork, S., Parry, R. and Shelton, D. (2001). *Natural assets: an inventory of ecosystem goods and services in the Goulburn-Broken Catchment*. CSIRO Sustainable Ecosystems, Canberra.

Chenoweth, A. and Moore, D., (2000). *Common Conservation Classification System for Western Subregional Organisation of Councils*. Chenoweth, EPLA, Brisbane, Australia.

LCCC (2001). Caring for our water: A community water management strategy for the Lockyer Catchment. Lockyer Catchment Coordinating Committee (LCCC), Forest Hill, Queensland.

LRMG (1994). Principles and guidelines for land use planning in the Lockyer. A final draft. Prepared by the land-use subcommittee of the Lockyer Resource Management Group (LRMG), Forest Hill, Queensland.

Forest Images Pty. Ltd. and others (2002). *Scenic Amenity of the Lockyer*. Report to Gatton, Laidley and Esk Shire Councils, the Environment Protection Agency and Powerlink.

Shaw, J.H. (1979). *Land degradation in the Lockyer catchment*. Division of Land Utilisation, Department of Primary Industries, Technical Bulletin No. 39. Brisbane.

Tibbets, I.R., Hall, N.J. and Dennison, W.C. (1998). *Moreton Bay and catchment*. School of Marine Science, University of Queensland, Brisbane, Queensland.

Soil Biodiversity - The Base of the Pyramid of Life on Earth

Mrs. V.D. Burnett, "Rathburnie Estate", Avocavale, Q, 4306.

At the 2001 Biodiversity Recovery Conference I endeavoured to tell <u>how</u> my late husband planned an ecologically and economically <u>sustainable integrated native forest and native pasture management system</u> with grazing as the primary purpose together with native timber production and retention of biodiversity (both below and above ground level).

My layman's presentation today will endeavour to explain <u>why</u> it has been successful in relation to biodiversity. It has been endorsed by Dr. Joe Baker AO, OBE, Chief Scientist with Queensland DPI and Commissioner for the Environment, ACT, "as the way to achieve sustainability in the future".

Land degradation

Degradation of our land - the National Estate - and its biodiversity below and above the surface has occurred - not from the introduction of hard-footed animals but from the way we have fenced them in and allowed them to weaken the original palatable nutritious perennial plants, destroyed trees, indiscriminately burnt plant residues above ground and disrupted the soil biology by intensive tillage.

We cannot go back in time to see the country as it was under Aboriginal custodianship; but this photograph of Kangaroo Grass (*Themeda triandra*) gives some impression of what the country was like when early explorers and settlers described it as "open woodland with oatentype grass" and "like a park".

Figure 1. Taken May 2000, Kangaroo grass between widely spaced trees on road verge similar perhaps to country described in the 1800's.



Degraded soil

Obvious symptoms of deterioration are:

- Lack of ground cover;
- Lack of desirable plants;
- Lack of wildlife;
- Poor water quality;
- Dryland salinity;
- Soil erosion; and
- Greenhouse carbon emissions.

Not so obvious but of primary importance - components absent from our degraded soils are:

- High levels of soil organic matter;
- High levels of microbial activity; and
- High levels of soil carbon.

And we address restoration of these components first if we are to restore above-ground biodiversity, and solve other problems.

Living soil

<u>Plant material</u> is the primary energy source for soil biology. Today it is increasingly important to restore surface and root residues and increase carbon stored in the soil which will then increase water infiltration, fertility and nutrient cycling; decrease carbon emissions, salinity, wind and water erosion; minimise compaction; enhance water quality and quantity - all of which were in balance before white settlement.

Restoration of <u>living soil</u> - the base of the pyramid of life on earth - with its <u>biodiversity</u> is our most important primary challenge today.

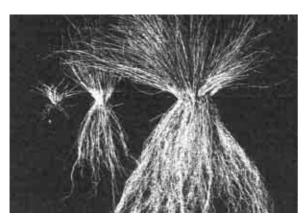
Solutions

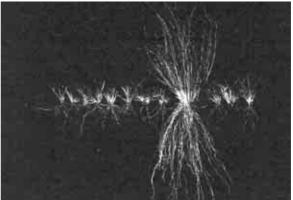
1. Grazing management (biodiversity restoration)

Grazing management, root growth and soil structure are closely related.

<u>Part of the solution</u> lies with changes in grazing management practices both to our vast native rangelands and improved pastures - programmes which can accommodate <u>sustainable</u> <u>improvement</u> in soil, vegetation, biodiversity, salinity and water quality <u>combined</u> with economic production throughout the whole year.

Figure 2. Left - the biomass of the roots and the tops of grasses are roughly equal, forming a mirror image. Right - Continual grazing pressure on the most palatable grasses provides a competitive advantage to the less palatable grasses for water and nutrients.





Rainfall At "Rathburnie Estate" Avocavale, Upper Brisbane River Valley Via Linville				
160 mm	December 1999 onset of prevailing rain season			
99 mm	January 2000			
56 mm	February			
36 mm	March			
31 mm	April			
27 mm	May			
Photographs - Onset of heavy frosts Year 2000				
51 mm	June			
25 mm	July			
0 mm	August			
0 mm	September			
95 mm	October			
128 mm	November			
Nil to 12/12/00	December			

Spell grazing management on "Rathburnie" - native pastures

Cattle are removed from alternate paddocks during 2 alternative wet seasons after the onset of the prevailing rains; and these paddocks are <u>spelled and allowed to set seed</u> before livestock running on the other alternate paddocks during the prevailing rains are allowed to return.

Following photographs - taken May 2000

Figure 3. Rathburnie - whilst tops of grass are frosted and seed has dropped, this hill native pasture was spelled for several months after onset of prevailing rains in December. Early frosts May 2000.



Figure 4. Rathburnie - whilst tops of grass in previous photographs are frosted, this shows the basal green shoots are protected.



86

Figure 5. Rathburnie - Same paddock after being heavily grazed by cows/calves during winter and spring (sufficient ground cover remains to provide cover for ground-dwelling mammals and birds, e.g. ground rail, curlew, quail).



Figure 6. Rathburnie - Basal growth on this paddock showing young protein - rich green matter (trampled dry matter forming surface litter, as does manure from grazing livestock not shown).



Comparison photographs - same day in December 2000 in nearby properties set-stocked and/or burnt

Figure 7. Foreground: unburned road verge (wildlife corridor) lightly grazed by travelling stock. Background: unburned set-stocked paddock.



Figure 8. Foreground: burnt road verge (wildlife corridor). Beyond fence: previous wildlife corridor on roadside still showing some benefit from fertility prior to approved incorporation into grazing block. Behind this strip: set-stocked original grazing area. Background: recently burnt hill.



Figure 9. Foreground: burnt road verge (wildlife corridor). Background: unburned set-stocked paddock.



Figure 10. Foreground: road verge burnt November (wildlife corridor). Background: unburned set-stocked paddock.



Figure 11. Foreground: road verge burnt October (wildlife corridor). Background: river flat not burnt.



Comparison photographs - returning to "Rathburnie" - still same day in December 2000

Figure 12. Unburned set-stocked river flat, between Avocavale and Linville.



Figure 13. Rathburnie Non-irrigated river flat. Self -sown Priebie Prairie and Lousiana White Clover on old lucerne paddock. Angus Bull, Cows and July born Calves.



These photographs illustrate how changes in <u>grazing management</u> can provide part of a solution.

2. Native woodland management

With proper planning for retention areas (including riparian zones) and an appropriate spacing regime in native woodlands, grass and timber can be jointly produced and assist in maintaining soil biodiversity by root penetration and surface litter as well as surface biodiversity and habitat requirements of native plants and animals.

Degraded land can be encouraged to naturally regenerate or may do so after fires encroach.

This regeneration can then be managed in a commercial manner:

- 1. If an area is deemed to be most useful and practical as a retained woodland or harvested for ethanol production etc then legislation and management should reflect that.
- 2. If the area is best suited to intensive agriculture then retaining an open woodland over the area would not be in the best interests of the landholder who should then establish perimeter windbreaks, practice conservation farming and use deep-rooted lucerne leys in the rotation.
- 3. However on our vast rangelands the opportunity exists for <u>co-use</u> of the area for multiple purposes either with grazing as the primary objective and timber and by- products secondary operation or vis-a-vis.

Multiple purpose use should endeavour to restore the balance - the biodiversity which existed before white settlement in open grassed woodland with widely spaced trees "you could gallop a horse through" or "ride through with a horse and dray".

I have explained how we can restore the perennial grasses; and CSIRO at Kingaroy found 80 stems per hectare of Narrow-leaf Ironbark and Poplar Box had little effect on grazing herbage biomass.

Sean Ryan and Dave Taylor of Queensland Forestry Research Institute have conducted experiments and field days on management of Native Woodlands; and they are dedicated to the maintenance of biodiversity outside nature reserves through wise retention and use of native woodlands on farms. I commend their work and that of Greening Australia's Ken Matthews to you. It now remains to integrate their <u>native woodland management</u> with <u>grazing management</u> to restore <u>biodiversity</u> within scientific and economic constraints; and we hope to do this on "Rathburnie" in the coming years.

3. Fire management

Indiscriminate and often regular burning of pastures in order to obtain a "green pick" is justified by unthinking landholders on the grounds "the Aboriginals burnt". They ignore the obvious - this is no longer the same landscape the Aboriginals knew and cared for by intermittent mosaic cool burning regimes which took place towards the end of winter. They also ignore the fact that ruminants need roughage as well as a proportion of protein; wild fires are very destructive of biodiversity and ground litter needed to create Living soil, and often endanger property and lives. They ignore the fact that burning at certain times encourages mature seed pods to open and germinate thickly in the ash, promoting dense regrowth to cover the bare earth. This regrowth is subsequently destroyed and burns, thus increasing greenhouse carbon whilst destroying ligneous cellulose which could provide cheaper ethanol than that from monoculture cropping which could be used instead for bio-diesel production. They ignore the fact that grass fires are much less destructive than are the wild tree-top fires exploding in regrowth forests.

Figure 14. November 2001. Roadside fire on Esk/Toogoolawah property photographed as I returned from the 2001 Biodiversity Conference.



Figure 15. Next day on "Rathburnie" a fire lit by upstream landholders seeking a 'cool burn' after 1" of rain fell following a very dry winter and spring jumped our winter-prepared fire breaks. This photograph shows damage which occurred to boundary fencing.



Figure 16. The same fire burnt regrowth remaining untreated (as listed "Of Concern") after establishment following a similar encroaching fire fanned by a severe north-westerly wind during the Brisbane Commonwealth Games.



It certainly is "of concern" to me as a landholder of freehold land - it provides neither grazing nor mill timber, nor litter to replenish the soil. Nor can it offset greenhouse emissions (even if Kyoto Protocol is ratified) as it germinated before 1990. Perhaps it encourages rainfall - I hope so!

The importance of living soil - Australia

The Sustainable Grazing Systems program from Meat & Livestock Australia have learned some important principles for testing changes to grazing management according to Lucinda Corrigan, Beef Improvement Association and Independent Board Member of the CRC for Plant Based Management of Dryland Salinity:

"The first of these is that graziers need to understand the movement of water through the landscape. We know for certain that prior to clearing and establishment of grazing, the water cycle was largely in balance with a low level of leakage into the underground aquifers.

The second and closely related issue is that annual (improved) pasture systems have reached their use-by-date because there is too much leakage into the water table, in turn mobilising salt and moving it to other places in the landscape.

The third important issue is the role of strategic grazing and spelling, based on an understanding of the requirements of an individual farming business, the need to control weeds or sustain perennial pastures.

There is now a sense of urgency to implement better grazing systems because of the understanding of how 'out of sync' the water cycle is in many farmed environments."

The importance of living soil - worldwide

According to US Natural Resource Conservation Service, the rate of soil loss on US rangelands is twice the rate of soil replacement; and soil loss from US croplands is more than four times the rate of replacement.

US Range Management Consultant, Dave Pratt, states:

"To make matters worse, when our soil erodes we are degrading the health of the soil that is left, burning removes organic matter returned to the soil, it also tends to expose the soil, making the surface more vulnerable to erosion and susceptible to capping.

Continuous grazing reduces the total root volume; and as 50% of plant growth occurs underground, most people aren't aware that 70-90% of the organisms in a rangeland ecosystem live underground or that one cup of healthy soil contains more than 6 billion living organisms.

The key to creating and maintaining a healthy soil is providing habitat and nourishment for the organisms in the soil.

The micro-organisms decompose organic matter and create HUMUS which holds 30 times more nutrients than clay, absorbs five times its weight in water and increases oxygen availability in the soil."

Conclusion

As I have tried to explain, we cannot afford economically or biologically to lose the <u>humus</u> in our soils.

Let us in Australia show the Americans we know how to care for <u>our land</u> and <u>our</u> biodiversity.

I should like this Conference to consider the following resolutions:

- 1. <u>Recovery of biodiversity of the soil's micro-organisms</u> on which all living organisms above ground level depend should be the first concern of this biodiversity conference.
- 2. <u>Regrowth timber optimum spacing</u> to allow integrated timber and grass production should be written into Vegetation Management Legislation to aid recovery of the biodiversity of living organisms below and above ground level.
- 3. <u>Fire management</u>. Education, research and legislation is required to ensure biodiversity is restored not devastated by indiscriminate burning-off of native pastures and native woodlands.

My thanks for the opportunity to attend this Conference to Lockyer Catchment Association, Southern Queensland Biodiversity Network, Gatton and Laidley Shire Councils, and to Bruce Boyes and Nigel Kimball for its excellence.

I hope a future Biodiversity Conference will be held at Lions Camp Duckadang in association with the Council of the Shire of Esk; and I (as Trustee under the will of my late husband G.C. Burnett) can welcome you on "Rathburnie" adjoining.

Thank you for the time you have taken to listen to a farmer's point of view.

May your God go with you.

Rathburnie Estate

An Environmental Estate so named by Justice Murray Wilcox when President of the ACF as one "in which economic farming practices are conducted with minimum ecological impact":

- 1700 acre hill property with flats on Avoca Creek and irrigated flats on the Brisbane River below the junction of Cooyar Creek which rises in the Bunya Mountains;
- 180 river miles from the river mouth;
- 500 feet above sea level; and
- Average rainfall 30 inches per annum

Prior to retirement - running 300 Angus breeders, turn-off prime yearlings and surplus organically grown lucerne hay.

Property now subject to long-term lease and covenants, with exception of 40 acres adjoining the Homestead retained. Improvements including farmhouse and cottage are situated on leased property with access from Avoca Creek Road.

Bequeathed by the late G.C. Burnett in 1987 to World Wide Fund For Nature (Australia) in trust for demonstration, education and research into sustainable systems. As Trustee during my lifetime, and now aged 75, I endeavour to carry out his wishes.

References

Burnett G.C. (1984). Rathburnie Environmental Estate. "Plant a Tree" A working Guide to the Greening of Southeast Queensland ISBN. 0 9594025 1 9 Pp. 75-76.

Corrigan L. (2002). BIA National Treasurer and Independent Board Member of the CRC For Plant Based Management of Dryland Salinity. Changing Approaches to Pasture. Australian Farm Journal, June 2002.

Jones C.E. (2000). Grazing management for healthy soils. Stipa Inaugural National Grasslands Conference "Better Pastures Naturally" Mudgee NSW Pp.68-75.

Jones C.E. (2002). Understanding Soil to Achieve Sustainable Grazing. Stipa Native Grasses Association Conference, Dookie, Victoria and Australian Farm Journal June 2002 Pp.62-63.

Jones C.E. (2002). Building New Topsoil. Stipa native Grasses "Changing Landscapes" Forum Armidale, 3 May 2002.

Pratt D. (2000). Senior Consultant, Range Management Consultants, USA, email pratt@mail.cwnet.cmo. Microbes and Organic Matter Keys to Healthy Soil. Australian Landcare published by Australian Farm Journal June 2000 Pp. 43-44.

Ryan, S. & Taylor, D. (2002). Mary Valley Sunshine Coast Farm Forestry Association & Queensland Forestry Research Institute for Food & Fibre Sciences, Qld DPI.

Walker J., Robertson J.A. & Pentridge L.K. (1986). Division of Land & Water CSIRO and Sharpe P.J.H. Texas N & M University, Biosystems Division, College Station Texas USA. Effect of Trees on Grazing Herbage Biomass, Herbage Response to Tree Thinning in a *Eucalyptus crebra* (Narrow-Leafed Ironbark) and *E. populnea* (Poplar Box) woodland Kingaroy. Australian Farm Journal of Ecology Vol II Pp. 135-140 and Pp. 574.5/1

Wylie P. (2002). Horizon Rural Management - Dalby Q. Good Crops Reduce Salinity. Australian Farm Journal Pp. 46-47 February 2002.

Recovery Actions for Endangered Species Corchorus cunninghamii

Shannon Parr, Ranger, Brisbane Forest Park, 60 Mt. Nebo Rd, The Gap, Q, 4061.

The Rainforest Ecotone Recovery Team (RERT)

The Rainforest Ecotone Recovery Team was established to identify best practice management strategies for land managers of rainforest ecotonal habitats in Southeast Queensland. The Natural Heritage Trust has provided funding over the last two years to initiate both habitat recovery and monitoring programs. Additional funds have been provided by numerous stakeholders in the project including: Brisbane Forest Park, Redland Shire Council, Brisbane City Council, Gold Coast City Council and the Queensland Herbarium. The program relies largely on community and volunteer participation, in both identifying additional populations and maintaining habitats through weed removal. A State Recovery Plan is now being drafted for public approval.

The project approach

The project aims to answer key questions regarding the biology, ecology and habitat requirements of *Corchorus cunninghamii*.

Recovery plan objectives include:

- Updating and improving existing knowledge of the ecology and distribution of *C. cunninghamii* in south-east Queensland and north-east New South Wales;
- Protecting and/or enhancing wild populations of *C. cunninghamii* and their habitat from further decline by developing management strategies for land managers;
- Shifting the current conservation status of *C. cunninghamii* from endangered to vulnerable; and
- Increasing community awareness and involvement in maintaining and enhancing populations of *C. cunninghamii*.

Actions needed:

- <u>Action 1</u>: Investigate population dynamics by tagging and monitoring the life history of individual plants in existing populations of *C. cunninghamii*;
- Action 2: Investigate the role of fire and weed disturbance on the ecology of individual plant populations;
- <u>Action 3</u>: Implement management programs (eg fire and weed disturbance regimes) that improve the habitat of known populations of *C. cunninghamii*;

- <u>Action 4</u>: Preparation and distribution of educational material (bookmarks and posters) highlighting the endangered status of *C. cunninghamii* to conservation groups and the general public; and
- <u>Action 5</u>: Recruitment of community volunteers to participate in monitoring and habitat recovery programs.

Corchorus cunninghamii

Corchorus cunninghamii is a perennial semi-herbaceous shrub growing to 1.5 m high, occurring in the ecotone between sub-tropical rainforest and open eucalypt forest. At present it is only known from 3 populations in northeast New South Wales and 13 in southeast Queensland.

Figure 1. Current locations of Corchorus cunninghamii in southeast Queensland and northern New South Wales.



The following description has been adapted from Harden (1990), Halford (1995) and Stewart (2000). Plants are non-lignotuberous with glabrous or sparsely hairy stems. Leaves are alternate, lanceolate, glabrous, base rounded or cordate, apex acute to acuminate, margins finely toothed, petioles 1-2 cm long. Stipules are ovate to 1 mm long and have a gland on the adaxial surface. Inflorescences are axillary or leaf opposed on the upper stem, cymes 3-8 flowered, peduncle 2-7 mm long, pedicels 5-12 cm long. Sepals 4 or 5, pale yellowish green, 7-11 mm long, petals 4 or 5, yellow, narrowly obovate, 9-11 mm long. Stamens numerous, 60-80, inserted on a lightly expanded disc. Ovary 2-5 locular, style simple, ovules several per loculus. Fruit an ascending, elongated capsule 1.5-3.5 cm long; 4-6 mm wide; 3-4 loculed; apex acute to rostrate, dehiscing along its full length. Seeds 2-22 per loculus; 2-3 mm long; brown to black.

Figure 2. *Corchorus cunninghamii* sketch (courtesy of the Queensland Herbarium).



C. cunninghamii is often confused with common associated species such as Abuliton oxycarpum (flannel weed), Trema tomentosa (poison peach) and Ageratina riparia (mistflower) when not in flowering season.

Phenology

Corchorus cunninghamii is recorded to flower from October to December, often continuing through to May, with some flowering evident throughout the entire year. Seeds are produced from December to May. Census data recorded from this project further supports evidence that flowering and fruiting may extend beyond May. This may be the result of the varying weather we have been experiencing this year.

To date few pollinators have been recorded for this species. It is suggested that insects are the primary pollinators *C. cunninghamii*, including *Apis mellifera* (the introduced honeybee),

which has been observed visiting cultivated specimens. Floral nectaries and glands on its stipules may attract insects but there does not appear to be any attractant to promote larger animal dispersal. It is suggested that *C. cunninghamii* is self-incompatible (explaining the solitary existence of only 1 plant at a site within Brisbane Forest Park for a number of years).

Table 1. Distribution.

Site Code	Land Tenure	Area (m2)	No. of Plants (2001)	No. of plants (2002)
W1	Freehold	225	252	Continuing
W2	Road Reserve	225	63	30
W3	Council Reserve	5045	4365	258
01	Edward Corbould Reserve and Nature Refuge	300	8	8
O2	Edward Corbould Reserve and Nature Refuge	225	4	0
BFP1	Water reserve	8000	50	6
BFP2	Water reserve	2500	153	124
BFP3	Land held by Brisbane City Council in Fee Simple	125	9	34
BFP4	Forest Reserve (interim tenure)*	n/a	1	0
BFP5	Forest Reserve (interim tenure)*	500	Not located at this date	131
BFP6	Forest Reserve (interim tenure)*	n/a	Not located at this date	1
EC1	Gallipoli Barracks - Training Area	2125	Not located at this date	306
MTC1	Road Reserve	120	28	11

^{*} These three sites were part of State Forest 309. Under the South East Queensland Forest Agreement, State Forest 309 has been transferred to an interim holding tenure (Forest Reserve) managed by the Queensland Parks and Wildlife Service, while allocation of final protected area tenure is being determined.

Habitat

Throughout southeast Queensland, *Corchorus cunninghamii* occurs predominantly on slopes anywhere between the ridge and gully depending on the position of the open forest and rainforest ecotone with which it is associated. Previous studies had indicated that it appears to favour the cooler, hillcrest or upper slopes of hilly terrain with a southerly or south easterly aspect, but this has had less correlation with present plant populations. Recent field observations indicate there is no significant correlation between population presence and elevation, with populations extending from 140-430 metres over its distribution range. Generally it is found on a shallow well-drained soil, with a stony nature, possibly of a loam or clayey consistency (kept towards the dry end of the scale and not continually moist which can lead to bacterial rot of stems and roots).

Spatial distribution

Current distributions of *Corchorus cunninghamii* within southeast Queensland depend on the coincidence of:

- Distribution of suitable habitat and solar radiation;
- Seed availability, either dispersed or freshly dropped from growing plants or as soil stored seed; and
- A disturbance regime favourable for germination, growth and reproduction.

C. cunninghamii has no apparent mechanism of seed dispersion, with no ejecting seed body or elaisome/ant-attracting body to facilitate wide spread distribution. Gravity disperses the seeds a limited distance from mature plants as suggested in field observations of clumped seedlings surrounding a mature plant. Most sites have evidence of soil disturbance, possibly from ground foraging birds including scrub turkeys, which may facilitate spreading the seeds over a few metres through soil displacement. Additionally foraging birds may swallow seeds for nutritional value, but due to the hard seed coat, the seed may pass through the digestive system unharmed and might theoretically be another mechanism of seed dispersal. No records of this have been recorded and such studies would be difficult to monitor.

Deliberate and accidental soil movement may be a contributing factor to spreading and/or initiating many new populations. Slashers and track graders may carry seed trapped in the soil in their tires and transport it short distances along tracks.

However since soil-stored seed densities are relatively low, the minimal amount of soil movement associated with accidental soil movement, make significant dispersal events limited. In newly disturbed areas from clearing tracks and or vehicle movement, seedlings usually emerge within 30 cm of the track where high levels of solar radiation permeate the newly agitated soil and there is less competition from weed species. Continued existence of the population at Mt Cotton appears to have been facilitated by track graders.

Distribution of plants over a site is also highly dependent on solar radiation levels permeating through the canopy to the soil. Field observations indicate that population density is greater closer to the edge of the track where light levels are greatest. Studies determining the effects of manipulation of the canopy and track clearing would be useful in determining the management of such disturbed areas.

Ecology and threats

Whilst *Corchorus cunninghamii* is a naturally rare, it is also directly threatened by loss of habitat as a result of development, genetic isolation, competition with introduced weed species (particularly *Lantana camara*), inappropriate fire and land management regimes and forestry activities.

Disturbance plays a beneficial role in the germination of *C. cunninghamii*. Components of current disturbance regimes through southeast Queensland differ in intensity, frequency and nature compared to a 'natural' disturbance regime.

Disturbances associated with back burning, vehicle trail clearing and regeneration activities have vastly altered the ecotonal habitat, with lantana infestations often unattended and competing with existing ecotonal species. Additionally invasions by exotics have suffocated

the ecotone and associated rainforest and appear to have been damaging to the survival of *C. cunninghamii*. Manual weeding regimes and/or high intensity fire (which is required to break the dormant hard seed coat of *C. cunninghamii*) can significantly improve the quality of the ecotone in both the short and longer term. Disturbance benefits however are highly dependent on the frequency of disturbance with excess disturbance having a deleterious effect on the soil stored seed bank and eventually depleting the population.

Conservation Status

Corchorus cunninghamii has a restricted distribution occurring naturally within a 120 km region between Brisbane (Queensland) and Lismore (New South Wales). It is currently known from only four locations in southeast Queensland (Brisbane Forest Park, Mt Cotton, Wongawallan and Ormeau) and two locations in northern New South Wales (Toonumbar, and Bungabbee). In Queensland the species has an estimated total population size of around 6772 individuals, which is an increase from the 1032 individuals recorded the previous year. In New South Wales the estimated population size is between 600-700 individuals (NSW National Parks and Wildlife Service, 1999).

Its low numbers, natural rarity and restricted distribution all contribute to *C. cunninghamii* being listed as Endangered under the *Queensland Nature Conservation (Wildlife) Regulation*, 1994 (Schedule 2, Part 2) and the *New South Wales Threatened Species Conservation Act*, 1995 (Schedule 1). The Commonwealth under the *Environmental Protection and Biodiversity Conservation Act*, 1999 also lists it as Endangered. The New South Wales National Parks and Wildlife Service (1999) are currently preparing a recovery plan for the species in NSW. A recovery plan for Queensland is being simultaneously prepared for on behalf of the Rainforest Ecotone Recovery Team (Saunders, 2001).

Monitoring sites

Monitoring populations of *Corchorus cunninghamii* provides insight into the rate of recruitment, age/size related mortality and its association with the rainforest ecotone that is desirable to the management of populations. Studies indicate that this herbaceous species lives for approximately 3-4 years and is predicted to reach its reproductive stage after approximately 1 year. Further studies would be desirable to indicate the exact age of reproduction. *C. cunninghamii* has been shown to grown 1.5 m in the wild (2m in cultivation) however no records of large plants in natural systems are available. Under recommendation by the NSW recovery team, large-scale monitoring programs are likely to be beneficial in determining population dynamics and associations with the ecotone.

Ecotone recovery sites

Fire has proven to stimulate the hard dormant seed coat of *Corchorus cunninghamii* seeds through the physical effect of heat and or the physiological effects of smoke. Monitoring the habitat and regeneration of *C. cunninghamii* after burning, management options can be idealised, with the potential to minimise weed competition. Trials done on *ex-situ* soil samples taken from Toonumbar indicate that seed germination is optimal at 90°C with smoke stimulation thus field tests under similar treatments have been implemented on a larger scale in this project.

Also desirable, are the implications of weed management on both *C. cunninghamii* and other ecotonal species. Often weeding is a more desirable management option and causes limited

negative effects to more sensitive ecotonal species. Large-scale, initial manual weeding operations have been implemented to determine the benefits of such disturbances, however trials concerning seasonal weeding i.e. before preferred germination season is yet to be started.

These recovery sites will help determine any changes to habitat values including the invasion of *Lantana camara* and to monitor the habitat and the regeneration of *C. cunninghamii* after burning.

References

Halford, D. A. (1995). Conservation statement and draft recovery plan for *Corchorus cunninghamii* F. Muell. Tiliaceae. Australian Nature Conservation Agency, Endangered Species Program, Project No. 515.

Greening Australia website www.qld.greeningaustralia.org.au (see our documents online).

Harden, G. J. (1990). Tiliaceae. *In*: Flora of New South Wales Volume 1. N.S.W. University Press 318-319

Natural Heritage Trust www.nht.gov.au

Parr, S (2001). Recommended Recovery Actions for *Corchorus cunninghamii* and the Rainforest Ecotone in South-east Queensland. Prepared for the Natural Heritage Trust on behalf of the Rainforest Ecotone Recovery Team (RERT).

Saunders, M. (2001). Recovery plan for the endangered native jute species, *Corchorus cunninghamii* F. Muell in Queensland. *Draft only*

Stewart, B. (2000). Population dynamics and disturbance regime requirements of *Corchorus cunninghamii*. Stage 1 Report. Prepared for the N.S.W. National Parks and Wildlife Service by Landmark Ecological Services Pty Ltd. *Draft only*

Adaptive Management of Acacia perangusta in Relation to Fire and Timber Harvesting

Jodi Rees, Botanist, Sustainable Forestry Sciences Unit, Queensland Parks and Wildlife Service (QPWS), Level 2, Block C, 80 Meiers Rd, Indooroopilly, Q, 4068.

Abstract

The vulnerable Acacia perangusta is restricted to southeast Queensland, found only in the Brisbane and Burrum River areas (Barker, 1999). Apart from Daisy Hill Forest Reserve it has not been recorded in any protected area, so populations occurring in State forests are important for its conservation. Current protective measures under the Nature Conservation Act 1992 for A. perangusta have the potential to greatly restrict timber production in State forests where it occurs. Adaptive management techniques have been devised to maintain harvesting of timber in such areas, while ensuring A. perangusta is adequately protected. Disturbance to A. perangusta plants and habitat by timber harvesting activities in March 1999 and a subsequent 'top-disposal' burn provided an opportunity to monitor the effects of such disturbances on A. perangusta, and refine management guidelines based on its response. Plots were established four months after timber harvesting and monitored for a total of two years. A. perangusta was found to be a fire sensitive species. Cool fires killed mature plants, but medium to high intensity fires were required for seedling recruitment. It appears to be well adapted to the disturbance associated with infrequent timber harvesting, however management is required to ensure that such disturbances take into account the life history of this species. A variable fire regime should be maintained with autumn fires every 10-30 years, avoiding low-intensity fires. Monitoring and adaptive management should continue for A. perangusta, and the results of this study utilised in the management of other listed acacia species with similar life histories.

Introduction

Acacia perangusta is listed as vulnerable under the Queensland Nature Conservation Act 1992 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. It is a shrub or small tree that is easily confused with the common Acacia fimbriata. A. perangusta is restricted to southeast Queensland in the Brisbane and Burrum River areas. The distribution on State land includes Wongi and Vernon State forests, north of Maryborough, and Daisy Hill Forest Reserve in Brisbane. Although A. perangusta shares life history traits with other acacias, its specific response to fire and disturbance had not been recorded prior to this study.

Queensland Parks and Wildlife Service (QPWS) compile species Management Profiles (SMPs) for endangered, vulnerable and rare taxa occurring on state land, including *A. perangusta* (Barker, 1999). They provide information on the description, biology and ecology, habitat, conservation status and distribution, threats and management, as well as

references and information sources. If little is known about a species, complete protection from disturbance is usually recommended until more information becomes available. Threatening processes listed on the SMP for *A. perangusta* include disturbance of habitat by timber harvesting and inappropriate fire regimes. The *Queensland Nature Conservation Act* 1992 requires no collection or damage to any part of a listed plant, so protective measures listed on the SMP exclude harvesting operations from populations of *A. perangusta*.

This was a management issue in Wongi State Forest (near Maryborough) where harvesting was taking place in March 1999. The presence of *A. perangusta* was noticed after harvesting had commenced and some plants were damaged by snig track or log ramp construction. This provided an opportunity to monitor the effects of such disturbances (and a subsequent top disposal burn) on *A. perangusta* as part of an adaptive management program (see box below).

Adaptive management

Our understanding of Endangered, Vulnerable and Rare (EVR) species and our ability to predict how they will respond to management is limited. Adaptive management is a formal, systematic and rigorous approach that tests, refines and improves management decisions. Actions and objectives are then adjusted based on the monitoring and improved understanding. In using adaptive management we are trying to:

- Find better ways of meeting the objectives of management;
- Identify key gaps in knowledge of EVR species, improve understanding of EVR species' responses, thresholds and dynamics in order to adopt practices to fit changing ecological conditions;
- Gain reliable feedback on the effectiveness of EVR management actions; and
- Encourage innovation in EVR species' management and pass on information and experience gained.

The aims of the study were to:

- Determine the response of *A. perangusta* to disturbances associated with timber harvesting operations;
- Utilise the results of this study to evaluate and refine management prescriptions to allow timber harvesting activities without compromising conservation of this species; and
- Apply these prescriptions to other listed acacias with similar life histories.

This paper covers only part of the study and copies of the full report are available (Rees, 2002).

Methods

Replicated 100 m² plots were established four months after harvesting had taken place in native eucalypt forest in Wongi State forest. Treatments consisted of subjecting plots with and without timber harvesting debris (such as branches and tops of trees) to experimental fires ignited with a drip torch. Mature plants and seedlings were monitored regularly over two years (Rees, 2002).

Results and discussion

Fires with harvesting debris present burned hotter, evidenced by greater scorch height and greater degree of fine fuel consumption (which determines how hot and to what depth the soil heats, and has subsequent impacts on breaking of seed dormancy) (Figure 1a). At the time of the experimental burn, it had been wet so it was difficult to ignite plots where there was not much fuel accumulation/harvesting debris. This resulted in patchy cool burns in plots where there was no harvesting debris.

Post-fire there were more seedlings in burnt plots with debris than burnt plots without debris (Figure 2), which suggested that fires where debris was present were hot enough to break seed dormancy and stimulate germination. By the end of the study, there were more seedlings in the burnt plots collectively than the unburnt plots, which translated to recruitment into the adult cohort in burnt plots with debris. A flush of seedlings was evident in the first year following treatment with fire (particularly in the plots with harvesting debris), and numbers were almost back to pre-harvesting levels by the end of the two year study. This supports the work of Purdie (1977), who reported that most seedling regeneration in dry sclerophyll forests occurs during the first year after burning, with seedling input in the second year being extremely low.

Overall, plots without debris had a higher density of mature plants than those with debris (in all plots at all times) (Figure 3). This can be attributed to the physical damage inflicted by falling trees. Fire very obviously reduced the number of plants, regardless of the temperature of fire. By the end of the study: the numbers of mature plants in unburnt plots stayed constant, both with and without harvesting debris; in burnt plots with debris the numbers increased; and in burnt plots with no debris the numbers decreased and stayed below pre-fire levels. Importantly, in burnt plots with harvesting debris, the numbers were in the pre-fire density range by the conclusion of the study i.e. recovery had occurred.

Figure 1. Result of experimental fire with (a) high (left) and (b) low (right) degree of fine fuel consumption. Note scorch height on trees.





Figure 2. Effect of fire on mean density of seedlings over the course of the study. Error bars show 95% confidence intervals.

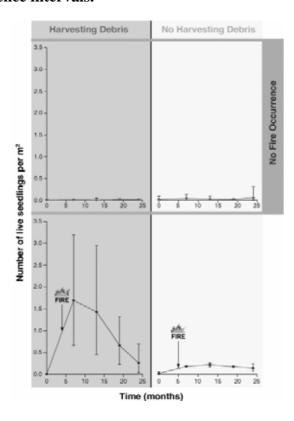
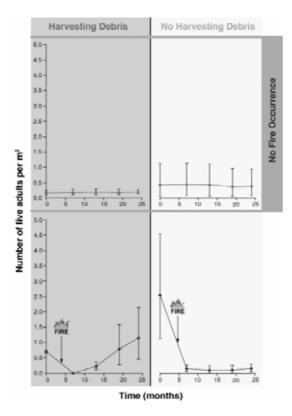


Figure 3. Effect of fire on mean density of mature plants over the course of the study. Error bars show 95% confidence intervals.



A. perangusta was found to be a fire-sensitive species that depends on seed for persistence at a site after fire. Mature plants were killed by even a cool fire, in contrast to some species that can resprout such as Acacia complanata. Cool fires are detrimental to A. perangusta because they kill mature plants and don't stimulate the germination of seeds. Thus total protection of A. perangusta from disturbance, as was formerly recommended in the SMP, could lead to local extinction.

Management recommendations

This study has provided information for management of *A. perangusta* at Wongi State forest and other sites where it occurs. The aim of *A. perangusta* management is to minimise long-term, fire- or harvesting-induced declines in populations, rather than preventing damage to individuals. The current research indicates that infrequent timber harvesting with fire (as long as it is hot enough) does not disadvantage *A. perangusta* over this time period. Thus, from the knowledge we now possess, the complete protection of *A. perangusta* as defined in the SMP (Barker, 1999) could in fact lead to population declines. However, such protection meets the legislative imperative of the *Queensland Nature Conservation Act 1992*. Consideration should be given to the extremely restricted and disjunct distribution of *A. perangusta*, as it could be at risk from stochastic extinction or disturbance from which it does not recover (Lynch, 1993).

Some refinements to the current adaptive management guidelines are presented below:

- Minimum fire free period to be 8-12 years. It is difficult to impose target regimes in a landscape prone to unplanned fire events (Bradstock *et al*, 1995). Wongi State forest is accessible to the public (and local graziers), and thus is susceptible to fires at any time, not necessarily within the ranges of the desired prescriptions. Fires at shorter intervals would prevent seedlings from maturing and at least partially replenishing the seedbank (Lynch, 1993; Auld, 1994; Morrison, 1995). A two to five year fire-free period is needed for plants to reach maturity, and another six years are needed to maximise seed input into the soil seed-bank, based on recommendations for *A. suaveolens* (Auld, 1987). If two fires in quick succession *do* occur, then the resilience of the *A. perangusta* populations to the second fire depends on the intensity of the first. If the first fire is hot enough to stimulate germination from low in the soil profile, then there will be less seed resources to withstand another fire (Auld, 1994). Thus it is more important to prevent two fires in quick succession when the first consumes more of the fine fuel (Auld, 1994). If the seedbank has been depleted, local extinction may occur if a fire occurs before the onset of flowering and seed-set (Gill & Bradstock, 1992).
- Aim for moderate inter-fire periods of 10-30 years. Such inter-fire periods are long enough for accumulation of sufficient fuel to carry a medium to high intensity fire, and short enough for the soil seed-bank not to be depleted below the critical level for a population to be self-replacing (Auld, 1987). The recommended fire regime attempts to define the risk of extinction attached to particular fire regimes, rather than simply maximising density (which may fluctuate within acceptable levels yet to be determined) (Bradstock *et al*, 1995).
- Ensure burns are medium to high intensity where *A. perangusta* occurs. Regeneration of *A. perangusta* will be favoured by medium to high intensity fires. Fires where little fuel consumption occurs will not produce high enough soil temperatures to break seed dormancy and hence, and could lead to population declines (Auld *et al*, 1991; Lynch, 1993). The burning of 6 20 tonnes ha⁻¹ of fine fuel on the ground is likely to

stimulate germination of buried seeds in the top three centimetres of soil ($> 60^{\circ}$ C) (Bradstock & Auld, 1995).

- Maintain variability in the fire regime. Repeated sequences of the same (short or long) fire interval may also lead to declines or losses in *A. perangusta* (Bradstock *et al*, 1995). Under a flexible management system, active use of fire is discretionary, being required when variability tends to uniformity (Bradstock *et al*, 1995). Active management of sites, if required, should occur after the reproductive period of *A. perangusta* in order to take advantage of any new seed crop (Lynch, 1993).
- Avoid fires following an extended dry period. Chances of seedling survival will be limited at such times. At Wongi State forest, rainfall is usually greatest in late summer, and the driest months are in late spring. Given this, the most suitable time for prescribed burning is in autumn.
- **Keep fire records at sites where** *A. perangusta* **occurs.** Fire events should also be followed up by assessment of survivorship and recruitment in the *A. perangusta* population. Fine fuel measurements prior to and after fires to estimate the level of soil heating for ecological purposes would be appropriate (Auld & Tozer, 1999).
- Consider other EVR species that may occur in the area. The range of fire intervals suggested should satisfy the ecological requirements of the entire community. Where there is conflict between species, preference should be given to those that are more threatened (Lynch, 1993) such as those that meet the criteria for the higher classifications of the IUCN Red List of Threatened Species (Hilton-Taylor, 2000).

The recommendations presented here may be applied to other listed acacia species in southeast Queensland that fall into the same fire response category (Gill, 1981) as *A. perangusta* (i.e. plants die when subjected to 100 % leaf scorch, with seed stored in the soil).

Acknowledgements

The author gratefully acknowledges the assistance of the following people during this project: Mirranie Barker, Alan House, Sherri Tanner-McAllister, Michelle Ensbey, Nadya Lees, Luke Hogan, David Jermyn, Jian Wang, Janet Hauser, Tracy Bell, Brendan Farthing, Kerstin Jones, Adrian Borsboom, Simon Cottier, and Geoff Smith.

References

Auld, T.D. (1987). Population dynamics of the shrub *Acacia suaveolens* (Sm.)Willd.: Survivorship throughout the life cycle, a synthesis. *Australian Journal of Ecology* **12** 139-151.

Auld, T.D. (1994). The role of soil seedbanks in maintaining plant communities in fire-prone habitats. *Proceedings of the* 2^{nd} *International Conference on Forest Fire Research* **2** 1069-1078.

Auld, T.D., Bradstock, R. A., and Keith, D. A. (1991). Germination of rare plants in relation to fire. WWF Project P154. NSW National Parks and Wildlife Service, Hurstville, NSW.

Auld, T. D. and Tozer, M. G. (1999). How well do post-fire indicators provide insights into the degree of soil heating during passage of fires? Australian Bushfire Conference 1999, School of Environment and Information Sciences, Charles Sturt University, Albury, NSW.

Barker, M. (1999). Species Management Profile for *Acacia perangusta* (eprapah wattle) In: Species Management Manual Vol. 3. Queensland Environmental Protection Agency, Brisbane.

Bradstock, R.A. and Auld, T.D. (1995). Soil temperatures during experimental bushfires in relation to fire intensity: consequences for legume germination and fire management in south-eastern Australia. *Journal of Applied Ecology* **32** 76-84.

Bradstock, R.A., Keith, D.A., and Auld, T.D. (1995). Fire and conservation: imperatives and constraints on managing for diversity. In: Conserving biodiversity: threats and solutions, pp. 323-333. Surrey Beatty and Sons, Sydney, NSW.

Gill, A.M. (1981). Adaptive responses of Australian vascular plant species to fires. In: Fire and the Australian biota, pp. 243-271. Australian Academy of Science, Canberra.

Gill, A. M. and Bradstock, R. A. (1992). A national register for the fire responses of plant species. *Cunninghamia* **2**(4), 653-660.

Hilton-Taylor, C. (compiler) (2000). IUCN Red List of Threatened Species. IUCN, Gland, Switzerland and Cambridge, UK.

Lynch, A. J. J. (1993). Conservation biology and management of 16 rare or threatened Fabaceae species in Tasmania. Endangered species program project no. 4. Parks and Wildlife Service, Hobart.

Morrison, D.A. (1995). Some effects of low-intensity fires on populations of co-occurring small trees in the Sydney region. *Proceedings of the Linnaean Society of New South Wales* **115** 109-119.

Purdie, R.W. (1977). Early stages of regeneration after burning in dry sclerophyll vegetation. II Regeneration by seed germination. *Australian Journal of Botany* **25** 35-46.

Rees, J. (2002). *Acacia perangusta*: its management in relation to timber harvesting and fire. Sustainable Forestry Sciences Unit Technical Paper 2002-01, Queensland Parks & Wildlife Service, Brisbane.

Environmental Defence Training

Caroline Edwards, Environmental Officer for the Department of Defence, Gallipoli Barracks, Enoggera, Q, 4051.

Nationally the Defence Estate comprises approximately 3 million hectares with approximately 700 leased and owned properties.

In Southern Queensland alone, approximately 600 000 hectares of training areas, bases and barracks are under Defence management. A number of Register of the National Estate listed properties and Land for Wildlife listings are included.

Overall, this equates to a significant use of the land, air and sea and hence Department of Defence has an important role to play in sustainable environmental management, including biodiversity conservation.

Defence's Corporate Services & Infrastructure Group (CSIG) contains the Directorate of Environmental Stewardship and Directorate of Environmental Programs, who support regionally based Environmental Advisers and Officers.

In December 2001, Defence reissued its Environmental Policy. The Environmental Vision for the Department is stated as "Defence will be a leader in sustainable environmental management to support the ADF's capability to defend Australia and its national interests".

The policy sets out six objectives to facilitate achieving this vision, and they are:

- 1. Establish an innovative EMS, which supports ADF capability, promotes environmental sustainability and achieves the Government's broader environmental objectives.
- 2. Creating a culture where sustainable environmental management s considered an integral element of capability development, equipment acquisition and through life support, including operational application.
- 3. Establishing clear lines of accountability for environmental outcomes.
- 4. Developing effective processes for education and training in support of the creation of an environmentally aware culture.
- 5. Measuring and reporting environmental performance as a apart of a process of continuous improvement.
- 6. Creating a climate of transparency and strategic partnerships with key environmental stakeholders.

Defence uses a variety of tools to facilitate environmental management:

1. Environmental Management Plans (EMP) have been developed for most Defence facilities or group of facilities. The EMP identifies and quantifies the risks associated with the property and its activities, whilst also setting specific strategies, objectives and

- tasks for implementation. Currently Defence is committed to developing and implementing Environmental Management Systems (EMS) for key sites.
- 2. Environmental Impact Assessments are undertaken for Defence activities to ensure that the risk and impacts of the proposed activity are identified and appropriate mitigation measures put in place. EIA take account of Commonwealth and State/local legislation. Where an activity is assessed as having a significant impact, legislative processes of referral under the EPBC Act are followed.
- 3. Where activities are assessed as not having a legally defined significant impact, an Environmental Clearance Certificate is issued which enables conditions and mitigation measures to be prescribed which the proponent of the activity signs off on. The ECC process is a tool that enables cumulative impacts and site-specific issues to be sustainably managed.
- 4. Documents that are vital to grass root environmental performance include Range/Base Standing Orders (RSO/BSO), Standard Operating Procedures (SOP) and Defence Instructions. These documents define do's and don'ts, processes and points of contact for further information to facilitate implementation of environmental responsibilities.
- 5. Another important tool, to aid biodiversity conservation in particular, is the process of collecting additional information through which strategies and procedures can be assured of continual improvement. Information gathering can be via surveys and research or importantly participating in local or regional working groups and forums.

Case Study 1 - Canungra Army Training Area (CATA)

CATA is located near Canungra on the Darlington Range. It comprises approximately 6000ha of heath to open forest to rainforest, and has been a Defence training area since 1942 (closed 1946-1952).

The majority of the training area was placed on the Register of the National Estate (Natural Values) in 1996 and was registere4d with Land for Wildlife in March 2000. It is also listed as one of few remaining habitats for the Richmond Birdwing Butterfly.

Over the years CATA has been subject to extensive regeneration and restoration efforts.

The first efforts began in 1970's for Groundsel infestations, but the results were not particularly successful. In 1990 a distinction was made between weed control and regeneration/restoration.

Regeneration sites are now selected using simple criteria including but not limited to:

- Soil type;
- Accessibility;
- Potential for use in military training; and
- Corridor linkage (in time).

The major issues facing CATA include infestation by Lantana, Groundsel, Ragweed and Crofton Weed, with Privet, Camphor Laurel and Chinese Elm in built up areas (old farm areas and within the barracks).

Methods of eradication include manual, mechanical, herbicide and a combination of these. Whilst the manual removal is expensive, slower and labour intensive, it causes less damage particularly to potential regeneration stock, and thus in some areas, manual removal is used exclusively.



Regeneration stock are obtained from a variety of nurseries within the area, or from the on site propagation nursery. The most success has been with 40cm+ plants. Importantly a maintenance schedule is included with all revegetation areas to ensure the good work does not go to waste.

A variety of personnel conduct regeneration works within the site. Defence contracts professional restoration contractors and also sponsors one Greencorp team per year. Canungra was awarded the Corporate Tree Planter Award in 1999 and has won Arbour Day awards in 1996, 1997 and 1999.

Canungra also plays a role is supporting university research studies and assists with surveys of flora and fauna. Specifically CATA has been involved with Koala release and ongoing monitoring projects, platypus surveys and frog surveys.

Case Study 2 - Gallipoli Barracks & Enoggera Close Training Area (ECTA)

Gallipoli Barracks and the ECTA is located approximately 7km north-west of central Brisbane, occupying 600ha of Commonwealth land comprising two distinct area - the Barracks/cantonment (200ha) and the ECTA (400ha).

The area was acquired in 1908 with development coinciding with major conflicts (WWI, WWII, Korean and Vietnam conflicts). The ECTA is a largely intact bushland forming an

important ecological corridor with State Forest and Brisbane Forest Park in the north-west and Mt. Coot-tha reserve in the south-east.

A recent project at Gallipoli Barracks involved the rehabilitation of a 1km stretch of degraded creekline within the Enoggera Creek catchment. The creekline was weedy, significantly eroding in areas and native species recruitment appeared minimal. Specific objectives of the project included:

- Remove factors hindering natural recruitment of native species;
- Provide a "kick start" to natural regeneration; and
- Manage factors causing soil erosion and stabilise affected areas.





The project was undertaken using ACF volunteers under project management of HLA Envirosciences. To achieve the objectives the following was undertaken.

Woody and herbaceous weeds were removed, poisoned and/or mulched. The problem species included Lantana, Cadaghi, Camphor Laurel, Groundsel and Asparagus Fern.

To mitigate localised erosion, hay bales were staked in priority areas and major erosion remediation was undertaken including the removal of an undermined weir and stabilisation of significant bank scour. Felled logs were positioned to delineate the creek zone and pedestrian creek crossings. This was an essential element of the project particularly for ease of the grounds maintenance staff.

To give the area a "kick start" approximately 2000 native tube stock were selected and planted along the creek banks, drainage lines and outlets, and in adjacent wildlife corridors. The species were selected to provide appropriate resources for future use by a variety of wildlife including nesting and food. Birds Queensland compiled a seasonal inventory of bird species within the vicinity and seventeen (17) wildlife boxes were installed as habitat or local native birds, bats, possums and sugar gliders that were known to exist in the area. Ongoing monitoring of these both birds and boxes is planned.

A key element of the project was the involvement of on site personnel. Adjacent Army units have become involved in weekly maintenance of the area and have assisted with the first round of wildlife box monitoring.

Due to the success of the rehabilitation of this section of creekline, further stretches of creekline will be remediated in a staged approach.

An Approach for Maximising the Benefits of Glen Rock Regional Park: Adaptive Management

Haig Allalemdjian, Heath Gibson, Bryan Grant, Nigel Kimball, Jonathan Powell, Travis Robinson and Amy White, The University of Queensland Gatton Campus, Q, 4343.

This study tackled the problem of how to increase the benefits of areas of land purchased by governments for the main purpose of nature conservation. The acquisition of protected areas, often involving large sums of money, is often questioned concerning the actual benefits these purchases provide to the greater public.

The Queensland State Government purchased Glen Rock Regional Park in 1996 to provide open-space as part of the South East Queensland Regional Landscape Strategy. Glen Rock was deemed a suitable case study to develop a process by which those stakeholders involved can realise the potential of these protected areas, and ultimately collaborate their efforts to maximise the park's benefits.

The proposed solution to maximise these benefits was the implementation of an Adaptive Management (AM) framework with feedback processes that allow for ongoing collaborative learning and knowledge building that involves all stakeholders. The Glen Rock case study outlines how this framework can be institutionalised so that the benefits of ongoing monitoring, feedback and knowledge building will be maximised.

A workshop was held to incorporate the stakeholders in identifying the needs, stumbling blocks and solutions of each component of the devised framework that could potentially inhibit the institutionalisation of this knowledge-building system. The outcomes of the workshop were compared to the findings of a literature review undertaken by the researchers.

The outcome of this study was the development of recommendations to help the implementation and institutionalisation of an AM framework at Glen Rock Regional Park.

Recommendations and conclusions

Steps to institutionalise Adaptive Management

The research team recommend the following steps to institutionalise the AM framework into the management of Glen Rock Regional Park. For this process to be perpetually applied to Glen Rock, a "making sense" forum needs to be adopted on an annual basis. A secondary consideration is that a time be allocated during the Glen Rock Management Advisory Committee (GRMAC) bi-monthly meetings to prioritise key outcomes from the management plan to be implemented and simultaneously identify relevant monitoring strategies including monitoring indicators, timing, and location of the monitoring sites, similar to the processes at the research team's workshop held together with the GRMAC on 22nd August 2002.

Knowledge base

As part of the AM framework, the research team recommend the development of a website and hard copy libraries at various locations including Glen Rock Regional Park, Regional Landscape Unit (RLU) and a section in the Gatton Library. It is recommended that the proposed website utilise the existing website if possible.

Before the website and library is developed a terms of reference needs to be established to set clear guidelines of what information the public may have access to and what information should be strictly kept for management purposes.

The development of an information dissemination process needs to be developed which incorporates a variety of formats. These formats will include at the least layperson summary documents, brochures and fact sheets.

The capturing of existing knowledge will need to be undertaken as this knowledge is an essential part of the knowledge building process. Existing knowledge to be collected will include local knowledge, existing park surveys compiled by various agencies including Queensland Parks and Wildlife Service (QPWS), all RLU records and all on-site management records.

Monitoring

The research team recommend to GRMAC that current monitoring programs in the park be built upon and expanded. In addition, it is suggested alliances are built with organisations capable and willing to undertake monitoring procedures that will result in a win-win situation. The University of Queensland Gatton Campus, and local field nature groups such as the Lockyer Catchment Centre should be approached and contractual alliances formed. This will address a number of stumbling blocks including commitment, continuity and lack of funding.

In regards to the outcome of grazing heritage it is suggested that further effort be expended in defining the meaning of the outcome before implementing monitoring for that outcome. This arises due to the conflicting definitions that were observed at the workshop held in August 2002.

Also, records of cattle production need to be properly and consistently maintained for monitoring of grazing heritage to work efficiently. In regards to the monitoring of infrastructure, it is suggested that audits take place on a 5 yearly time span to reduce unnecessary work.

Incorporation of a monitoring system such as QPWS's ParkInfo is highly recommended. This system may be utilised by GRMAC for any GIS based fieldwork that requires the collection of information and storage to assist in operational daily management processes, including track building and flora and fauna surveys.

The on-side management needs to keep rigorous records of visitor feedback and this information needs to be available and in a suitable format for the annual making sense workshop. This information will ensure that GRMAC remains relevant in addressing issues faced by Glen Rock Regional Park that are of general concern.

Conclusion

This project endeavoured to find a way to justify the large financial outlay that was required to purchase Glen Rock Regional Park by maximising the benefits of the park to as many members of the community as possible. The problem was compounded by the multiple uses that had to be accounted for and managed at Glen Rock Regional Park. To accomplish this, the research team determined that the best way to achieve this was through the institutionalisation of an AM framework. The framework that we have detailed in this report enables better management, collection and dissemination of information to the various stakeholders. This also equips the stakeholders to make more informed and efficient decisions that will ensure the management of Glen Rock is sustainable.

The strength of the AM framework lies in the process upon which it was built. The research team has incorporated the needs, stumbling blocks and solutions that stakeholders expressed in the design of the framework, creating a greater sense of applicability and ownership.

Nevertheless, the framework that has been developed is only the beginning of the Glen Rock Adaptive Management journey. There must be an ongoing commitment to the continued application of the framework by the stakeholders or it will fail. Every component is integral to the success of the framework, so this commitment must extend to (1) utilisation, capture and dissemination of information within the knowledge base, (2) ongoing monitoring, (3) making sense of the data that is produced from the monitoring, and, (4) using the lessons learnt to improve management. This will ensure flexibility is in-built within the management framework, so as priorities and uses within Glen Rock change, the framework will adapt and continue to improve management.

Further stumbling blocks may arise after the AM framework has been instigated. However once the AM framework proposed for Glen Rock Regional Park is adopted and refined, stakeholders will experience the benefits stemming from the acquisition of protected areas.

People and Biodiversity

Keynote Presentation

Dr. Ingrid Burkett, Lecturer, School of Social Work and Social Policy, The University Of Queensland

Communities and Participation in Biodiversity Recovery: Working From the Inside in to Inside out

Dr. Ingrid Burkett, Lecturer, School of Social Work and Social Policy, The University Of Queensland, Q, 4072.

Current contexts of participation in biodiversity recovery: Dreams, Dilemmas and Disappointments

Much has been written in recent years about the need and the desire for community participation in biodiversity conservation and recovery as a means for enhancing 'bottom-up' processes, building a broad-scale movement of commitment and action, and promoting public responsibility for the environment. In this paper, I explore how participation and communitybased processes are currently faring and being interpreted in the field of biodiversity recovery. I do so from the position of someone who is diversely involved (locally and internationally) in field of integrated community development, not as someone who is an expert in the specific area of biodiversity recovery. The paper centres on the role of participation in biodiversity recovery, how community participation is built, and what future challenges exist in building participation in working towards developing a movement for change. Undertaking this task involves entering a jargon filled territory - it is much like entering a dense forest where one can hardly see the light between the trees of terminology, and where one can become lost amidst thick concepts, so that one often is not able to see the woods for the trees. Concepts such as 'community', 'partnership', 'bottom-up processes', and 'participation', are the trees of this forest - often they have become weighed down with thick vines of political rhetoric, so that we may not even be able to see the original trees to identify what they are, and as we stumble through between them on the path which is increasingly hidden by weeds of misunderstanding, we can lose sight of what our original intention in entering this forest actually was. We can too easily forget, when we become caught up in the latest concept or the latest term, that what we are actually talking about in this conceptual forest is the basic idea of people's involvement in biodiversity recovery. Some people have suggested abandoning concepts such as 'participation' and 'community' to try and clear the way for

getting down to the business of making sense of people's involvement, but my experience is that as soon as we chop down in particular concept, another grows in its place and is soon equally strangled by vines of rhetoric. I prefer, therefore, to recover the original concepts by clearing away vines of rhetoric, to remember and reclaim meanings that will actually enable us to move forward on our journeys of biodiversity recovery rather than have us get caught up in conceptual vineyards.

So, I take my secateurs and enter the conceptual forest looking to recover remnants of the endangered species of 'participation' and 'community'.

Participation

Participation is a word often spoken and variously defined, often aspired to and variously idealised, often used and variously applied. Many authors have mapped the range of processes associated with participation, ladders of participation have been built, indicators and scales have been developed, and still participation is used 'to mean all things to all people'. Perhaps the best overview of participation for the current purposes has been developed by Pretty (1995), an outline of which is presented in Table 1. There is general recognition that participation is a necessary part of broadscale biodiversity recovery, with assertions such as the following increasingly common in literature:

"Citizen participation in conservation has not only proved effective - it is now seen as vital" (Chamala, 1990;6).

"...the public is increasingly concerned with having an opportunity to participate in decisions about their forests" (Stankey and Clark, in Clark, Stankey, Kruger, 1999; 75).

Simultaneously however, it is also apparent that the difficulties of participation both in terms of definition, and application plague participatory approaches to biodiversity recovery and every other community and social process which is deemed to involve participation - as the following quote illustrates:

"However, despite the increasing numbers of participatory initiatives in different parts of the world, it is clear that most of these are still only "islands of successes". Also we must be clear that much of what is billed as participation, is so in name only" (http://nrm.massey.ac.nz/changelinks/co_man.html).

Table 1. Pretty's (1995) Typology of participation (from Pretty, 1995;p173).

Typology	Characteristics of each type
1. Passive participation.	People are informed of what is going to happen or has already happened.
	Information being shared belongs only to external professionals.

2. Participation in information getting.	People participate by answering questions posed by researchers using questionnaire surveys or similar approaches. People's information is extracted; findings are usually	
	neither shared not checked for accuracy.	
3. Participation by consultation.	People participate by being consulted and external agents listen to views.	
	External agents define the problems and solutions, and may modify these in the light of people's responses.	
	People do not usually share decision-making and professionals are not obligated to take on board people's views.	
4. Participation from material incentives.	People participate by providing resources (e.g. labour) in return for material incentives.	
	People have no stake in prolonging activities when the incentives end.	
5. Functional participation.	People participate by forming groups to make predetermined objectives related to the project.	
	Such involvement does not tend to be at early stages of project cycles or planning, but rather after major decisions have been made.	
6. Interactive participation.	People participate in joint analysis, which leads to action plans and the formation of new local institutions or the strengthening of existing ones.	
	These groups take control over local decisions and so people have a stake in maintaining structures or practices.	
7. Self mobilisation.	People participate by taking initiatives independent of external institutions to change systems.	
	They develop contacts with external institutions for resources and technical advice they need, but retain control over how resources are used.	

Community

Notions of community-based process exist within an equally swampy terrain - 'community' too has been described as a motherhood word, meaning whatever the user wants it to mean. It to is a concept often referred to in the context of biodiversity recovery and yet as some authors have noticed:

"... despite its recent popularity, the concept of community rarely receives the attention or analysis it needs from those concerned with resource use and management" (Agrawal and Gibson, 2001; 1).

Politically, 'community' has experienced a revitalisation not seen in Australia since the Whitlam era. With the State in the grips of neoliberal agendas, the notion of 'community' has been used politically as representing the new space of responsibility, and as such, community has become a 'spray-on solution' (Mowbray and Bryson, 1981), for an almost limitless array of social and environmental ills. The difficulties occur when one tries to unpack what is meant by 'community' in this context - where what one finds often is a rather mythical interpretation of community that gives us very little practical ground on which to stand. For this reason, I have argued elsewhere (Burkett, 2001) that there is a need to consider 'community as a verb' - a 'doing word' which is only realisable in practice. In other words, community is what we make it rather than an abstract concept which we can write into policy and hope that it will translate into various fields in practice.

Together these concepts underpin what have variously been referred to as 'people centred' or 'people oriented' approaches to biodiversity conservation and recovery. Such approaches are currently both revered and despised depending on where one positions oneself, what one defines as sustainability, how one interprets protection, and how one links people to environment. The evaluation more of the successes or otherwise of such approaches in **actually** contributing to on the ground recovery also swings between elation and despair - as illustrated in the following:

"According to the conventional wisdom that emerges in recent literature on international biodiversity conservation, current people-oriented approaches to protecting the world's biologically richest areas are failing miserably" (Wilshusen et al, 2002; 17).

"The Landcare movement is undoubtedly the most exciting and significant development in land conservation in Australia" (Campbell, in Curtis and DeLacy, 1995;1).

Building 'Participatory' and 'Community-Based' processes: what works?

From the discussion above, it is clear that the building of participatory and community-based processes in biodiversity recovery are simultaneously desired and contested in the current policy and practice environment. There are however, many lessons to be learnt from other fields outside the area of biodiversity recovery (such as community development) which could be linked with the increasing number of learnings from community-based initiatives such as Landcare and the various ecology 'watch' groups, to build more secure foundations on which to base community participation processes in biodiversity recovery.

Drawing on the vast amount of literature and research data which has examined participation and volunteering in a wide array of community-based activities, we can draw some conclusions about basic factors which build or enhance participation.

What builds participation?

- Feelings of ownership;
- Feelings of control / ability to make a difference;
- Relationship / connection with others;
- Validation of importance of role; people's contribution / participation is valued and acknowledged by those 'higher up the food chain';
- Belief in the importance of issue personal belief in and connection to the issue, this is particularly strong if there are personal experiences, costs/benefits;
- Belief in possibilities for change (important particularly in long term participation);
- Possibilities for building up personal skills and capacities;
- Incentives (personal, financial, indirect) but these have usually only been shown to work in the short-term;
- Benefits for self, family and friends;
- Being personally asked to participate; and
- 'Fun' factor participation is mainly enjoyable (even if it is sometimes hard work).

Interestingly, the Institute for Volunteering Research (UK) suggests that half of all volunteers are involved because they were personally asked to be involved. The corollary of this has also been shown in research - that the least effective means of involving people in voluntary participation is mass advertisement or mass leaflet distribution. Other reasons why people are not involved in voluntary activities is perceptions of the time involved in the activities (which can be accurate in the case of biodiversity recovery!), hidden costs of involvement, and perceptions that the voluntary work is not valued.

In understanding participation in biodiversity recovery, we need to ask the question 'who participates' and 'how do they participate'? It is common to answer the first question with reference to 'stakeholders', that is, anyone who has an interest and/or a share in the issues being addressed. In biodiversity recovery, the 'stakeholders' are a diverse group indeed - in fact, it is hard to see how anybody could not be a stakeholder in this context. Certainly at a more micro level, people with an association to particular land represent what could be called the 'key stakeholders' - so landholders, for example, particularly in rural areas have become most associated with the participants in various biodiversity recovery community groups. There is an oft quoted figure which underpins the need for private landholders to be engaged in biodiversity recovery - that is, that private landholders manage around two-thirds of Australia's land mass (Stephens, 2001; 189). Yet in many ways, this figure does not give us the picture of the real complexity of land ownership in the Australian context, which is needed if we are to adopt a 'stakeholder' approach to participation in biodiversity recovery. This is particularly the case when we consider the demise of family farms in the Australian context, and the subsequent 'corporatisation' of private landholdings. The participation of this group of landholders will no doubt become increasingly important in the not so distant future.

Further, we need to think 'socio-diversity' in community-based biodiversity recovery processes. The diversity of people participating in such processes needs to be reflective of the social diversity in any given place or context. Furthermore, this diversity need to be reflected

across the hierarchies of participation, so, for example, certain groups and identities do not dominate such processes. For example, a study of Victorian Landcare groups found that women made up just over a third of members, but that 90 percent of chairperson positions were held by men (Curtis and DeLacy, 1995).

It is important that we also examine closely the 'how' of participation, for it is still, unfortunately, the case that in reality much so-called participation falls into the realm of informing after major decisions have been made, after the parameters of action have been defined through policy documents. Given that ownership is a major factor in sustaining participation, we very much need to consider how ownership is developed in processes - and we know from experience in the field of community development, that the earlier people become involved in processes the more likely it is that they will have a sense of ownership both of process and outcome. We also know, that ownership of process and product is a very powerful thing, which needs to be respected if participatory processes are to be sustainable and transferable within and across community issues. Therefore, if people are involved in making contributions to processes, and those contributions are not respected or feedback loops become blocked so that communities lose contact with and control of their contributions, then this can be a very damaging for future community-based processes be they in biodiversity recovery, or any other field impacting on communities.

At this point we need to go back to the beginnings of participatory processes - because the 'how' of participation differs depending on where and by whom the participation is initiated.

Endogenous and exogenous initiations: Strengths and limitations of community initiation and external initiation of participatory process

Increasingly, participation is being advocated as an essential dimension of biodiversity conservation - and most government and government-funded initiatives require a dimension of participation in their briefs. This brings up an interesting dimension of participation in terms of where it is initiated. In very simple terms, participation can be initiated endogenously (starting from the internal resources within a community, i.e. community initiated) or exogenously (starting from resources located external to a community, i.e. externally initiated, usually by a State body, a funded organisation or a corporate entity), and very often there is a combination of the two. Thus, these processes are not necessarily mutually exclusive - they may sometimes be endogenous (such as where community members identify particular spaces or issues which need attention and then rally around to address those issues using only the resources within the group); and that at a later stage there may be exogenous layers added to the process (such as if those issues are also identified by external bodies such as government departments, who then initiate processes to engage with the local community in order to address those issues). However, in terms of developing participatory, community-based biodiversity recovery processes, it is important to consider starting points and how they affect the basis and sustainability of community participation. There is a culture in the Australian context that tends to favour exogenous solutions, whereby the dominant mindset becomes one which advocates that "...the best way to deal with the problems of ...environmental degradation ... is to turn to external solutions" (Pretty, 1998;226). This is not just the case in the field of biodiversity recovery - indeed the dominant models used to address community and social development more generally in Australia, are not based on endogenous development principles or practices. Rather, they are based on exogenous development approaches - approaches premised on the notion that the key to enhancing community development is to maximise external inputs such as government funding. Certainly, this has resulted in short-term gains for many communities in Australia

and elsewhere, but, this has not been without its problems - the major two being that: it is usually already more 'prosperous' communities who gain most benefits from exogenous development; and that over-reliance on high levels of external input (especially in terms of finances) can result in dependency, instability, and ultimately, lack of sustainability. The corollary of these difficulties is that exogenous development is most problematic for marginalised communities (those communities which are non-coastal, remote, inaccessible, in more difficult environments and with sparse populations) which are already most disadvantaged in terms of service provision.

Compounding this problematic feature of exogenous development is the fact that in such models, 'experts' from outside the actual communities are often the drivers of the processes which are imposed on communities to 'improve' their environmental, economic and social well-being. This leads to two negative consequences: first, that often the unique characteristics of particular localities (in terms of environments, demographics, cultures, and existing social infrastructures) are not taken into consideration and what occurs is a monosolution to what is interpreted as 'the problem'; second, such processes can actually exacerbate the disadvantages of more peripheral areas, particularly where there is high-level degradation and seemingly intractable ecological damage, increasing the likelihood that they become (or remain) "poor, depopulated, disorganised, dependent, marginal and apathetic" (Bassand, in Day, 1998;99).

If we take some of the lessons learnt from the fields of social and community development, we can begin to explore possibilities and dangers of building participation from both exogenous and endogenous positions. Table 2 outlines some of the strengths, weaknesses, opportunities and threats inherent in building participation from both these positions. It should be noted that each has both strengths and weaknesses - and both can generate positive actions as well as have negative consequences.

Table 2. Where do we stand to build participatory, community-based processes? Catalysts for Community Participation.

	Endogenous (Community Initiated)	Exogenous (Externally Initiated)
	(participation and action agendas initiated from the inside: usually from the community sphere)	(participation and action agendas initiated externally: usually from the social sphere)
Strengths	Energy/motivation for participation is grounded from within experiences of community members, therefore energy is more sustainable.	Access to a 'big picture' on which to build participation vision of need for participation: access to a 'global' analysis.

	Participation is more likely to develop organically, through relationships and internally generated connections, therefore multidimensional relationships and commitments to groups are more likely to develop. Participation is often built around small, concrete and local realities and geared towards unique local context that people can relate to, therefore commitment to action can be more visible and personally relevant.	Access to resources in the form of information and finances. Access to social and political decision-making mechanisms. Access to a range of technical expertise.
Weaknesses	Group skills and capacities can be variable therefore there can be greater possibilities for in-group difficulties and instabilities. Access to resources can be limited, with resource deficiencies extending to information, technologies, finances, and expertise. People in community groups can have difficulties linking actions to a 'big picture' and to seeing how small, local actions can make a difference. Community groups can have difficulties feeding into decision-making and/or broader political processes, or negotiating spaces for doing so.	'Big picture' can crowd out/squash local realities, with a tendency towards 'one size fits all' approaches which denies local uniqueness and difference. Greater likelihood for difficulties in working in a participatory manner throughout processes; greater tendencies towards tokenistic participation and 'lower-level' participatory strategies. Role based work allocation can mean that Community processes are approached technically and not relationally, therefore 'partnerships' between social structures and particular communities can be impersonal and unstable.
Opportunities	Potential for greater sustainability in participatory processes for biodiversity recovery. Potential for locally relevant, contextually concrete vehicles for action.	Potential for linking local actions into a bigger picture analysis. Potential for development of 'clearing-houses' for sharing learnings across social sphere and across community spheres.

	Potential for diversity of involvement and vehicles for 'cultural mechanisms of change' and base development of social movements for biodiversity recovery.	Potentials for supporting and resourcing programs and experiments.
Threats	Vulnerability to parochialism and isolation both from other community actions and from broader processes and analyses. Vulnerability to individual power plays from within group, and lack of access to external mechanisms for resolving disputes and difficulties. Vulnerability of individual members to burn out, particularly if certain members are the 'group glue' or the motivators over long periods of time.	Vulnerability to political shifts and therefore short-termism. Vulnerability to role shifts/restructuring/organisational realignment, and therefore frequent personnel movement, meaning 'partnership' difficulties.

Rather than discussing this table in great detail, I would like now to highlight one or two tensions inherent in each position.

Building participation from the outside...

Many if not most policy documents and reports which detail government (at all levels) and corporate initiatives in biodiversity recovery (both locally and globally) in the current context, repeatedly stress the importance of participatory process in achieving positive outcomes. Although Australia's National Biodiversity Strategy does not explicitly refer to participatory processes, it does stress the importance of involving individuals and community groups in biodiversity recovery:

"Individuals and community groups have an increasingly important role in conserving biological diversity through such activities as tree planting, weed eradication, surveying and monitoring. Some 1600 Landcare and similar community-based groups now exist in Australia; they are proving extremely effective in disseminating information and in the adoption of ecologically sustainable natural resource management in the rural sector. Community groups also contribute to the debate on such issues as institutional change. Examples of such groups are the World Wide Fund for Nature, the National Parks Associations, the Society for Growing Australian Plants, and Greening Australia."

Other national strategies and plans discuss the importance of participation more forthrightly. For example, India's National Biodiversity Strategy and National Action Plan states the following:

"The participation of women and men from all walks of life, both within and outside government, rural and urban, is essential for preparing an implementable action plan".

In adopting these positions, however, one of the tensions of building participation exogenously can be highlighted. That is, the 'stick' tension, which Pretty (1995; 170) describes vividly:

"For close to a century, rural development policies and programs have taken the view that farmers are mismanagers of soil and water, and so must be advised, lectured, paid and enforced to adopt conserving practices and technologies. Yet most projects have adopted the rhetoric of participation to describe these activities" (Pretty, 1995;170).

Thus, this tension for building participation endogenously centres around what the purpose of participation means, how participation is framed vis-a-vis the desired outcomes, how the participants are engaged, how the participation processes are managed, and what the relationship between the organising body and the participants is. So, in the Australian National Strategy, individuals and groups are seen as both a resource, and the threat:

"Australians have broad expertise in managing a diverse array of species, habitats and ecosystems, ranging from arid lands to tropical rainforests and coral reefs. This expertise is itself a marketable commodity...The loss of biological diversity cannot be slowed effectively unless its underlying causes are directly confronted. These underlying causes are extremely complex; they include the size and distribution of the human population, the level of resource consumption, market factors and policies that provide incentives for biological diversity depletion, undervaluation of environmental resources, inappropriate institutions and laws, ignorance about the importance and role of biological diversity, underinvestment in biological diversity conservation, and inadequate knowledge of our biological diversity and the rate at which it is being lost".

In the Indian national strategy the threat posed by people is emphasised:

"...diversity is seriously threatened by human activities leading to severe shortages of water, fodder, fuel; and natural disasters such as floods, landslides and famines".

Participation, in both instances, is framed as the way of addressing the threat posed by people to the environment. The tension which can arise from this framing of participation centres on the enforcement of a 'participatory' stance, the notion that 'participation' can be imposed 'top-down', implemented on the ground, but orchestrated and controlled 'from above'.

Similarly, when participation is enshrined in policy, there can arise a tension between genuine and tokenistic participation-the latter being the sort of participation which you have when you have to have participation. The dangers inherent in imposing participatory processes from within policy is something which is increasingly being experienced in overseas development projects, the standard funding applications for which now specify very clearly the desirability of participatory process, particularly, gender sensitive participation. Yet, the experience on the ground overwhelmingly indicates that mandatory participatory frameworks for projects very often lead to tokenism, and manipulation.

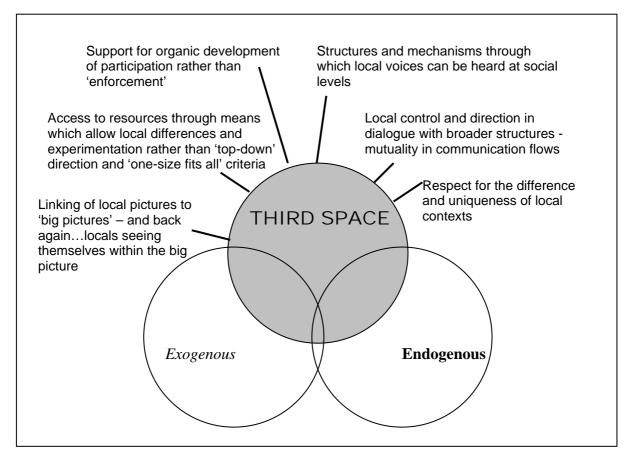
Building participation from within

One of the tensions which is associated with endogenous development and participation, centres on the human resources needed to engage in participatory processes. That is, endogenously generated participation is much more likely to occur amongst people who already have some resources, in the form of strong social networks and relationships between community members, capacities to interpret information, and financial resourcing. Therefore, endogenous development is much more likely to occur in stronger communities, more educated communities, and better-resourced communities; and less likely to occur where community ties are weak, in communities where people are less educated, and in communities which are less resourced. There is also evidence to suggest that generating participation is easier in less degraded areas, and thus much more difficult to build around highly degraded areas, particularly where 'solutions' are technically difficult and/or costly.

The second tension which I wish to mention in relation to endogenous participation, is one which is related to the culture of participation in the Australian context. Given that we live in a political context where service delivery by government is demanded and expected (though increasingly not delivered), one of the difficulties of building participatory processes in the Australian context, whether they be around biodiversity recovery or any other community issues, is that an ever present aspect of community-based processes is the culture of expectation. At the community level this is often manifested in and lack of confidence in the potential of community-based initiatives to be self reliant and/or self-sustaining without external input. This is reinforced by frequent references from the political realm regarding the need for participation to be 'incentified'. Interestingly, at an international level, it is now well known that financial incentives (despite being effective in the short term) do not stimulate a culture of participation or protection - rather, they are increasingly expensive, and build a culture of expectation and, often, indifference to the 'real' aims of the programs involved (Bunch, 1991). In raising this, I am not in any way suggesting that community-based participation should not be funded. Rather, I am merely suggesting that the development of movements of change cannot be founded on the expectations of financial incentives alone broadscale cultural development and cultural change is rarely, if ever, based solely on incentives which benefit individuals. I raise this in the spirit of dialogue, for I believe that increasingly we need to examine the nature of cultural change if we are to really build local and global movements for biodiversity recovery.

With the tensions inherent in both exogenous and endogenous development, there is a need for a 'thirdspace' to emerge which can hold and build on the strengths of each while also reducing the weaknesses inherent in each. In many ways this has been what has happened in the Landcare movement - there are both the programmatic and the community aspects to the movement (reference) - though perhaps there are still learnings from a 'thirdspace' perspective which could enhance the relationship between the two. Figure 1 illustrates some of the features of such a perspective.

Figure 1. Finding a 'thirdspace' between endogenous and exogenous initiation of participation.



Some questions for the futures of participation and community-based processes in biodiversity recovery

In this final section, I would like to raise a number of points regarding the futures of community participation in biodiversity recovery. I raise these points in the hope that they will generate some discussion and dialogue - though I should stress that the points are somewhat disparate and wide-ranging, without any kind of unifying structure. They are generated from what I see as key issues in community development which can be linked to biodiversity recovery.

1. Creating a culture of biodiversity

Much of the debate around participation in biodiversity has been in what could be described as the 'rational realm' - there are an abundance of theories, scientific hypotheses, methodologies and technologies of building participation. People are being informed, educated, consulted and converted to the idea of biodiversity recovery. There is, admittedly, an array of scientific reasons for this - and we are increasingly aware of the statistical information about habitat destruction, species loss, economic losses and so on. The question which I would like to raise here concerns how this 'rational' realm is helping us to build a culture of participation in biodiversity recovery? I acknowledge the complexity of this term, 'culture', as meaning a process (or set of processes) which provide patterns of living and ways of understanding the world, and also as 'products' - art, music, poetry and so on (Duncombe, 2002;36). In suggesting the need for the building of cultures of biodiversity I am putting

forward the notion that it is not just rational argument which will lead to change in peoples understanding of and participation in biodiversity recovery. It is much more than this - it is how people make sense of and engage with their environments, their connections to the land, their passion for natural environments - all these things are much more in the realm of culture than of scientific technique. Duncombe (2002) summarises the reaction which is common in mentioning 'culture' as part of the puzzle. He says that people often "consider culture a distraction from the 'real' struggle' (p.35), arguing that on the contrary:

"...culture is deeply political. ...Both the culture we enjoy and the culture in which we live provide us with ideas of how things are and how they should be, frameworks through which to interpret reality and possibility. They help us account for the past, make sense of the present and dream of the future. In order to strive for change, you have first to imagine it, and culture is the repository of imagination" (Duncombe, 2002;35).

I know from past experience that bringing up the idea that 'culture' can make a contribution to 'serious' issues such as biodiversity can cause a few eyebrows to be raised. I bring it to the table acknowledging that it appears like an 'off the wall' suggestion - one which I do believe, however, needs some consideration if we are to move forward on building broad movements for change in the field of biodiversity recovery. Therefore, my question is how do we build cultures of biodiversity recovery - how can we engage cultural means (dance, theatre, song, story) to strengthen people's participation in such a movement? What are the cultural traditions with which we can link to do this? How do we understand diversity within Australian cultures - particularly as much of the work which has been done in linking cultural understandings of biodiversity recovery internationally has been limited to Indigenous cultures and 'other' cultures in overseas development contexts.

2. Integrating biodiversity and development

The link between biodiversity conservation and development has been one characterised by on-going tension and adversity - with development being blamed for environmental degradation, and conversely, conservation being touted as ignoring livelihood needs. Although there have certainly been some moves made towards bridging the divide - particularly through the notion of 'sustainable development' - as is suggested in the following quote:

"Biological diversity is now considered as an essential part of efforts to eradicate poverty and achieve sustainable development. Conservation and development are no longer seen as conflicting goals but as mutually interdependent" (http://www.biodiv.org/events/wssd.asp).

However, it is the case that a large gulf still exists and is evoked each time there are local conflicts between environmental and economic / social development. In this context I merely wish to raise the issue that further integration is still required - integration through which the environment is seen as central to any development processes, and where social and community contexts are seen as central community contexts are seen as central to any natural resource management, and environmental decision-making processes. From on-the-ground experiences I know there has been much thought put into this, however, the realities have not yet born the integrated fruits which are possible.

3. Beyond the linkage between information and participation

In all community work we are needing to come to terms with the limitations of information - a difficult task indeed when we are living in what is commonly known as an 'information age'! Access to information and the capacity to interpret information is an important *part* of engaging with action - but it is only a part, and in an area as complex as biodiversity recovery, its role in actually generating change is still quite unclear, as Machlis (1999;13) highlights:

"Evidence regarding public education processes has been well advanced on single, relatively simple issues such as recycling behaviour, but work directly related to complex issues such as biodiversity is sparse to nonexistent".

Creating a more informed community by launching large campaigns to educate people about land degradation and species loss will no doubt have some impact on building participation in the movement to engage biodiversity recovery. However, the extent to which this will actually build participation is somewhat of a moot point given that the relationship between 'knowing' and 'doing' is a complex one. So the question we need to ask is this: 'if we have all the information, does that always mean that we will be committed to active participation in that area?' The simple answer to this very complex question is 'no' - because motivations to act are not subject to simple, causal relationships (as we can see from the reasons why people participate examined earlier in the paper). So, again, I open questions rather than propose answers - what is the role of information and education in building participation in biodiversity recovery? And what else is involved?

4. Limits to protectionism without participation

Finally, I would like to add to a debate which has been raging in some circles which examine the social aspects of biodiversity recovery of the past few years. This debate centres on the oppositionalising of protectionism with participatory approaches to biodiversity conservation and recovery. This debate is fuelled by comments such as the following:

"Biodiversity conservation is doomed to failure when it is based on bottom-up processes that depend on voluntary compliance.... I would also advocate a top-down approach to nature conservation - contrary to much contemporary political and conservation rhetoric - because in most countries it is the government, not the people around the protected areas, that ultimately decides the fate of forests and wildlife" (Rabinowitz, in Wilshusen et al, 2002; 19).

While there is certainly a role for protection in the form of parks, reserves and so on, the sorts of widespread protectionism and top-down management advocated for by the above authors and others like him, would, I believe be a retrograde step for biodiversity conservation and recovery. If we build walls around nature to protect it, we inevitably deny the complex relationships between people, livelihoods, lifestyles, cultures and the environment and what we are then building is a culture of disassociation - people having no connection to nature except in the terms defined by law and policy. This disassociation is not only one of the bases of poaching and misuse of nature (as we have seen in Queensland leading up to the legal enforcement of landclearing restrictions); it also represents what could ultimately be a fundamental flaw into the conceptualisation of who is responsible for conservation and recovery. Given that in the Australian context most of the land managed privately, and protected areas represent less than 10% of the continent, if we are realistically going to engage in broadscale conservation and recovery, there is need to work with communities and

landholders to do this - blanket enforcement and top-down management is not only patronising in the extreme, impractical and unrealistic, it is financially ludicrous.

Conclusion

In conclusion, I would like to suggest that there is still much territory to be explored regarding community participation in biodiversity recovery, there are many questions to be asked, many community-based experiments to be undertaken, and many mistakes to be learnt from. This is really a space where we need to put into practice a truly integrative approach - where we blur the boundaries between academics and practitioners, between landholders and departmental workers, between researchers and communities, between research and action, between science and art, between technology and culture. The task ahead is of overwhelming proportions, and the imperatives to move quickly to stop the loss of biodiversity cannot be ignored - however, as a community development worker, I would be a strong advocate of working with people in biodiversity recovery, rather than implementing strategies without people, or for people, which may have some short-term gains, but in the long run we all - all people on earth - need to find ways of living sustainably with the diversity of species we share the land with, and we can only do this by developing active and intimate connections with this land.

References

Agrawal, A. and Gibson, C. (eds) (2001). Communities and the Environment: Ethnicity, Gender and the State in Community-Based Conservation, Rutgers University Press, New Brunswick.

Agrawal, A. and Gibson, C. (2001). *Introduction: The Role of Community in Natural Resource Management*, in Agrawal, A. and Gibson, C. (eds) Communities and the Environment: Ethnicity, Gender and the State in Community-Based Conservation, Rutgers University Press, New Brunswick.

Australian National Strategy on Biodiversity, http://www.ea.gov.au/biodiversity/, accessed 3/9/02

Bunch, R. (1991). *People-centred Agricultural Improvement*, in. Haverkort et al (eds) Joining Farmers Experiments, IT Publications, London.

Burkett, I. (2001). *Traversing the Swampy Terrain of Postmodern Communities: Towards Theoretical Revisionings of Community Development*, European Journal of Social Work, vol. 4, no.3, pp233-246.

Burkett, I. (2002). *Integrated systems and rural community development: possibilities for partnership*, in, Warburton, K., Pillai-McGarry, U. and Ramage, D.L. (Eds.). Integrated Biosystems for Sustainable Development, Rural Industries Research and Development Corporation Publication No. 01/174. Feb.

Chamala, S. and Mortiss, P. (1990). Working Together for Land Care: Group Management Skills and Strategies, Australian Academic Press, Brisbane.

Clark, R. Stankey, G. and Kruger, L. (1999). *From New Perspectives to Ecosystem Management: A Social Science Perspective on Forest Management*, in Aley, J., Burch, W., Conover, B. and Field, D. (eds) Ecosystem Management: Adaptive Strategies for Natural Resources Organisations in the 21st Century, Taylor and Francis, Philadelphia, pp. 73-84.

Curtis, A. and DeLacy, T. (1995). Evaluating Landcare Groups in Australia: How They Facilitate Partnerships Between Agencies, Community Groups and Researchers, Journal of Soil and Water Conservation, Jan-Feb, vol. 50, no. 1, pp15 (6).

Day, G. (1998). Working with the Grain? Towards Sustainable Rural and Community Development, Journal of Rural Studies, vol. 14, no. 1, pp89-105.

Duncombe, S. (2002). Cultural Resistance Reader, Verso, London.

Indian National Strategy on Biodiversity http://sdnp.delhi.nic.in/nbsap/callparticipation.html Accessed August 29th, 2002.

Machlis, G. (1999). *New Forestry, Neo Politics, and Voodoo Economies: Research Needs for Biodiversity Management*, Aley, J., Burch, W., Conover, B. and Field, D. Ecosystem Management: Adaptive Strategies for Natural Resource Organisations in the 21st Century, Taylor and Francis, Philadelphia, pp. 5 - 16.

Mowbray, M. and Bryson, L. (1981). "Community": The Spray-On Solution, Australian Journal of Social Issues, vol. 16, no. 4, Nov, pp255-267.

Natural Resource Management Massey University http://nrm.massey.ac.nz/changelinks/co_man.html (accessed 29th August, 2002).

Pretty, J. (1995). Regenerating Agriculture: Policies and Practice for Sustainability and Self-Reliance, Earthscan, London

Pretty, J. (1998). Living Land, Earthscan, London

Stephens, S. (2001). Visions and Viability: How Achievable is Landscape Conservation in Australia? Ecological Management and Restoration, vol. 2, no. 3, December, pp. 189-195

Wilshusen, P., Brechin, S., Fortwangler, C. and West, P. (2002). *Reinventing a Square Wheel: Critique of a Resurgent "Protection Paradigm" in International Biodiversity Conservation*, Society and Natural Resources, 15:pp17 - 40.

Wilshusen, P., Brechin, S., Fortwangler, C. and West, P. (2002). *Beyond the Square Wheel: Toward a More Comprehensive Understanding of Biodiversity Conservation as Social and Political Process*, Society and Natural Resources, 15:pp41-64.

Community Participation - Lessons Learned in the Helidon Hills

Graham Burkett, 42 Woodside Street, The Gap, Q, 4061.

Contextual introduction

The text below, with minor editing, is taken from the notes to my presentation at the Conference. The only thing missing is the wailing and gnashing of teeth that was part of the performance.

The author is a landholder in the Helidon Hills, has an Engineering background, recently retired and learning about biodiversity from the grass roots.

This paper may have the appearance of being written by a smug, arrogant individual who goes around putting "monkeys on people's backs". Hopefully this is not true, but simply an individual sharing his experiences, knowing that Community Participation is a very important aspect of achieving ecological sustainability, and believing it to be in severe trouble.

Background to Community Participation

Around 60% of land in Australia is privately owned and 40% is government owned.

By coincidence the Helidon Hills is about that ratio: 22,000ha of private property and 12,000 ha of Forest Reserve, with the latter shortly to become a mixture of National and Conservation Parks.

It is therefore logical that when government agencies are developing natural resource management policies, on either a National, State or local basis, community participation will be an essential element of their planning process.

The examples to be given

Personal experience at the local government level will demonstrate how good community participation can be achieved, but also derailed by management decree.

Then comes an example of an apparently very successful Landcare Group that really has a long way to go in relation to ideal community participation.

Finally there is a sad example from State Government where a Forest Agreement derived project appears to be stumbling to finality, after having severe problems with community participation.

Local Government

Bruce Boyes was appointed Project Coordinator, by WESROC, to run "The Sustainable Management of the Helidon Hills" project. As stated in the Draft Final Report, this project was aimed at being different, having community direction as its prime mode of process.Bruce would turn up to the Community Meetings with blank pieces of butcher's paper, describe our challenge for the night and document our discussions.

The Draft Report contains 93 Recommendations and each of us could see our fingerprints throughout the document.

So we owned it and still do.However, the Project Management Committee, some of whom were reputedly uneasy with community direction, eventually won the day and directed that the project be completed quickly from the Office.Bruce resigned on principle and that effectively was the end of the Project.There is no Final Report, but the excellent framework within the document still directs our Landcare Group in determining its activities in the Hills. It is well worth a read and to their credit, WESROC have got it on their Website at: http://www.wesroc.qld.gov.au/Projects.htm

Some observations from a Community Participants perspective are:

- 1. The process can be "painful", with often-spirited debate, but everyone with whom I have spoken believe that the outcome was worth the effort and they would like more projects to follow this process.
- 2. Obviously Bruce had done a lot of planning work before each meeting to "guide" us towards optimal solutions.
- 3. Having the Community committed to the process and outcomes from early in the project meant that implementation of any recommendation is almost assured.
- 4. Bruce and his team must have found it quite frustrating at times, listening to ideas that the Team may have already discussed and discarded. In addition the collective solution may also be a compromise and neither as elegant nor effective as that thought of by the Project Team beforehand.
- 5. The Community Group had both factions and fractions, which called upon extreme levels of skilful meeting facilitation.
- 6. Community Participation is quite time consuming, so this extra time must be built into the Project Schedule from the beginning. However it really can be a very good investment in time.

Landcare

You would be forgiven for thinking that the Helidon Hills Landcare Group is a fine example of Community Participation in Natural Resource Management.

But if we are to brutally truthful, it isn't!!

(In relation to other Landcare Groups that I am aware of, many suffer similar maladies).

Certainly, we have a strong membership (30) and the meetings are well attended.

We've had a number of successful programmes, like Lantana Management and our members have been involved in a lot of skill sessions many of which were delivered by The University of Queensland. We are also strongly supported by the Lockyer Catchment Association.But let's look a little more closely at the community participation aspects.

(It is ironic to note that the citation on the recent Award to the Group from Minister Robertson is for *Outstanding COMMITMENT to NRM* not *Outstanding OUTCOMES*).

Members own less than 5% of the Helidon Hills, (one of our members owns 3%, leaving 29 of us with 2%), so programmes like weed eradication are not likely to be really successful in the long term.

We have organised 2 detailed Workshops in the past 12 months:

- 1. Property Planning.
- 2. Fire Management Plans.

Despite a lot of publicity, not one Helidon Hills Landholder attended.

We have to conclude that at this point of time, Landcare planning is not a high priority for community participation in the Helidon Hills. We recognise that we need skills / advice / support to solve this community participation problem.

DNR&M/EPA/QPWS also provide us with lots of support, but in terms of community participation they also seem to have their own challenges. In the Lantana Programme DNR&M didn't have funds to participate in chemical eradication, only for burning. Their current burning regime is also resource limited and not compatible with the latest Biodiversity methodology. (It's the old Timber Production method of 1000ha mosaics, with no account taken of biodiversity, or specific Regional Ecosystem needs).

But we desperately need this Landholder (the largest in the area) as a community participant in Landcare. We are all resource limited, not just them, so we start with something in common.

An embarrassing thought is that we have never asked them to be a participant as a peer landholder, perhaps that is all that is needed!!

State Government

An outcome of the South East Queensland Forest Agreement (SEQFA) was an initiative to change the tenure of many State Forests to a form of National Park. This process was to include public meetings in the Lockyer and Toowoomba. The Lockyer meetings were badly disrupted by dissidents and one planned meeting in Toowoomba was cancelled prior to the meeting date because the hosts were so concerned at the probable dissent.

Subsequently a limited form of community participation was undertaken by bringing together selected *Interest Groups*. In May this year, two members of the Helidon Hills Landcare Group were invited to join a number of other *Interest Groups* (Leisure, Aboriginals, Timber Industry, Conservationists) and spent a most enjoyable day examining and discussing the Values of the Helidon Hills. The outcome was to have a plenary meeting with other *Interest Groups* in mid-July and reach a consensus on Tenure Allocation for State Forests in the area.

Almost 5 months later we have not had any communication on this matter from the organisers.

Unfortunately, it appears that, for this project, community participation has become part of the problem, not part of the solution.

Since the SEQFA there have been many instances of damage to QPWS and community infrastructure in the Hills, something that was not evident prior to this process. So some members of the community must be feeling very frustrated with either the current process, or possible outcomes. They need to be encouraged to participate in dialogue, not continue with their vandalism.

Conclusion

Watch this space!!! The above examples represent my case for community participation in trouble within natural resource management (NRM) in South East Queensland. However, I do not believe that NRM is unique and assert that community participation is generally in difficulty. In the sphere of NRM, project sponsors, Landcare/Catchment Groups and Government Departments/Agencies are for whatever reason only effectively paying lip service to community participation, to the long-term detriment of environmental management.

It is clear that there are many facets to community participation, far beyond my capability of understanding or proposing solutions.

However, at this Conference there are two experts in community development of which community participation can be considered a subset.

They agree with the broad proposition that community participation currently has problems.

They have also agreed to jointly develop a research paper, which could be used as a catalyst to start resolving this matter.

So please watch this space!!!

Quollity Challenges

Michael Gregory, Wildlife Ranger, Queensland Parks And Wildlife Service (QPWS), PO Box 64, Bellbowrie, Q, 4072.

In response to identification of the apparent rapid decline in Spotted Tailed Quoll sightings through the early 1990's in South East Queensland, Scott Hetherington (the then QPWS NatureSearch Coordinator) and Mike Gregory (then TSN Qld Coordinator) developed the concept of a quoll seekers network.

The Spotted Tailed Quoll (*Dasyurus maculatus*) is the largest remaining carnivorous marsupial on the Australian mainland. It is a highly elusive and cryptic carnivore frequenting predominantly densely forested areas. In South East Queensland (SEQ), it has known populations in a number of locations throughout the Scenic Rim including Lamington and Main Range National Parks. However, it has been seen in the adjoining areas such as Springbrook and Mt. Tamborine and there are occasional isolated sightings from other remnant areas that have declined most notably through the 1990's.



Quoll illustration courtesy of Michelle Evans

Despite being listed as vulnerable in Queensland and under national legislation, very little research or recovery activity had been undertaken in SEQ throughout this time of apparent decline. Combined with an extremely low awareness of quolls in the general community and a certain level of antagonism from those who were aware of them - thanks in part to the quolls' taste for poultry - it appeared as if quolls may quietly disappear from Queensland.

The combination of the quolls cryptic nature with its' readily identifiable spotted coat and its mysterious reputation as a hunter of the night appeared to lend itself extremely well to a community based approach to attempting to conserve the SEQ population. Many eyes would be needed to find them, but a high level of technical expertise or equipment is not crucial for accurate identification. Also, as a wide-ranging species with an extremely large home range, the potential for private landholders to contribute to conservation is critical.

The threatening processes most affecting the quoll such as land clearing, habitat fragmentation and the effects of introduced species including the cat, fox and cane toad, are

also common to many other threatened species and can be highlighted through efforts to increase community awareness of the quoll and it's plight.

The opportunity to facilitate increased nature conservation skills in the community is also obvious with particular regard to field survey techniques, habitat recognition and wildlife identification and management issues. Participation in such a group also enables members to develop their knowledge of group processes and the legislative and organisational management environment affecting conservation. The associated social benefits in connecting with other likeminded individuals developing and working towards shared objectives are also significant.

Quollity opportunities

The QPWS NatureSearch program aims to engage the community in collecting high quality data on the location of the State's flora and fauna. Integral to this is the building of similar capacities, particularly in relation to survey techniques and identification skills, to those identified as necessary for members of a group aiming to positively affect the conservation of quolls in SEQ.

Similarly, the Threatened Species Network (TSN) aims to increase public awareness and involvement with the protection and recovery of threatened Australian species and their habitats. TSN seeks to work cooperatively with government agencies, scientists, educators and community groups in achieving species and habitat conservation. Through this work the network supports communities to undertake species conservation through developing communication between interest groups, initiating and facilitating on-ground conservation projects, providing education and resources, and supplying funding through the TSN Community Grants.

Through the combined resources of each of these programs, it was envisaged that a community group could be established to investigate reported sightings, raise community awareness of the spotted-tailed quoll and associated conservation issues, with a subsequent high likelihood of contributing to the continuing presence of quolls in SEQ.

Initial calls for information regarding recent sightings of quolls in SEQ in local and regional media resulted in several excellent sightings, together with a wide range of people expressing interest in involvement in a group of 'quoll seekers'.

First information session – Redlands IndigiScapes, October 2001

With a steadily increasing list of interested people, an initial information and planning session was organised in October 2001 to present the current available information on the status and ecology of quolls in SEQ. This session also aimed to facilitate the formation of the Quoll Seekers Network, recruit a volunteer coordinator and establish the aims and key roles for the group.

More than 40 people attended this first session and despite the generally bleak news concerning the current information available, the dramatic decline in sightings and the extremely low likelihood of getting to lay eyes on an animal, a roomful of hands were thrust forward to support the notion of establishing the group.

Table 1. Aims of the QSN as established at the first information session, Redlands IndigiScapes, October 1 2001.

Aim	Actions
1. To raise community awareness of quolls existence, status & relevant threatening processes, as well as community members potential for practical contribution to conservation of the species through:	 Production and distribution of information brochure; Publicity opportunities for both the quoll and the network; and Regular production of a network newsletter.
2. To gather data on recent sightings to facilitate better management through:	 Dedicated field work in known or reported sites; and Encouraging landholders to report sightings to network.
3. Provide training and support for volunteers who may:	 Become involved in field work to ascertain quoll presence from reported or likely sites; Monitor existing known sites for quoll activity; and Assist with distribution of information regarding the project and other administrative tasks.
4. Provide a central point for collection, collation and dispersal of information relating to quolls in SEQ to interested parties and the wider community through:	 Publicity, newsletter and linkages with related programs; and Development of a reputation for commitment to quoll conservation and community based action.
5. Target most relevant groups including rural and semi rural landholders, relevant State government agencies, local government and community groups.	 Encourage relevant management agencies to consider quoll conservation in planning and management actions; and Provide viable options and relevant information to landholders to facilitate quoll conservation on private land.

Following this successful initial information session, the compilation of contact details for ongoing involvement revealed one of the newly formed networks greatest resources - the extent and diversity of skills and knowledge evident amongst it's members.

The initial group included teachers, journalists, under-graduate and post-graduate university students and numerous dedicated individuals. A number of organisations including the Numinbah Valley Environmental Education Centre (NVEEC), Wildlife Preservation Society of Queensland (WPSQ) and officers representing local government also indicated support for the project.

Numinbah Valley Environmental Education Centre, December 2001

In order to develop the actions and priorities for the network, as well as begin to develop members' skills in undertaking fieldwork, a planning and training weekend was arranged at the Numinbah Valley EEC.

More than 25 people dedicated a precious weekend to furthering the network, showing their true community nature conservation colours and dedication to the cause.

In addition to receiving excellent presentations on a diversity of topics (see table 2), the newly appointed volunteer Coordinator for the QSN, Robert Callaghan was introduced to the group. Rob's role will include management of the QSN postal and electronic mailing lists, the QSN resource library and providing a first point of contact for the network.

Table 2. Presentations - QSN weekend 1-2 December 2001.

Mt Tamborine Spotted Tailed	Scott Martin
Quoll Community Survey	Griffith University
Passive & Baited Soil Plot	Alex Beresford & Amber Hooke
Surveys	University of Queensland Gatton
Susceptibility of Native Animals	Peter Cremasco
to 1080	Department of Natural Resources
Fauna Survey Techniques	Scott Hetherington
	QLD Parks and Wildlife Service

The group also undertook a 'swot' analysis facilitated by Mike Gregory (then Threatened Species Network) that developed a cohesive picture of the strengths, weaknesses, opportunities and threats relevant to the network.

Perhaps the most significant factor evident throughout this process was the common vision shared by the group in terms of achieving realistic goals through manageable actions. In what turned out to be an overwhelming acknowledgement of the potential for community based action to achieve important benefits for conservation, the group agreed that even in the hypothetical situation of having access to unlimited resources, the strategies employed would be virtually the same as the ones identified in the existing resource poor situation.

In addition to presentations, discussions and planning sessions, the network demonstrated its commitment to fieldwork by heading down to Numinbah State Forest for a swim. The Nerang River was a welcome respite from the hot, steamy conditions back at the EEC and the river was quickly abuzz with the enthusiasm building up through the day's sessions.

A training session outlining various methods of surveying for quolls was also held and followed up with hands on small mammal trapping training. The elliot and cage traps turned up a nice representation of small mammals encountered in the forest type of the site and presented a good opportunity for some introductory identification training. Species trapped included Bush Rat (*Rattus fuscipes*) and Fawn Footed Melomys (*Melomys cervinipes*).

Lamington National Park Quolls – a remarkable sighting

Auspiciously, within days of the QSN weekend at Numinbah EEC, rangers at Lamington National Park were privileged to view what few others have ever seen.

Members of a track crew working in the park observed an adult spotted tailed quoll with a mouthful of bird enter a rock crevice. Shortly after, the adult quoll emerged and headed off down the river. Whilst pondering their luck at such a sighting, things began to get even more exciting.



Juvenile quoll at Lamington National Park, December 2001. Photo courtesy: David Sakzrewski

Over the next half hour or so, up to four juvenile quolls (about one third of the adults size) were observed exploring around the mouth of the den. The young continued to test out their balancing and climbing ability until mum returned with another mouthful of bird and all retreated inside.

The quolls were observed on a number of occasions during the next week but were not seen again and are likely to have become independent (at around 18 weeks old).

Goomburra field weekend, March 2002

March 2002 saw nearly 50 people descend on Goomburra State Forest near Allora for a weekend of survey techniques training. During the early 1990's, the campground at Goomburra was a well-known spot for encountering quolls, often exploring the campground in search of any food scraps. As for many other sites, these sightings have decreased dramatically in the ensuing period and the QSN is particularly interested to establish if they still occur in the area.

QSN members participated in training in cage trapping, hair funnel sampling and spotlighting techniques. Elliot traps were also deployed and trapping results showed that despite no quoll sightings over the weekend, an extremely healthy population and diversity of potential quoll prey is present on site. Species observed and/or trapped included Northern Brown Bandicoot (*Isoodon macrourus*), Common Planigale (*Planigale maculatus*), Bush Rat (*Rattus fuscipes*), Fawn Footed melomys (*Melomys cervinipes*) and Yellow Bellied Glider (*Petaurus australis*).

Once again, the dedication and energy displayed by such a large and consistent group of people towards the efforts of QSN demonstrated the potential of the group in achieving positive outcomes for quoll conservation in Queensland (and went someway towards ameliorating some members disappointment at still not laying eyes on one!)

Partnership development

The development of cooperative efforts with relevant organisations and individuals is integral to the success of community based conservation efforts.

The support of TSN (Qld) and QPWS in allocation of staff time to QSN projects has been instrumental in the facilitation and operation of the network. The QSN has also established relationships with a number of key organisations including Wildlife Preservation Society of Queensland, University of Queensland Gatton Campus, Redlands IndigiScapes and Gold Coast City Council.

These partnerships take many forms and include recognition and support for QSN actions and initiatives, technical and resource support and assistance with promotion of QSN events and issues.

QSN has been able to offer in return access to recent relevant research, technical advice and provision of survey equipment. It is envisaged that as the resource base of the network develops and further field studies are carried out, the opportunity for cooperative efforts will exponentially increase.

Major achievements

In addition to planning and field activities undertaken and the cumulative benefits of information sharing through raised community awareness, the following points highlight some of the significant achievements of the network thus far:

- 1. Two editions of the QSN Newsletter have been produced by network volunteers, which have provided a great opportunity to share accomplishments and promote the activities of the group in the community. As at July 2002, the QSN has a mailing list of 150.
- 2. Network volunteers have also developed a high quality website that includes information about quolls and their plight, the QSN and how to get involved, QSN newsletters, photo gallery and links to other relevant sites. The QSN is currently working towards an official launch of the website in Threatened Species Week 2002.
- 3. The establishment and promotion of the network has already resulted in an additional 12 reliable sightings of quolls in SEQ.
- 4. The network has already attracted significant media interest including several interviews on ABC radio, feature articles on *Totally Wild* and in the Winter 2002 edition of *Wildlife Australia*. The QSN has also been featured in the national TSN newsletter, *The Web* and several editions of the QPWS newsletter, *Wild Times*.

- 5. Wildlife artist, Michelle Evans has donated the use of several of her works for QSN publications and will promote the QSN as part of an exhibition planned for Threatened Species Week 2002.
- 6. QSN volunteer Coordinator, Rob Callaghan has established an email list to facilitate discussion amongst members and as an additional opportunity to share accomplishments and ideas.
- 7. The QSN has also established a relationship with a quoll captive breeding program in SEQ, facilitating access to quality images for use in publications.

Planned projects

The QSN has only positive action ahead of it given the considerable level of achievement during the formative stages. Some of the projects currently in development include:

- Education Kits (including a poster together with information and activity booklets for a range of education levels);
- Fact Sheet series with specialist compilations for landholders, land managers etc.;
- Negotiation for sponsorship;
- Establishment of quoll proof chook house program including grants for materials (following the establishment of a similar program on the Atherton Tableland);
- Establishment of committees to undertake activities relating to fundraising, publicity and field work; and
- More dedicated, ongoing field work in conjunction with University of Queensland Gatton Campus, local government and private landholders.

Acknowledgements

The QSN is indebted to all network members just for showing up, let alone contributing amazing energy, knowledge and top quollity ideas. The following people have also contributed to the development and potential of QSN in a major way: Martin Fingland; Michelle Evans; John McCann; Kathy Julian; Trevor Beetson; Neil Simms; Jim Rebgetz and staff of Numinbah EEC; Bruce Cowell; Scott Burnett; Peter Cremasco; Wayne Abbot, David Sakzrewski & Lamington track gang; Rayelene Brown; Leanne White; Tim Moore; Redlands IndigiScapes Centre; Michael Lieberman; and Gold Coast City Council.

Risks or Threats to Biodiversity

Russell Turkington, "Twin Hills View", Lagoon Creek Road, Greenmount, Q, 4359.

The management of our family property has extended over a 112-year period and four generations.

In 1890 my grandfather selected this land. It was in degraded condition due to large numbers of wild cattle left over from Pilton Station. Conditions of selection were to clear 10% of timber per year and live on the place. The land was lightly timbered with very little grass cover and would run 1 house cow if you were lucky.

On the natural assets of the land, I feel that in the last 112 years we have been responsible in achieving positive results in the following areas:

- 1. <u>Good grass and tree cover</u>: Most areas have a covering of Blue grass, Wild Oats and the soft mountain grasses returning from oblivion (due to past Pilton Station excesses). Tree cover which was not present when I was a young man. In places now trees are too numerous as we are loosing the balance between good grass and sensible tree cover.
- 2. <u>Biodiversity</u>: Large increase in animal, plant and bird life and an increase in native species and also cattle grazing, moderate and sustainable grazing benefits the overall result, as sustainable grazing, using rotational systems, more watering points and fencing to manageable sized paddocks allows biodiversity to persist and improve. It also increases the seed bank in the ground. I have monitored this over a lifetime of 60+ years.
- 3. <u>Clean water</u>: Our creek now runs clear water after heavy and storm rains. When I was a young boy the creek ran liquid mud due to little grass cover, no contour banks on cultivation and the pressure of dairying, resulting in the handy country being eaten out, for obvious reasons.
- 4. <u>Carbon absorption</u>: This could be enhanced over a larger result in healthy tree cover if the Vegetation Management Act allows this to happen. At the present it has reverse effect.
- 5. <u>Clean air</u>: Balanced tree and grass cover results in controlling dust storms which were common in earlier days. The Queensland government in its Vegetation Management Act and Herbarium Maps seem to reward freehold landholders if they have few or no trees. If you have tried to do the right thing and left good tree cover you are rewarded by constraints and laws and costly permits (some reward). Your rights as a citizen are discriminated against, purely on tree cover. There seems to be moves at foot to do the same with biodiversity (without specific government mandate to do this).

Risks or threats to biodiversity come in a few forms:

1. Madeira Vine, Cats Claw and some of our other weed species (Parthenium etc.) are a very real threat to some of our land systems particularly scrubs. They have the ability to destroy same and are difficult to control.

- 2. Feral animals namely pigs, cats, foxes and domestic dogs gone wild, etc. In remote western country, camels, horses and cattle have gone wild and are in pretty large numbers in some areas.
- 3. People can also cause problems by spreading weed species and the inappropriate dumping of garden species and waste. Also by taking the total population of desirable bush and scrub plants for their gardens from areas in the bush.
- 4. The effect of the Vegetation Management Act is most disturbing! With anything that is in the white, people are making sure that the vegetation levels are managed so as not to be put in colour. This is the advice of some people in the administration of this act!!! There is a general feeling amongst landholders that with third party dobbing regime and list of fines that they are ducks in a shooting gallery and not members of a free democracy, or have equal rights with their city cousins, or understand the law as it is.
- 5. The recommendations to include biodiversity as an add on to the Vegetation Management Act is also most disturbing. What next after that???? I would have thought that an individual property management plan tailored to the particular property and done in a manner that would address the whole spectrum, namely, rare and endangered species, Vegetation Management, and animal and bird habitats, (to name a few) would be a lot more beneficial. There is a chronic shortage of hollows for birds and animals. The present situation at our place is our Red Rumps, Turks and Rosellas are building in gas heaters, irrigation pipes and sheds.

To understand the requirements of Vegetation Management Act (VMA), I have asked that our property's Property Management Plan be updated and brought up to speed to meet the VMA. I have asked Bruce Boyes to be present to advise on the biodiversity aspect. I thought that approach would enhance trust and mutual understanding and get an in-depth result that might build a few bridges between landholders and both State and Local governments and government Agencies and give landholders the assurance that they too were part of the future.

I also disagree with the approach of special designated areas as it is destroying the natural laws. A "whole of landscape" solution is what is needed not fragmentation.

There should be a change in the VMA to try and encourage all landholders to sustainably manage their land. Encourage them to revegetate an appropriate area of their property and have overall improvement in biodiversity on the "whole landscape" scale. This is particularly needed in the white areas.

Various assumptions have developed over the years as to the rights of the owners of freehold land, and the VMA and proposals such as the recommendations of the biodiversity group dated 23/07/02 are challenging some of these assumptions.

Landholders are naturally anxious to protect, not so much their "rights" in a legal sense (which appear to be ill defined) but to return to their existing traditional authority which will allow them to maintain their properties as sustainable units that are financially viable.

At present, two classes of title to freehold land seem to be developing, namely, the rights of the owners of the land in the "white" areas, and their rights of those owners who have tried over the years to maintain biodiversity with the consequence that their properties fall within the "coloured" areas.

The first class have no responsibility to maintain biodiversity in the form of vegetation and animals and suffer no penalties under present and proposed legislation and they will retain what has been regarded as the traditional rights of the owners of freehold land. The second group is being subject to various impositions, which will undo generations of work in preserving the biodiversity of their land.

This is a ridiculous situation, as the earning capacity of these properties has to be maintained if the owners are to remain viable and so be in a position to fulfill their obligations to the environment.

This uncertainty is not something that will develop in the future. The bush is already hurting and this is reflected in devastating suicide rates and stress levels in country people of all ages.

The Vegetation Management Act presents an opportunity to pull together, (conservation groups, local government, landholders and government agencies). The government is asking their public servants to put blueprint type legislation on a living, breathing landscape just like they would on a plan for a building approval!

We want a practical, commonsense plan to improve the overall landscape and unite all concerned, not a "Political Solution" that will win a lot of votes short term and divide the community and cause lasting rifts.

If I was not a landholder or custodian, some people would brand me an extreme greenie!!! The present climate makes that proposition unthinkable!!!

Our family have been custodians of this country for 112 years, I and my sons have a long term commitment to the land and feel we have been caring custodians of the same hope to continue in that role. Our land owns us not the other way around!!!!!

Appendix A Overview of 2000 and 2001 Conference Proceedings

Overview of 2000 South-East Queensland Biodiversity Recovery Conference

Taking Biodiversity Conservation "From Vision to Reality"

In 1981 Lockyer Valley farmer Fred From had a vision. A vision to bring people together to care for their catchment. The Fred From vision became reality with the formation of Queensland's very first Catchment Care/Landcare Group and one of the first in Australia. The Lockyer Watershed Management Association (LWMA) Inc. - Lockyer Landcare Group emerged as an action-orientated group, and has gone on to take many successful projects "From Vision to Reality".

LWMA's successes have been built on people - people at all levels working together to understand the issues of the Lockyer Catchment and foster workable, cooperative solutions. By organising the 2000 South-East Queensland Biodiversity Recovery Conference, LWMA sought to foster similar success at a regional level - a desire to take biodiversity conservation in South-East Queensland "From Vision to Reality".

The 2000 South-East Queensland Biodiversity Recovery Conference, held at the University of Queensland Gatton Campus from 21-26 October 2000, brought together almost 100 participants with the common objective of saving South-East Queensland's declining biodiversity. The range of participants in the conference was one of its great strengths, and included representatives from Local Governments and State Government agencies; landholders; university lecturers, researchers and students; and representatives from Landcare, catchment management, environment and community groups.

The conference was hosted by the Lockyer Watershed Management Association Inc. - Lockyer Landcare Group and The University of Queensland Gatton Campus, as part of the significant and valuable partnership between the University and Landcare and Catchment Management in the Lockyer Catchment.

The organisation of the conference was facilitated by a funding grant from the Queensland Environmental Protection Agency/Queensland Parks and Wildlife Service. Additional funding and in-kind support was provided by Gatton Shire Council, Laidley Shire Council, Esk Shire Council, the Lockyer Catchment Centre and The University of Queensland Gatton Campus.

Presentations covered the full spectrum of biodiversity conservation activities and issues in South-East Queensland, from regional-level planning to on-ground action on individual properties. The presentations centred on the following themes:

- Setting the scene.
- Science and research foundations for the right outcomes.
- Creating effective partnerships.
- Regional biodiversity planning.
- New local and regional approaches to recovery planning.
- Community biodiversity conservation challenges, success stories and good ideas.
- Tools for securing successful outcomes.

The presentations culminated in the *Fred From AO Address*, which was given in honour of Mr. Fred From AO, founder and patron of the Lockyer Watershed Management Association (LWMA) Inc. - Lockyer Landcare Group.

Participants then took the presentation messages and, with the background of their own knowledge and experiences, answered the following questions in workshop groups:

- What is our vision for biodiversity in South-East Queensland in the year 2050?
- What are the barriers to achieving this vision?
- What actions are required to overcome these barriers?

The Southern Queensland Biodiversity Network was established to implement the conference actions and further advance biodiversity conservation in the region.

The 2000 Conference proceedings

The proceedings of the 2000 South-East Queensland Biodiversity Recovery Conference can be purchased from the Lockyer Catchment Centre, Ph. 07 5465 4400.

Contents:

Introduction

Setting the scene

- Keynote Presentation: Adrian Caneris, President, Wildlife Preservation Society of Queensland (WPSQ). South-East Queensland Biodiversity: "Now we see it. Our Children won't..."
- Keynote Presentation: Mike Gregory, Queensland Coordinator, Threatened Species Network (TSN). *Biodiversity in Queensland: Emerging Issues and Community Involvement.*

Science and research - foundations for the right outcomes

• Keynote Presentation: Dr. Luke Leung, University of Queensland Gatton Campus. Wildlife Conservation in the Lockyer Catchment.

• Dr. Grant Wardell-Johnson, Dr. David Pullar and Robin Thwaites, The University of Queensland. *Ecological Survey, GIS, and Decision Support Systems to Identify Sources of Unsustainability: The Helidon Hills Proposal.*

Creating effective partnerships

- Keynote Presentation, Greg Siepen, Lecturer, School of Natural and Rural Systems Management, The University of Queensland Gatton Campus. *Community and Science: Partners for Success.*
- Graeme Burkett, landholder. The Human Factor in Biodiversity Conservation.
- Rick Galbraith, Devolved Grants Project Officer, Sustainable Management of the Helidon Hills Project. What Do You Do When You Can't Give \$72,000 Away?

Regional biodiversity planning

- Keynote Presentation: Professor Hugh Possingham, Professor of Zoology and Mathematics and Director of the Centre of Conservation Biology (CCB), The University of Queensland. *Regional Biodiversity Management Planning: Four Fundamental Principles*.
- Ann Peterson, Queensland Environmental Protection Agency. South East Queensland's Regional Nature Conservation Strategy: Working Together to Conserve Biodiversity.

New local and regional approaches to recovery planning

- Keynote Presentation: Bruce Boyes, Project Coordinator, Lockyer Catchment Biodiversity Recovery Project. *Multi-species Local Recovery Planning Benefits and Impediments*.
- Keryn Hyslop, South East Queensland Rainforest Recovery Officer, World Wide Fund For Nature. World Wide Fund for Nature South-East Queensland Rainforest Recovery.
- Wendy Drury, Brigalow Belt Reptile Recovery Planner, World Wide Fund For Nature. Addressing Reptile Biodiversity Decline in the Southern Brigalow Belt Using a Multispecies, Bioregional Approach to Recovery Planning.

Community biodiversity conservation - challenges, success stories and good ideas

- Arnold Rieck, Chairman, Society for Growing Australian Plants (Ipswich Branch). Establishment of the Rosewood Scrub Arboretum.
- Ian Smith, Coordinator, Mary Cairncross Scenic Reserve. *Juggling-balancing Tourism and Biodiversity in a Small, Valuable Reserve Mary Cairncross Scenic Reserve*.
- Brenda and David Parsons, landholders. *Re-discovering Plants Used by Aboriginal People*.
- Steve Fox, Technical Officer, Lockyer Catchment Centre. *Lockyer Roadside Conservation Project*.
- David Rounsevell, Project Manager, Birds Australia and Peter Sparshott, Project Coordinator, Birds Australia. *Woodland Birds of Queensland Project*.
- Alison Goodland, Project Officer, World Wide Fund For Nature. *Conservation of Darling Downs Remnant Native Grasslands*.

• Bruce Lord, Project Officer, Brisbane Valley Kilcoy Landcare Group. *Greenhide Rainforest Remnant*.

Tools for securing successful outcomes

- Stacey McLean, Program Officer (Flora & Fauna), Brisbane City Council. *Conserving Threatened Species and Ecosystems: A Local Government Approach*.
- Dr. Coral Rowston, Bushland Management and Consulting Services. *Biodiversity Monitoring: The Why's and How's*.
- Penny Watson, Fire and Biodiversity Coordinator. *The South-East Queensland Fire and Biodiversity Project*.
- Russell Turkington, landholder. Achieving Land for Conservation: The Effect on Landholders.
- Andrew Davidson, Lockyer Catchment Coordinator. Be Part of the Sequence Consort With the Consortium: A Community-based Funding Initiative.
- Craig Middleton, Nature Conservation Extension Officer, Queensland Parks and Wildlife Service (QPWS). *Nature Refuges* "Top Shelf" Conservation Agreements.
- Henk Hagedoorn, landholder. Tourism and the Helidon Hills.

The First Inaugural Fred From AO Address

- Introduction to the *Fred From AO Address*: Alan Brimblecombe, Life Member, Lockyer Watershed Management Association (LWMA) Lockyer Landcare Group.
- Presentation of the *Fred From AO Address*: Dr. Julia Playford, Manager Research Coordination Unit, Queensland Parks and Wildlife Service and Botany Department, The University of Queensland. *Biodiversity Conservation -From Vision to Reality*.

Vision, Strategies and Actions - Taking Biodiversity Conservation "From Vision to Reality"

Appendices

- List of Conference Participants.
- Map of Areas of Regional Significance.

Overview of 2001 Southern Queensland Biodiversity Recovery Conference

Biodiversity - the Big Picture

What biodiversity conservation progress has been made, both positive and negative, since the 2000 biodiversity recovery conference?

On the one hand we are continuing to lose our biodiversity to a range of threats including land clearing, weed invasion, feral animal predation and inappropriate fire regimes. On the other hand, new initiatives such as the Regional Vegetation Management Plan (RVMP) process, the National Action Plan for Salinity and Water Quality (NAPSWQ) and Natural Heritage Trust Stage Two (NHT2) offer considerable opportunities for achieving biodiversity outcomes. The South East Queensland Regional Nature Conservation Strategy provides an excellent framework for assisting the delivery of these outcomes; built as it is on a growing foundation of biodiversity conservation initiatives by Local Governments, community groups and landholders.

How do we maximise the ability of the RVMPs, NAPSWQ plans, NHT2 and other key processes and initiatives to deliver biodiversity conservation outcomes? How do we make sure the science is right? What gaps still exist? Who will fill these gaps, and how and when?

These were the questions asked by the 2001 Southern Queensland Biodiversity Recovery Conference, which brought together over 100 key biodiversity decision-makers at local, regional, State and National level.

The Conference was an initiative of the Southern Queensland Biodiversity Network, and was facilitated by a funding contribution from the Queensland Environmental Protection Agency and in-kind support and assistance from Crows Nest Shire Council. The Conference was held from 29 October to 2 November 2001 at the Lake Perseverance Recreation Centre near Toowoomba.

Presentations covered the full spectrum of biodiversity conservation activities and issues in South-East Queensland, from regional-level planning to on-ground action on individual properties. The presentations centred on the following themes:

- Setting the scene.
- Perspectives on private land biodiversity conservation.
- Protecting biodiversity using the best available science.

- Developing markets for ecosystem services.
- Local Government initiatives and innovations.
- The human factor in biodiversity conservation.

The presentations culminated in a Conference Resolutions session.

The 2000 Conference proceedings

The proceedings of the 2001 Southern Queensland Biodiversity Recovery Conference can be purchased from the Lockyer Catchment Centre, Ph. 07 5465 4400.

Contents:

Introduction

Conference Resolutions

Setting the Scene

- Keynote Presentation: Dr. Jeremy Thompson, Manager Biodiversity Planning, Queensland Environmental Protection Agency. *A Regional Nature Conservation Strategy for South-East Queensland*.
- Peter Voller, Queensland Department of Natural Resources and Mines. Regional Vegetation Management Planning in South West Queensland A Model for Regional Consultation for Vegetation Management Reforms.
- Paul Harris, Queensland Department of Natural Resources and Mines. *Regional Vegetation Management Planning in South East Queensland.*

Perspectives on Private Land Biodiversity Conservation

- Russell Turkington, landholder. Threats to Achieving Good Biodiversity Outcomes.
- Robert F. Skitch, Queensland Department of Natural Resources and Mines. *Encouraging Conservation Through Valuation*.
- Doug Cook, landholder. *Nature Conservation on Freehold Land Some Views, Particularly Regarding Land Tax.*
- Sally Stephens, Bush for Wildlife National Coordinator. *Nature Conservation on Private Land Where Does it Fit?*
- Carole Rayner, State Bushcare Coordinator. Land for Wildlife.
- Valmai Burnett, landholder. *Integrated Native Forest and Native Pasture Management*.

Protecting Biodiversity - Using the Best Available Science

- Keynote Presentation: Sean Hoobin, Queensland Murray-Darling Officer, World Wide Fund For Nature. *Protecting Aquatic Biodiversity Using the Best Available Science...* and Taking Precautionary Action.
- Monika Rhodes, Griffith University. *Maintaining the Biodiversity of Insectivorous Bats in Suburban Brisbane by Providing Artificial Roost Habitat.*

- Wardell-Johnson, G., Kanowski, J., Catterall, C., Proctor, H. and Reis, T.; Rainforest CRC, The University of Queensland, & Griffith University. *Measuring the Restoration of Rainforest Biodiversity: A Case Study in Research Design, and its Implications for Establishing Monitoring Frameworks*.
- Luke Leung, D. G. Kay, A. M. Beresford, N. Finch, A. Hooke, M. Boyd, & S. Brown; The University of Queensland. *Managing Impacts of Introduced Predators on Native Wildlife in the Helidon Hills*.
- Peter Sparshott, Birds Australia and Queensland Parks and Wildlife Service. *Woodland Birds Project Queensland*.
- Bat Advisory/Recovery Team. Submission on the Management of Bats on State Lands as Part of the Southeast Queensland Regional Forest Agreement Process.
- Stuart Collard, The University of Southern Queensland. *Ecological Services Provided by Vegetation Remnants of the Brigalow Belt Bioregion*.

Special Guest Presentation

• Carl Binning, Principal Research Economist, CSIRO Sustainable Ecosystems. Developing Markets for Ecosystem Services.

Local Government Initiatives and Innovations

- Bruce Boyes, Crows Nest Shire Council. *Innovation in Action: The Crows Nest Shire Natural Resource Management Program.*
- Dr. David Manning, Crows Nest Shire Council. The Use of Land Resource Information in the Sustainable Management of Natural Resources and Conservation of Biodiversity.
- Michelle Milton, Gatton Shire Council. *Managing Biodiversity Through the Gatton Shire IPA Planning Scheme*.
- Sharyn French, Logan City Council. *Managing Natural Areas in Logan City*.
- Alison Buchanan, Noosa Shire Council. Bushland Management Sponsorship.
- Gerard Brennan & Rick Galbraith, Crows Nest Shire Council. Striking the Balance Achieving Biodiversity Conservation Outcomes in Local Government.

The Human Factor in Biodiversity Conservation

- Keynote Presentation: Professor Ockie Bosch, School of Natural and Rural Systems Management, The University of Queensland. *Processes and Mechanisms for Integrating Research and Management*.
- Keynote Presentation: Professor Helen Ross, School of Natural and Rural Systems Management, The University of Queensland. *Community Initiative in the Conservation of Biodiversity*.
- Greg Ford, North East Downs Landcare Inc. *Understanding Human Perspectives and Values: The Key to Achieving a Balance Between Agricultural Production and Biodiversity Conservation.*
- Jeanette Mill & Fiona Hall, Australian Network for Plant Conservation. *The Australian Network for Plant Conservation*.

- Arnold Rieck, Society for Growing Australian Plants (Ipswich Branch). Another Weed Poster!
- Cuong Tran, South East Queensland Fire and Biodiversity Consortium. *The South-East Queensland Fire and Biodiversity Project An Update and Reasons for its Success.*
- James McKee, Greening Australia Queensland. *Community Nature Conservation Practical Biodiversity*.
- Sue Pechey, Environmental Protection Agency. Oral History in the Field.
- Nigel Kimball, Crows Nest Shire Council & The University of Queensland. *Public Participation in Natural Resource Management in Crows Nest Shire*.

Appendices

- List of Conference Participants.
- Excerpt from Regional Nature Conservation Strategy for South-East Queensland.

Appendix B Conference Participants

Surname	First name	Position	Property/Organisation/Group/Agency
Adams	Simon	Environment Management Officer	Logan City Council
Allalemdjian	Haig	Student	The University of Queensland
Anderssen	Geoff	Technical Officer	Lockyer Catchment Centre
Armstrong	Trevor	Agronomist	Alan Fletcher Research Station, DNR&M
Bailey	Jennifer	Senior Biodiversity Officer	Environmental Protection Agency
Barber	Dennis	District Environment Officer	Department of Main Roads
Bauer	Rob		Lockyer Discovery Tours
Beaty	Dave	Natural Areas Supervisor Operations	Logan City Council
Beitz	Ian		Lockyer Catchment Centre
Bigge	Frances	Environment Management Officer	Logan City Council
Blackley	Roxane	Natural Resource Monitoring Officer	Taroom Shire Landcare Group
Bland	Siobhan	Coordinator, Environmental Planning	Caboolture Shire Council
Borsboom	Adrian	Senior Ecologist	Sustainable Forestry Sciences Unit QPWS
Boyes	Bruce	Conference Coordinator	Southern Queensland Biodiversity Network
Braddick	Brent	Technical Officer	Tondoon Botanic Gardens
Brennan	Gerard	Director Technical Services	Crows Nest Shire Council
Brimblecombe	Linton	President	Lockyer Catchment Association
Brown	Richard		The University of Queensland
Brown	Peppa	Education & Community Partnerships Officer	Logan City Council
Burkett	Ingrid		The University of Queensland
Burkett	Graeme		
Burnett	Valmai	Trustee	Rathburnie Estate
Canavan	Margo		
Catherine	Hulm	Rainforest Recovery Coordinator	World Wide Fund for Nature
Clarke	Christine	Environmental Officer	Department of Defence
Cook	Doug		
Cordingley	Evan		Kipper Creek Fauna Sanctuary
Coyle	Melissa	Bushland Management Officer	Maroochy Shire Council
D'Arcy	Helen	District Environmental Engineer	Department of Main Roads

Surname	First name	Position	Property/Organisation/Group/Agency
Davidson	Andrew	Coordinator	Lockyer Catchment Centre
Diete	Greg	Owner/Manager	Black Duck Valley 4WD Park
Diete	Kate	Owner/Manager	Black Duck Valley 4WD Park
Drabsch	Gayle	Assistant Technical Officer	Lockyer Catchment Centre
du Blet	Roger		Reduct Pty Ltd
Ducret	Chantelle	Conference Assistant	
Durward	Jeremy	Environment Officer	Department of Main Roads
Edwards	Caroline	Environmental Officer	Department of Defence
Fritz	Bill	Manager-Save the Koala-Tree Planting Tours	Australian Koala Foundation
From	Eric	·	
From	Fred		
Gietzelt	Adam	Biodiversity Planner	Environmental Protection Agency
Gower	Matthew	Conference Assistant	
Gregory	Michael	Wildlife Ranger	Queensland Parks & Wildlife Service
Hagedoorn	Henk		
Hancock	Frederick	Ranger	Brisbane Forest Park
Hansen	Adrian	Bushland Regeneration Supervisor	Arborcare Qld
Harris	Paul	Regional Coordinator, Vegetation Management	Department of Natural Resources & Mines
Hausknecht	Tony	Student	
Hetherington	Scott	CERRA Executive Officer	Queensland Parks & Wildlife Service
Howell	Steven		Environmental Protection Agency
Hyslop	Keryn	Coordinator	Threatened Species Network
Jackway	Cathy	Environmental Officer	Department of Defence
Jones	Cr. Steve		Gatton Shire Council
Jorgensen	Brad	Lecturer, School of Journalsim and	The University of Queensland
Keith	Ken	Lecturer	The University of Queensland
Kerr	Jim		
Kimball	Nigel	Conference Assistant	

Surname	First name	Position	Property/Organisation/Group/Agency
King	Elizabeth	Assistant Manager (Terrestrial) Parks & Forests	Environmental Protection Agency
Larsen	Darryl	Conservation Project Officer	Gold Coast City Council
Laurie	Mark	Planning Officer, Regional Landscape Unit	Environmental Protection Agency
Lieberman	Michael	Conservation Officer	Gold Coast City Council
Lord	Bruce		
MacDonald	Steve	Manager, Regional Landscape Unit	Environmental Protection Agency
MacDonald	Jim		Lockyer Catchment Association
MacDonald	Cr. Jim	Mayor	Gatton Shire Council
MacQueen	Peter	Teacher	Southern Qld Institute of TAFE
Maher	Philip	SEQ Programs Manager	Greening Australia
Mahony	Kathryn	Regional Environmental Officer	Department of Main Roads
Manning	David	Land Resources Officer	Crows Nest Shire Council
May	Peter	Team Leader Natural Areas Unit	Logan City Council
Mayers	Fiona		
McGuire	Shannon	Senior Planning Officer	Logan City Council
McKenzie	Drew	Technical Officer - Ecology	Maroochy Shire Council
McPherson	David	Team Leader - Conservation	Maroochy Shire Council
Mitchell	Dave	Spatial Analyst/ GIS	Australian Koala Foundation
Moran	Ann	Director	Jaeger-Moran Environmental
Moscoso	Jennette	Administration Officer, Regional Landscape Unit	Environmental Protection Agency
Murray	Dan	PhD Student	Griffith University
Murton	John		Brisbane Valley RVMP WG
Neuendorf	Cr. Dave	Chair - Planning and Environment Committee	Gatton Shire Council
Noble	Bruce	Ranger	Brisbane Forest Park
O'Donohue	Mark	Water Quality Manager	SEQ Water
Parr	Shannon	Ranger	Brisbane Forest Park
Pfitzner	Christine	Conservation Officer	Logan City Council
Pitt	Cr. Shirley	Mayor	Laidley Shire Council Mayor

Surname	First name	Position	Property/Organisation/Group/Agency
Pritchard	Tanya	Bushcare Facilitator	Queensland Parks & Wildlife Service
Querengasser	Klaus		
Rajbhandari	Beryl		The University of Queensland
Rees	Jodi	Botanist	Sustainable Forestry Sciences Unit QPWS
Rieck	Arnold	Secretary	SGAP Ipswich
Robinson	Travis	Student	The University of Queensland
Ross	Helen	Lecturer	The University of Queensland
Rudd	Jenni	Ecologist	Queensland Parks & Wildlife Service
Scanlan	Dick		
Schilling	Veronica	Director - Planning and Environment	Gatton Shire Council
Shewell	Christine	Senior Conservation Officer	Environmental Protection Agency
Siepen	Greg	Lecturer	The University of Queensland
Smith	Ian	Principal Conservation Officer	Environmental Protection Agency
Steel	Kate	Landcare Coordinator	Taroom Shire Landcare Group
Straton	Anna		The University of Queensland
Swarbrick	John	President	Friends of the Escarpment Parks
Thompson	Dr. Jeremy	Manager, Biodiversity Planning Unit	Environmental Protection Agency
Towerton	Kel	Bushcare Officer	Logan City Council
Townson	Trudy		Lockyer Discovery Tours
Turkington	Russell	Secretary	Lockyer Catchment Association
Ward	Doug	Principal Biodiversity Planning Officer (Spatial	Environmental Protection Agency
Wardell-Johnson	Dr. Grant	Senior Lecturer	The University of Queensland
Weis	Ray	Stock Routes Inspector	Crows Nest Shire Council
Wynn	Alan	Revegetation Officer	Barung Landcare
Young	Peter	Senior Principal Biodiversity Planning Officer	Environmental Protection Agency
Zietek	Richard	Assistant Grounds Coordinator	Griffith University Nathan Campus

Notes