

Biodiversity Conservation

“From Vision to Reality”



THE UNIVERSITY
OF QUEENSLAND

Proceedings of the 2000
South-East Queensland
Biodiversity Recovery Conference

The University of Queensland Gatton Campus
21-26 October 2000



**The Lockyer Watershed Management Association
(LWMA) Inc. - Lockyer Landcare Group and
The University of Queensland present:**

***Biodiversity Conservation
“From Vision to Reality”***

**Proceedings of the 2000 South-East Queensland
Biodiversity Recovery Conference
The University of Queensland Gatton Campus
21-26 October 2000**

Edited by Bruce Boyes, Conference Convenor

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Cover picture

Splendid boronia (*Boronia splendida*) with satin blue butterflies (*Nesolycaena albosericea*), original artwork by Ian Smith. Small populations of the rare and recently described 'splendid boronia' have been found in parts of the southern Lockyer Catchment. Now the search is on to try and locate the beautiful satin blue butterfly, a threatened species that is dependent on boronias. The Turkington family, landholders at Greenmount in the southern Lockyer, have recently fenced off an important threatened species habitat area that includes populations of 'splendid boronia' - see Russell Turkington's paper *Achieving Land for Conservation: The Effect on Landholders* in these proceedings.

The artist Ian Smith has had a varied career as RAAF Hercules pilot, tractor salesman and dentist, becoming an environmental professional after completing Masters Degrees in Botany and Environmental Management at the University of New England and Griffith University. This followed a long interest in conservation in which, among other activities, Ian was a founding member of the Boondall Wetlands Management Committee. He is currently researching the ecology of Bunya Pine between appointments as a Principal Biodiversity Planner at the Environmental Protection Agency and Coordinator of the Mary Cairncross Scenic Reserve (see Ian's paper *Juggling-balancing Tourism and Biodiversity in a Small, Valuable Reserve - Mary Cairncross Scenic Reserve* in these proceedings). His botanic art provides the relaxation to stop him going completely crazy.

Ian completed Introductory and Advanced courses in Botanic Art with internationally known Brisbane artist Margaret Saul. He has exhibited at joint botanical art exhibitions at the Queensland Herbarium, Mt. Coot-tha Botanic Gardens in 1998 and 1999; the Burpengary Creek Environment Centre in 1999; and Mary Cairncross Scenic Reserve in 2000-2001. He is also the illustrator and joint author of *Common Birds of Mary Cairncross Scenic Reserve*. Although using a traditional botanic art style, as an ecologist Ian likes to incorporate the birds and insects that depend upon the plants. He works in watercolour, gouache and pencil.

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Introduction

The 2000 South-East Queensland Biodiversity Recovery Conference

Taking Biodiversity Conservation “From Vision to Reality”

Bruce Boyes, Conference Convenor, C/- PO Box 35, Crows Nest, Q, 4355.

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 has 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 jointly 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 issues and activities in South-East Queensland, from regional-level planning to on-ground action on individual properties. The presentations centred on the following themes:

1. Setting the scene.
2. Science and research - foundations for the right outcomes.
3. Creating effective partnerships.
4. Regional biodiversity planning.
5. New local and regional approaches to recovery planning.
6. Community biodiversity conservation - challenges, success stories and good ideas.
7. Tools for securing successful outcomes.

The presentations culminated in the first inaugural *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:

1. What is our vision for biodiversity in South-East Queensland in the year 2050?
2. What are the barriers to achieving this vision?
3. What actions are required to overcome these barriers?

Conference location and venue

The 2000 South-East Queensland Biodiversity Recovery Conference was held at The University of Queensland Gatton Campus, which is located in the Lockyer Catchment approximately 100 km west of Brisbane. The Lockyer Catchment provided the ideal location for the conference, and The University of Queensland Gatton Campus the ideal venue.

The Lockyer Catchment is a major agricultural area where the impacts on biodiversity from vegetation clearance and modification can be clearly seen. At the same time, the Lockyer Catchment also showcases a range of leading biodiversity conservation initiatives including Queensland's first private land Nature Refuge Agreement and one of Australia's first multi-species local-level recovery plans for threatened species and ecological communities.

The University of Queensland Gatton Campus is a recognised leader in the field of biodiversity education and conservation, with its graduates sought after throughout the world. This is one reason why the University was the ideal venue for the 2000 South-East Queensland Biodiversity Recovery Conference. Another reason was the low-cost nature of the University facilities. 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 low-cost facilities at The University of Queensland Gatton Campus 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 program

<i>Saturday 21/10/00</i>	Welcome reception.
<i>Sunday 22/10/00</i>	Field trips.
<i>Monday 23/10/00</i>	Keynote speakers and presentations, with a 'biodiversity video night' in the evening.
<i>Tuesday 24/10/00</i>	Keynote speakers and presentations, followed by the Conference Dinner and first inaugural <i>Fred From AO Address</i> .
<i>Wednesday 25/10/00</i>	Workshops: <ul style="list-style-type: none">• Practical workshops developed skills in using the new <i>Urban Bushland Assessment and Monitoring Kit for South-East Queensland</i> and <i>Individual Property Fire Management Planning Kit</i>.• Issues and solutions workshops explored South-East Queensland biodiversity conservation issues and developed proposed actions.
<i>Thursday 26/10/00</i>	Optional post-conference ecotour. Hosted by the LWMA <i>Lockyer Discovery Tours</i> program, the ecotour visited Bauer's Organic Farm, Bauer's Rare & Threatened Species Arboretum, Glen Rock Regional Park, Pepperina Place historic cottage and "A Touch of Paradise" scrub remnant.

Conference proceedings

These conference proceedings provide a wealth of information that will be invaluable to anyone involved in any way in the conservation of South-East 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 a plan of action that embraces the diverse experiences of landholders, government bodies, scientists and community groups.

Acknowledgements

The efforts of many people contributed to the success of the 2000 South-East Queensland Biodiversity Recovery Conference. I would like to thank:

- The **Queensland Environmental Protection Agency/Queensland Parks and Wildlife Service** for the \$4,000 grant that facilitated the organisation of the conference.
- **Gatton Shire Council, Laidley Shire Council, Esk Shire Council, the Lockyer Catchment Centre and The University of Queensland Gatton Campus** for additional funding and in-kind support.

- Keynote presenters **Adrian Caneris, Mike Gregory, Dr. Luke Leung, Greg Siepen** and **Professor Hugh Possingham** for their excellent presentations.
- **Dr. Julia Playford** for presenting the first inaugural Fred From AO Address.
- **Alan Brimblecombe** for introducing the first inaugural Fred From AO Address.
- **All of the conference presenters** for a great range of perspectives on biodiversity conservation.
- **Greg Siepen** and **Pam Lee** from The University of Queensland Gatton Campus for arranging access to the University's excellent low-cost facilities.
- **John Cockburn and the Lawes Campus Club catering** for keeping us very well fed during the conference.
- **Gayle Drabsch** and **Helen Smythe & Don Walker** for staffing the check-in desk and running many errands.
- **Graeme Burkett** for coordinating the audiovisual equipment.
- **Ian Smith** for the conference proceedings front cover artwork.
- **Greg Siepen, Rob Bauer** and **Trudy Townson** for hosting Field Trip 1; and landholders **Graham & Esther Cook** and **Peter Keys & Leanne Jackson-Keys** for welcoming Field Trip 1 participants to their properties.
- **Dr. Ann Ross, Kaori van Baalen, Helen Smythe, Martin Bennett, Dick Scanlan, Philip Lennon** and **Dr. Luke Leung** for hosting Field Trip 2; and landholders **Albert Welk, Henk & Geri Hagedoorn** and **Kent Smith** for welcoming Field Trip 2 participants to their properties.
- **Dr. Coral Rowston** for facilitating the "Using the Bushland Assessment Kit" workshop.
- **Penny Watson** for facilitating the "Planning fire management on an individual property: balancing safety and conservation" workshop.
- Lockyer Catchment Centre staff and volunteers **Andrew Davidson, Kaori van Baalen, Steve Fox, Gayle Drabsch, Patti Grant** and **Helen Smythe** for facilitating the "Issues and solutions" workshops.
- The **Queensland Environmental Protection Agency** for supplying copies of the "Biodiversity Planning Assessment of the South East Queensland region" map for inclusion in the conference proceedings.
- **Jim McDonald** for creating the conference participant database and assisting with the processing of registrations.
- **Helen Smythe & Don Walker, Jim & June McDonald, Paul and Tessa Hutton** and **Gayle Drabsch** for assisting with conference brochure folding and mail-outs.
- The **many willing volunteers** who helped out by chairing conference sessions, coordinating carparking and moving equipment.
- The **Lockyer Catchment Centre** for the use of its computer, photocopying and telephone facilities.
- **Everyone who attended the conference** for their enthusiasm, participation and commitment to the conservation of South-East Queensland's biodiversity.

Setting the Scene

Keynote Presentation

Adrian Caneris, President, Wildlife Preservation Society Queensland

1st Floor, 95 William Street, Brisbane, Q, 4000.

South-East Queensland Biodiversity: “Now we see it. Our Children won’t...”

Will biodiversity be maintained on our planet or even in our region? How long will it be before we see the effects of our current land management practices impacting on our lives in a very serious way? Our winters will be summers and our summers will be hell on earth! When will we realise the implications of our current actions and see our leaders, both locally and across the world, start to take action? The need has never been more crucial, particularly here in Queensland.

The recent unprecedented flooding across England has certainly got their Prime Minister thinking that this stuff is suddenly serious and “we all need to start taking note and implementing some real actions”. I hope his words and thoughts persist after the waters have receded. It amazes me how many Australians have watched these reports and don’t see any link. Too often we all see our own little part of the world in isolation. We even attribute different conservation status to the same species of wildlife, depending on which State it resides in!

Australia has the worst mammal extinction rate in the modern world. Since the settlement of Australia by Europeans in 1788, at least 30 species of mammals and birds and some 100 species of plants have become extinct in Australia. There are numerous species of mammals, birds, reptiles, frogs, and fish and over 200 plants nationally recognised as being endangered. That means that unless we change our current land use practices and remove the threats, these species will become extinct in the next 25-50 years. Considering that if anything our Governments try to understate the situation rather than erring on the side of caution. There are also many species which we don’t know enough about to even begin classifying.

This is an unacceptable scenario for most Australians, yet we all do very little about it. It is unacceptable on a global standard, particularly as Australia has such a high endemic fauna and flora assemblage. It is estimated that 82 per cent of our mammals, 89 per cent of our reptiles, 70 per cent of our birds, 94 per cent of our frogs and 85 per cent of our flowering plants are endemic. That is, they are only found in Australia and therefore can only be conserved by Australians.

We are the envy of the world when it comes to wildlife. Yet Australia spends less on its National Parks than any other western country. Yet many of our National Parks are considered to be the most precious and diverse in the world. We all know the problem but who is doing anything about it? The Commonwealth Government (and any 10-year-old child) has identified land clearing as the biggest threat to biodiversity.

Here at Wildlife Preservation Society Queensland we have the unfortunate task of trying to protect Queensland's biological diversity against an ever-increasing human demand for more land and resources. To give an example, in 1999 there was some 500,000 hectares of land cleared across Australia. Queensland is currently responsible for some 80% of land clearing in Australia. Last year alone we witnessed over 400,000 hectares cleared, much of which is virgin scrub including many endangered vegetation communities such as the brigalow.

This is a 20% increase on the previous year. As a result, South-East Queensland will see ecosystems becoming extinct within the next 10 years, and of course species will disappear much earlier. During this conference you will hear about many positive actions and initiatives undertaken in relation to these issues. However, you **must** realise that whilst we lose some 400,000 hectares per year, the areas covered by Bushcare, Land for Wildlife and other similar projects pale into insignificance in comparison.

There are many very alarming statistics being bandied around. How often do we have to hear that "by this time next century 50% of our forest dependant birds will be lost forever", before we all start making a serious contribution to reversing the trends. The birds won't be the only ones to go and soon our unique Aussie landscape will lose much of its character and resemble many others around the world. We will all share the same weeds, feral intruders and pastoral practices. It is happening before our very eyes and we are all too busy or ignorant to care. We already share South-East Queensland with many intruders. Weeds, which are dominating much of the landscape, are far too many to name here. Feral animals are not far behind; foxes, pigs, numerous fish, feral cats, Indian mynas, spotted turtle doves, sparrows, starlings, cane toads, bees, and many more are entrenched residents.

All this and we still hear those hollow statements about "ecologically sustainable development" and how in Australia we have strategies to conserve our biodiversity and natural landscapes. We must all realise that what little funding is currently available to help everyday Australians address this issue is limited, and came on the condition that the Federal Government could sell Telstra.

The words have all been written, our children are hearing about the problem in their school rooms, scientist are conducting research, but we need one more crucial ingredient to make it all possible. What we need is strength of character and commitment in our politicians and Government bodies. We must start demanding it. Real action is needed, not just talk. The sense and courage to see beyond political time frames is unfortunately extremely rare. If political courage and foresight were a native species, undoubtedly it would be considered "Critically Endangered".

Conserving our forest can and does pay. When logging was stopped in the wet tropics the sale of timber in the region was worth some \$25 million per annum. The nature-based tourism that has since developed is now worth in the vicinity of 25 times that amount and growing yearly. Wildlife is worth millions more than any development ever will be; yet somehow we continue to give precedence to development.

One of my favorite proverbs/quotes (I have no idea from where it originated) is:

Faith is a bird which begins singing in the new dawn whilst it is still dark.

I wish I could have such faith that this time next century we will still have forest dependant birds there to welcome the dawn, regardless of whether it is still dark or not.

Rest assured that the Wildlife Preservation Society Queensland will continue to be advocates for sensible and practical land use and to be the voice for our silent and often overlooked wild friends.

Keynote Presentation

Mike Gregory, Queensland Coordinator, Threatened Species Network

PO Box 710, Spring Hill, Q, 4004. The Threatened Species Network is a community-based program of the World Wide Fund For Nature Australia and the Endangered Species Program of the Natural Heritage Trust.

Biodiversity in Queensland: Emerging Issues and Community Involvement

Introduction

Queensland has more native mammal, bird, frog and reptile species than any other State or Territory. This simple fact makes the conservation of our remaining natural areas especially important in terms of Queensland's part in protecting Australia's biodiversity. South-East Queensland and the Wet Tropics of Queensland alone include areas with some of the most diverse range of forest flora and fauna in the country. There are over 500 species which could be considered threatened in Queensland (as either endangered or vulnerable) with many more also considered as rare, coupled with approximately 300 threatened ecological communities. Already, 27 species are presumed extinct since European settlement and some ecosystems have been reduced to a tiny percentage of their former range. Despite this, Queensland retains one of the highest clearing rates for vegetation in the world.

For the majority of threatened species and ecosystems throughout Queensland, habitat protection and management remains the primary action required, but achieving this has been both a complex and evolving task. In many cases, little is still understood about the biology and ecology of these species and communities, thus recovering them from the brink of extinction requires both ongoing research combined with on-ground action. In terms of conservation, one without the other is not good enough.

Although over the past decade there have been considerable improvements in environmental planning and management in addition to the considerable Commonwealth resources invested into the environment under the auspices of the Natural Heritage Trust (NHT), there remain considerable deficiencies within the current framework. These deficiencies include low levels of resourcing and limitations in the institutional arrangements and mechanisms that could support community involvement in recovery work and targeted biodiversity protection. These problems are compounded by (or possibly symptomatic of) the political nature and extent of the landclearing issue in Queensland.

The status of our biodiversity: The number of Nationally listed species and ecological communities

The *Queensland Nature Conservation (Wildlife) Regulation 1994* lists 21 plant and 6 animal species as presumed extinct in Queensland. A further 63 mammals (28% of Queensland mammals), 64 birds (10%), 83 reptiles (19%), 45 frogs (38%), 3 butterflies (5%) and 1017 plants (13%) are listed as endangered, vulnerable or rare. It should be noted that the list of threatened species in Queensland is biased towards vertebrates and vascular plants, reflecting in part the paucity of knowledge of many of the less well-known taxonomic groups. The list also masks the extent of regional extinctions and continuing regional declines for many species, and the “health” or status of their habitats. Table 1 shows for the total numbers of Queensland species listed under the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*.

Table 1. Total numbers of Commonwealth listed species for Queensland.

	Endangered	Vulnerable
Fish	4 species	2 species
Amphibians	9 species	3 species
Reptiles	4 species	16 species
Birds	10 species	8 species
Mammals	10 species	14 species
Non-vascular Plants	1 species	0 species
Plants	78 species	214 species

Landclearing is considered to be the major cause of, or factor contributing to, the decline of at least 44 threatened vertebrate species. Currently, programs are being implemented for approximately 23% of known threatened species.

Furthermore, there are no listed ecological communities in Queensland and the Queensland legislation does not have the capacity to list these or threatening processes. Likewise there are currently no nationally listed communities in Queensland under the new Commonwealth *Environment Protection and Biodiversity Act 1999*. However, there are a number of community nominations that were submitted under the previous legislation and it is expected that the legislation will be amended in the near future to more realistically reflect the status of Queensland ecological communities. A large number of these ‘at risk’ (either endangered or of concern) ecological communities are in the Brigalow belt, the region that has the highest rate of land clearance in the past 2 years (SLATS Report 2000). Sattler and Williams in *The Conservation Status of Queensland’s Bioregional Ecosystems* identified that of the 1085 Regional Ecosystems (REs) identified across all bioregions, 107 are classified as ‘endangered’ and 243 as ‘of concern’. Endangered ecosystems have been identified as usually associated with extensively cleared agricultural areas, wetlands, riparian zones and rainforest types in the Wet Tropics and Central Queensland Coast lowlands. Such areas also correlate with the number of threatened species recorded from these regions and the highest levels of biodiversity (Sattler and Williams, 1999).

Compounding the decline of many species and ecosystems is the fact that there is generally a lack of knowledge in regard to many aspects of our biodiversity, a fact recently

identified by the *State of the Environment Report 1999* (Environmental Protection Agency, 1999, Chapter 7). This lack of knowledge includes:

- detailed data on the status of many marine ecosystems, seagrasses and many other intertidal habitats;
- knowledge of benthic habitats and their extent;
- knowledge of invertebrate animal, non-vascular plant, fungal and micro-organism diversity;
- insufficient data on historical distributions to determine the extent of regional declines for most species;
- insufficient data to assess genetic diversity across bioregions - no coordinated monitoring of genetic diversity occurs; and
- comprehensive data on the impact of habitat fragmentation throughout Queensland.

Threats and biodiversity “hotspots”

Landclearing in Queensland represents the most significant political and socio-economic issue in relation to improving community capacity to undertake threatened species and ecological community conservation. Approximately 54% of clearing occur on leasehold land and 44% on freehold land (disturbingly the latest SLATS figures indicate an increase of freehold clearing). The most salient impact of clearing on biodiversity is the degree of habitat fragmentation. Remnant vegetation is typically fragmented into small patches, much of which may be inadequate for long-term protection of biodiversity, especially when considered with issues such as edge effect and condition of remnant vegetation, proximity to larger remnants and/or core habitat, and the provision of adequate corridors for wildlife. For example, in the South-East Queensland bioregion, 99% of habitat fragments are less than 50 hectares. The principles of island biogeography and conservation biology would suggest that many of these fragments maybe unable to provide continued viable habitat for many species, let alone maintenance of ecosystem function. Without large investments of capital and human resources to address these problems, either halting or reversing the decline of many regional ecosystems and species at the landscape scale represents an insurmountable task.

Landclearing has been identified at the regional scale to impact on:*

- 31% of REs in the South-East Queensland bioregion (rainforests and coastal lowlands contain the majority of rare and threatened species - a total of 230 flora and 94 fauna);
- 26% of REs in the Brigalow Belt (several woodland species are under threat, especially birds as well as many reptiles - a total of 79 fauna and 144 flora);
- 23% of REs in the Mulga lands (the most widely recognised landscape in Queensland to be extensively degraded, as much as 20% of all species of plants and animals are under threat - a total of 28 fauna and 19 flora species); and
- 39% of RE's in Wet Tropics bioregion (altered fire regimes in wet sclerophyll forests and clearing and drainage of coastal plains threaten the majority of listed species - a total of 87 fauna species and 363 flora).

(*Note: All totals refer to Queensland legislation, under the Nature Conservation Act, and were correct at the time of writing).

At this point the community's capacity to contend with these issues has been limited to dealing with a range of natural resource management issues and environmental restoration work. Much of the work to date is yet to be part of a targeted or integrated approach to biodiversity and threatened species conservation issues. In Queensland, outside of the land clearing debate and some of the wildlife protection advocates, comparatively little community effort has been allocated to strategic "high priority" biodiversity projects. There are many projects in areas such as South-East Queensland, central coastal Queensland and the Wet Tropics region which concentrate on restoring or replacing native vegetation communities. In many cases the possibilities of linking these groups with projects that could be targeted at priority threatened species and ecological communities has only just begun to be explored. In late 1998 the Threatened Species Network (TSN) was able to encourage community groups to undertake such approaches through the TSN Community Grants program. For example the Bridled Nail Tail Wallaby habitat restoration project, and more recently the multi-species local-level recovery project that the Lockyer Watershed Management Association (LWMA) Inc. - Lockyer Landcare Group has been carrying out.

Other threatening processes

Much Landcare and Bushcare funding is allocated to the management of environmental weeds for a range of biodiversity and production based outcomes. A very limited amount of this work involves feral animal management. Even in the South-East Queensland context where the community resources (including expertise) could be expected to be greater than for the rest of the State, the threats posed by such species (e.g. feral pigs) seem enormous when compared to the level of community resourcing. The introduction and spread of exotic species pose a serious threat to endemic biodiversity. For instance, declines in at least 17 species of threatened fauna have been attributed to predation by foxes and cats. Furthermore, there are approximately 300 introduced plant species that could or already have become environmental weeds.

Changes in fire regimes and the consequential habitat alterations also have grave implications for the maintenance of biodiversity. This is especially notable in the transformation of wet-sclerophyll forests into rainforests and the invasion of grasslands by woody weeds (both problems occurring predominantly throughout north Queensland). The implications of changes from the original regimes, which were either natural or the result of human management (such as in the case of Aboriginal 'firestick farming'), has yet to be accounted for within current land management paradigms. Similarly the impacts of fishing, such as species loss and seabed disturbance, is largely unknown. However there are indications of over-exploitation, although clear trends are difficult to identify. Very little has been done to generate community capacity to deal with any of these issues, although there are signs that this has begun. For example, the South-East Queensland Fire and Biodiversity Consortium and the Cooperative Research Centres for Wet Tropics, Rainforests, Savannahs and Coastal Management are all attempts to coordinate research and community responses to these issues.

Another primary biodiversity issue in Queensland has been unsustainable land management. Unsustainable grazing practices in combination with other land management practices have contributed to the deterioration and degradation of 85 million hectares, or 58% of the native pasture area in the State. Grazing by sheep and cattle covers 87% of the State (State of the Environment Report 1999). These impacts threaten a number of ecological communities throughout the State, particularly where grazing pressures are high, such as in the Mulga Lands where there is also a number of threatened flora species. At this stage little has been done to alter these practices. There are trial devolved grants programs under NHT, operating

in areas such as the Brigalow Belt where individual landholders are encouraged to enter into conservation agreements. The agreements include financial incentives for encouraging more ecologically sustainable land management (essentially fencing remnants and watering points with a small amount of re-vegetation also taking place), but there are few models which operate at the community level to generate both awareness and on-ground action. This is particularly lacking with respect to targeting threatened species or ecological communities.

A new (revived) program is in development by Queensland Parks and Wildlife Service. Called NatureSearch, it aims to increase community capacity to survey and monitor wildlife and if resourced over a long period will help to generate community involvement in many areas of biodiversity protection.

Institutional issues and community capacity

While there are many legislative and policy initiatives which influence the management of biodiversity, there are several deficiencies. Critically, no overall State Biodiversity Strategy exists to integrate and coordinate government and community efforts. Also, there is no current Threatened Species Strategy, although one is currently under development. Protected Areas and Bioregional Planning have been a major focus of State agency resources, however at this point in time they remain dependent on a statewide review of bioregional issues and are neither fully developed, or being implemented. Regional Strategy groups and Natural Resource Management groups (initiated by the bio-regional debate and resourced under the NHT) are yet to fully realise the potential to influence community resourcing in respect to threatened species and ecological communities.

The South-East Queensland Regional Forest Agreement (SEQ RFA) has been acknowledged as setting up a model for the establishment of a comprehensive, adequate and representative forest conservation reserve network for the region. However, there was limited community input into this process (as has also been argued in regard to some Regional Strategy Groups and Natural Resource Management Groups) and progress with implementation has been slow. Given this, the SEQ RFA is unlikely to establish a useful community capacity building model for threatened species and ecological community outcomes.

Also, major deficiencies in the comprehensiveness, adequacy and representativeness of the land and marine protected area system has yet to be fully addressed and there appear to be no mechanisms in place for the community to influence these decisions. For instance many conservation groups have been disappointed with the progress of the State Coastal Plan in terms of readdressing the inadequacy of coastal planning and development assessment and enhancement of the protected area network.

At the grass roots level there are many community groups broadly taking part in the protection and restoration of biological diversity as previously stated. Significant resources have been established under the Natural Heritage Trust. However, there is no data available on the extent of community involvement across Queensland and until recently the rationale or criteria and ecological prioritisation of this work has been somewhat ad hoc. This is mainly due to the lack of any strategies in which to place them (recent improvements have been made to align NHT program objectives within statewide environmental priorities). Also, very little documentation exists on the successes of projects to deliver tangible conservation outcomes for threatened species and ecological community recovery. It is hoped that the TSN Community Grants projects and other WWF project work will deliver some much needed data and models for best practice in this area.

Some suggested priority areas for increased community capacity include:

1. The Southern Gulf and Northwest Highlands, where there has been an inadequate level of survey and assessment of the region's biodiversity. There is little or no community action occurring in the region. A general lack of both awareness and availability of environmental educators in the region also exists.
2. The Brigalow Belt region has seen broad scale landclearing since the 1950's. Despite some effort from government agencies, the combination of demand for an increase in agricultural production and the past active encouragement by government to clear has led to one of the greatest land degradation and biodiversity "hotspots" in Australia. Considerable resources are now being invested in the region to halt the decline of native vegetation and species loss. But for many of the species and ecological communities it may be a case of too little too late.
3. Cape York, whilst remote, is one of the most comprehensively studied regions in the State, but even here some areas have been neglected. The vegetation of some of drier inland communities and the herpetological fauna is still poorly assessed. The main threats to biodiversity at present are associated with altered and inappropriate fire regimes. Communities are both small and remote and in many cases poorly resourced.
4. The Central Queensland coast has had a long history of clearing for sugar cane and pasture. Fragmentation of habitats and the associated impacts of ferals (especially weeds) pose a significant threat to both species and ecological communities. Both flora and fauna are reasonably well assessed in the region, however targeted conservation work by community groups is limited. Identification and development of appropriate icon conservation species could be successfully modeled on the very successful Queensland Parks and Wildlife Service Proserpine Rock Wallaby Program. Such recovery projects indicate the potential of strong community involvement, particularly where a species can be used for its "flagship" or icon status.
5. The SEQ coastal lowlands have a large number of endemic species, especially flora. There are a large number of community groups operating in the region and Local Governments are considerably better resourced, although little or no coordinated efforts are currently in place to focus community recovery efforts. Other opportunities include value adding to State agency lead recovery programs by creating partnerships with community groups. This is currently taking place with a number of recovery programs such as the Coxen's Fig Parrot, Eastern Bristlebird and the Mountain Stream Breeding frogs.

Reasons for community involvement

Environmental organisations make an important contribution to the conservation and enhancement of Australia's natural environment. Among the many activities undertaken they actively involve the community in the protection and enhancement of the natural environment. Such activities include raising community awareness and increasing the understanding of environmental issues, as well as effective advocacy in expressing the community's environmental concerns. There are thousands of environmental groups that seek to address local environmental issues and to undertake projects funded through a range of programs established by the Commonwealth Government under the NHT.

It has been estimated that, during 1998-1999 over 450,000 Australians were members of environmental organisations (see the March 1998 issue of the ABS publication

“Environmental Issues”). It is clear that community is indicating a clear commitment to the protection of the environment. One of the challenges I see for those who attended this conference is to translate this commitment into demonstrable biodiversity priorities and outcomes.

It is now nearly five years since the National Biodiversity Strategy came into being in 1996. The Strategy requires that the Australia and New Zealand Conservation and Environment Council review the performance of the National Strategy. In 1998 the Humane Society International and the World Wide Fund For Nature Australia released their own preliminary review of progress to implement the National Biodiversity Strategy in 1998. The review found that the National Strategy provides an effective policy and institutional framework to implement the International Convention on the Protection of Biological Diversity. However, it has been inadequately resourced into an action program strong enough to halt and reverse the major threats and fails to meet the agreed National Strategy timetable (agreed to by the Commonwealth and all States and Territories). This is particularly the case for priority actions relating to establishing a National Reserve System, halting or limiting broadscale land clearing, stopping and reversing the loss of remnant vegetation and effectively implementing the conservation of Australian species and communities threatened with extinction.

In the case of the National Reserve System and recovering threatened species, the major constraint is the inadequate amount of funds allocated. A large jump of funding to \$25 million per year for the Endangered Species Program would be needed to effectively develop and implement the recovery plans and threat abatement plans required under the EPBC Act 1999. A jump of funding to \$150 million over four years for the National Reserve System would be needed to implement a comprehensive, adequate and representative reserves system within a reasonable time frame, before opportunities are closed from ongoing land clearing.

However, it seems for any environmental cause it is always a question of resources and priority for both the community and government. Community support, involvement and finally pressure can only rectify the lack of government funding for the protection of species and ecological communities. Addressing the number of threatened species and ecological communities (1429 species currently listed by the EPBC Act) is too great a task under current recovery or conservation models. The experience of WWF working on a range of threatened species and eco-regional projects indicates that if we are to move to a ecosystem level of recovery then the Commonwealth under its Endangered Species Program will need to increase its funds. The Endangered Species Program, which has never been allocated more than \$7 million per year since its inception in 1990, is far short of the \$25 million per annum successive Commonwealth governments have admitted is required (Pittock, 1998, 22-23. WWF - HSI assessment on the National Biodiversity Strategy).

Without on-going stewardship and the sustainability of the recovery process much of the good work already done will fail to fulfill the desired outcomes, such as the successful recovery of a species or the reduction or erasing of a key threatening process. Maintaining “Recovery” beyond its initial public funding will be a requirement of most threatened species and ecosystem programs. It has been suggested by Pittock (1998), that the continued mainstreaming of biodiversity conservation (by both government and non-government organisations), so that land-management practices are integrated with threatened species and ecosystem maintenance, is at the core of this “sustainability issue”. Only through community participation and ownership of the recovery process can this be achieved.

Increasingly, resource planning and the distribution of Commonwealth funds have been allocated to regional authorities. Without the support of regional communities and authorities the future ability of Recovery Teams to create the necessary support for their activities may be limited. Recovery efforts will need to consider how to work within integrated regional processes - working with local economic initiatives, in particular to bring about threat mitigation. The role of community extension work and communicating project work should also be emphasized and needs to be considered within the community development context. From an ecological standpoint this signifies the importance of off-reserve conservation and the amount of habitat on private property and from an socio-economic perspective it considers the landholders needs.

The recovery process needs to identify how it can establish long-term change. Local communities, Local Government and conservation NGO's are well placed to provide this support if adequately involved and enabled during the recovery process. For the recovery of most species and ecological communities, it will be the responsibility of the community to sustain conservation efforts.

Finally, only by maintaining government support through demonstrable community participation in recovery programs can those concerned about biodiversity maintenance be assured of continued support and funding. By integrating recovery planning at the regional or local scale within other statutory plans (such as catchment management plans for instance), communities can avoid one of the greatest problems with nature conservation programs to date, which is that they have been largely piecemeal and not sufficiently co-ordinated to address the broader conservation issues facing the country. The implementation of comprehensive nature conservation strategies has been deficient and still remains one of the greatest environmental challenges for the future. Increasing the community expertise and systematic integration of conservation of ecological communities and threatened species into all Commonwealth programs like Bushcare will ensure that biodiversity is explicitly considered within environmental budgets and programs.

Conclusion

It is clear that from the number of species and ecological communities at risk in Queensland that the State is facing an ecological crisis. As mechanisms which seek to halt and reverse this decline continue to be developed the role of the community must be emphasized. Communities can make a substantial difference on the ground, through developing partnerships and providing political support. However, for improved biodiversity protection Queensland requires improved strategic direction and coordination. Moves to create a regulatory safety net under new Commonwealth laws (the *Environment Protection and Biodiversity Act 1999*) and Queensland vegetation and planning legislation (*Vegetation Management Act 1999* and *Integrated Planning Act 1997*) provide protection for some key remnants. However, it is clear that these alone will not provide the broad habitat protection and maintenance of ecological processes required to maintain biodiversity.

Community involvement in the protection and recovery of threatened species and ecological communities is essential for ensuring the long-term sustainability of biodiversity programs. By incorporating community involvement into biodiversity planning, the opportunities for community development can be identified along with threat mitigation strategies. As governments decentralise their natural resource management programs, the community must ensure that the resources are in place to focus on priorities. This means government provision

of assessment, mapping, identification and management expertise in relation to biodiversity, in particular for threatened species and ecosystems.

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Science and Research - Foundations for the Right Outcomes

Keynote Presentation

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Wildlife Conservation in the Lockyer Catchment

The cumulative impact of one hundred and sixty years of agricultural and pastoral development has resulted in extensive loss of native vegetation and introduction of weeds and animal pests in the Lockyer catchment region. These processes have caused declines and extinctions of wildlife populations elsewhere in Australia. Clearly, there is an urgent need to assess the conservation status of wildlife in the region.

The University of Queensland Gatton Campus is centrally placed in the Lockyer catchment region. We have recently initiated a wildlife program that aims to achieve conservation initially through integrated student projects, and subsequent externally funded projects. The program is built on the complementary strengths of the university, local Landcare groups and communities, regional environmental organisations and government agencies. The strategy of the program is to actively involve all stakeholders in developing and implementing conservation projects. The program is currently linked to the Lockyer Catchment Regional Biodiversity Recovery Project. Considerable planning and discussion with the Lockyer Catchment Centre and local Landcare groups has already gone into the program.

The wildlife program commenced in July 2000 with systematic surveys of terrestrial wildlife fauna in the Helidon Hills area. Ten pitfall trap lines (5 traps per line), 10 cage trap lines (6), 56 Elliott trap lines (20), 10 baited soil plot lines (12), and 10 passive soil-plot lines (10) were used to sample relative abundance of wildlife species during the first census in August 2000. Two more censuses using only the pitfall trap lines were conducted in September and October. Trap and soil plot lines were set for four consecutive nights for each census. Lines were located at least 200m apart to prevent individual animals from being sampled by more than one line (sampling independence).

The most disturbing finding from the surveys was the widespread distribution and abundance of foxes versus the sparse distribution and low numbers of most native wildlife species. Foxes are more abundant in and near cleared areas that are used for pasture. This is possibly because (1) the predator is more efficient in catching prey in the open habitat and (2) its main prey, the brown hare, is more abundant in the cleared areas.

The common dunnart, a small marsupial insectivore, was recorded at moderate numbers by pitfall traps. The relative abundance of this species was significantly reduced in areas where numbers of foxes were higher. This indicates that predation by foxes is causing declines in local populations of the dunnart.

Based on tracks recorded on soil plots, the abundance of some small and medium-sized native species (potential prey of the fox) was significantly reduced in areas with higher abundance of foxes. This again indicates the negative impacts of foxes on some native wildlife. A freshly killed female brush-tailed rock wallaby was found during the survey; teeth marks on the body indicated that it was killed by a fox.

During the surveys, tracks of the long-nosed potoroo (*Potorous tridactylus tridactylus*) were recorded in only one soil plot; and tracks of a quoll (possibly *Dasyurus maculatus maculatus*) were recorded along a dirt track. These results suggest that both the potoroo and quoll occur in very low numbers in the Helidon Hills area. Given such low numbers, it is difficult to collect sufficient data in the field to demonstrate the effect of predator, habitat factors, or other potential factors on these species.

Five individuals of the New Holland mouse (*Pseudomys novaehollandiae*) were recorded in the surveys. This was the first record of the species in the Helidon Hills area. This species occurs in NSW, Victoria and Tasmania. The New Holland mouse was first recorded in Queensland in 1996; it was trapped near Crows Nest and a second trap record was made in Glen Rock (Steve van Dyck, Queensland Museum, personal communication). The discovery indicates our lack of knowledge about the abundance and distribution of wildlife in the region and highlights the need for further surveys.

Having demonstrated the negative impact of foxes on native wildlife, we recommend that management of this introduced predator should be initiated as soon as possible. A fox-specific baiting project is being planned for 2001 and will be implemented through a high level of local community involvement. Continued support for the conservation and management initiatives will be maintained through publicity and education.

We are optimistic that native wildlife can be saved using a combination of science and education. There is a tremendous amount of good will toward native wildlife from the local communities. If we can convert this into action, then the future of native wildlife in the region is promising.

Ecological Survey, GIS, and Decision Support Systems to Identify Sources of Unsustainability: The Helidon Hills Proposal

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We introduce a methodology to identify sources of unsustainability within forested ecosystems. From a philosophical perspective, we believe that while sustainable ecosystem management cannot be defined precisely over time and space, it is possible to accurately identify unsustainable practices. A model of unsustainable land practices is based upon decision tables that relate land condition, environmental hazards, management options and their relationship to sustainable practices. The model can be extended to assess spatial and temporal information associated with natural landscape regions. This will result in a powerful tool of practical interest to land resource decision-makers. We believe that there is potential to develop this project using the Helidon Hills as a case study. A regional quadrat-based survey of this area, which incorporates both floristic and abiotic variables, would provide the data to apply the methodology.

Introduction

Australia's forests are both diverse, and limited in distribution. Biodiversity measures therefore play a key role in the monitoring and portrayal of forest health, nationally, regionally and locally. However, in themselves they do not provide the information necessary to achieve sustainable land management. Current measures of forest health concentrate on map-based products and changes reflected by forest cover within and between bioregions. These approaches are not likely to reveal subtle processes underpinning longer-term reductions in biodiversity within forested ecosystems because they do not explicitly reveal areas of threat, or areas that are being managed unsustainably. Thus, these approaches do not enable the identification of key sources of unsustainability. The imminent demise of many biological communities and hence of societies social and economic frameworks within key regional agricultural landscapes (e.g. Western Australian wheatbelt, sections of the Murray Darling Basin) does not allow complacency in management or monitoring of forest refugia. Thus, there is a need to develop a methodology for identifying sources of sustainability so that sustainable land management becomes a measurable goal.

A methodology and tool for sustainable land management is necessary based upon the identification of sources of unsustainability within ecosystems. The research may be based on

a promising model, developed at The University of Queensland called TIM (Smith et al., 1999; Smith and Thwaites, 1998), for explicitly evaluating land management options in relation to the environmental hazards that threaten land productivity and natural biodiversity.

It is possible to extend the TIM methodology and to implement its analysis capability in usable computer software. This work is central to a vibrant and emerging field of research in ecosystem management (Klopatek and Gardner, 1999). Evaluating unsustainable land management practices at explicit spatial and temporal dimensions may assess the principles of ecosystem sustainability. A knowledge-based tool can be developed to perform this evaluation using geographic information systems (GIS) and expert systems technology.

Furthermore, such a project would allow the development of a geocological basis for land management decision making. Ecosystem management needs to include base-line biophysical criteria and threats (e.g. fire sensitivity, disease vulnerability, salinity) that have spatial and temporal variability. A site-based survey is necessary to elucidate threats to biodiversity and ecosystem stability, hence providing a focus on how best to combat likely threats and hazards (Noss, 1990).

These goals require investigation within the context of a case study. The Helidon Hills near Gatton provides a suitable area because it is a discrete area that is subject to intense public interest on environmental and socio-economic issues. Furthermore, a draft management plan for the area provides a blueprint for community involvement in research and management, and offers a positive vision for the management of the Helidon Hills. A project to develop this methodology would use this invitation for community involvement to apply the project research goals to identify and quantify the existence of threats and hazards. This would then provide a decision tool to evaluate the sustainable management options available to combat these threats or hazards.

The importance of landscape ecology in monitoring ecosystem health

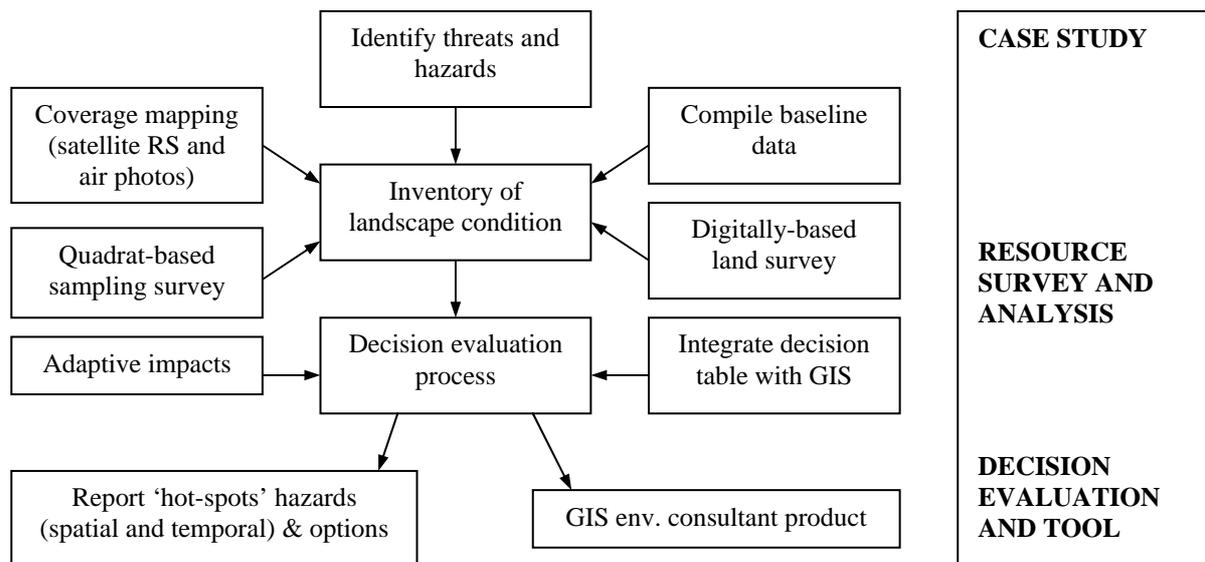
Landscape ecology, as a developing discipline, needs an enhanced scientific approach to relating the ecosystem fluxes of organisms, materials, and energy with models of landscape heterogeneity. The development of TIM methodology would make a contribution by quantifying threats at the broad landscape scales from site-based surveys at finer scales. For example, Wardell-Johnson *et al.*, (1999) provides a means of quantifying threats to biodiversity from potential weed invasion which depend upon quadrat-based floristic sampling. Such an approach is also advocated in the Helidon Hills case study. The ability to identify and monitor change at different spatial and temporal scales is a major shortcoming in current landscape monitoring schemes. The project will demonstrate that quadrat-based sampling, with advanced land resource assessment techniques can be used for 'ground truth' mapping, or to express trends at broader landscape scales.

The incorporation of GIS technology

The current development of TIM uses a desktop GIS to store, query and analyse spatial information. It was successfully applied in an agricultural area in the lower Herbert River agricultural district of far-north Queensland (Smith *et al.*, 1999). Despite strong interest (for the methodology and tool) by private and public environmental consulting groups it has not been productively embraced by these groups. A major impediment to adoption is that a functional prototype is not available that includes an inference capability to assess a suite of land management options. It is clear that industry values a working model much more highly

than a well-researched methodology. A working model could be built in a timely manner by embedding an expert system shell in the GIS. Additionally, the original methodology and tool can be enhanced to include spatial and temporal quantification on land management hazards (Pullar, 1997), ecological threats, and subsequent evaluation of management options. By linking this knowledge-base to obtain a more intelligent tool with TIM, significant developments in enhanced approaches to land resource assessment are likely. Furthermore, a prototype tool that can be readily used by land resource scientists is likely to lead to a very positive response from the relevant industries for its future adoption. This project would incorporate several interrelated modules (Figure 1).

Figure 1. Interrelationship of various modules required in developing a system for the identification of sources of sustainability.



Case study: The Helidon Hills

The Helidon Hills is a distinctive hilly region immediately to the north of Gatton Campus of The University of Queensland and has been used as a field study site from the Campus for many years. The Helidon Hills includes an area of approximately 33,430 ha, of which about two-thirds is private freehold and the remainder State Forest. The area is the subject of intense public interest, and a draft management plan has been released (see Boyes *et al.*, 1998). There is considerable interest both in the specific ecosystem and in its management by the local community. Nature conservation issues in State Forest and leasehold land have been included in the Regional Forest Agreement (RFA) process. The area has long been recognised for its floristic diversity (Toowoomba Field Naturalists Club, 1987).

Despite the conservation importance of the area and its close proximity to Brisbane, current management relies on local knowledge, lists of critical species, and a very active local community involvement in management decisions. Far fewer resources have been allocated to providing necessary management data compared (for example) to the nearby Brisbane Forest Park. Some data is included in vegetation maps compiled by the Queensland Herbarium (Johnson *et al.*, 1997; Grimshaw, 1998), but no detailed mapping or quantitative analysis of the vegetation communities exists in the area for portraying vulnerable or rare communities. The scarcity of reliable quadrat-based ground data makes it impossible to take

advantage of remote-sensed imagery. Thus, alternative management practices and threats to biodiversity conservation are currently difficult to assess either spatially or temporally.

Threats to the Helidon Hills

Weed and feral animal invasions were identified by Boyes *et al.*, (1998) as serious threats to the biodiversity values of the Helidon Hills. For example, endangered rainforest vegetation communities have become infested with the exotic weed, madeira vine (*Anredera cordifolia*). Some uncommon plant communities in the area, such as those dominated by palms (*Archontophoenix cunninghamiana*) and associated rainforest species, are restricted in development because of regular fire events (Boyes *et al.*, 1998). The identification of rare or threatened communities remains rudimentary in the area, but there is a high likelihood that plant disease caused by the pathogen *Phytophthora cinamommi* is a threat to plant communities (and associated biota). The link between disease, fire management and disturbance is strongly suggested (e.g. Wardell-Johnson and Nichols, 1991; Wardell-Johnson and Horwitz, 2000). Many of the soils in the area are duplex sodic and therefore will erode badly when exposed or disturbed by fire, timber exploitation, and road/track access. The potential to exacerbate the naturally occurring salinity of the area is high.

Data about threats and hazards is necessary as part of the knowledge base for the project. This information must come from a combination of scientific, and local expert knowledge. Data can be acquired through field work and consultation in the early project stages. It must become more structured at later stages to enumerate management options and the impacts of decisions. Focus group meetings are considered as an effective way to evaluate the project, and also to deliver outcomes.

Resource survey and analysis

Information requirements for the project include the collection of quadrat-based floristic data that can be related to remotely sensed data. In addition, there is a requirement for the acquisition of land-based data that can be predictively determined through digital modelling. This will not only allow the derivation of effective vegetation and land resource maps of the region, but will also provide the biophysical basis for land management decisions. It will also enable a base-line of biophysical criteria and attributes (e.g. fire sensitivity, disease vulnerability, erodibility, salinity). The process will include compiling base-line mapping information in a GIS, a site-based biophysical survey (see Thwaites, 1995; Wardell-Johnson, 1997), broad-scale calibration with satellite remotely sensed imagery and digital aerial photography with field and GIS data, and a thorough quadrat-based floristic assessment (Wardell-Johnson and Williams, 1996; Wardell-Johnson, 2000). A digital elevation model (DEM) for the area using currently available topographic data and related to reconnaissance soil survey data will be used for digital site-quality prediction. Soil sampling would coincide with the floristic quadrats as well as serve the digital site modelling process.

Relationships between floristics, overstorey and environmental attributes

Considerable detailed quadrat-based floristic survey has been carried out in relation to environment in Australia. For example, community-types were strongly associated with edaphic, climatic and geographic attributes in both Toohey Forest (which includes sandstone substrate similar to the Helidon Hills) and the Tingle Mosaic in south-western Australia (Wardell-Johnson and Hurst, 1999; 2000). For the Tingle Mosaic, environmental attributes were strongly associated with patterns of variation in both community type and basal area of

individual overstorey species. There was also a significant relationship between community type and basal areas of individual overstorey species. Conversely, in marked contrast to the floristics, limited patterning could be discerned in basal areas of the overstorey within Toohey Forest. Thus, the degree to which one component of the biota can be used as a surrogate for others is likely to vary between regions. These results suggest that care is required in the use of overstorey features in mapping surrogates for biodiversity. Furthermore, it is likely that a thorough floristic survey will be necessary to relate the environment and the biota (see McKenzie *et al.*, 1991; 1996).

Decision evaluation and tool

TIM will be implemented as a knowledge based system using decision tables. Decision tables use a tabular structure to store condition and action relationships as attributes. Land condition values and management options translate to condition attributes in TIM, and threats and management practice ratings translate to relationship attributes. Decision tables are consistent with GIS data models. Hence, integration of the technologies would enable the provision of spatial interpretations on decision evaluations. A logical inference algorithm (Pullar, 1997) will be integrated in the GIS to evaluate spatial and temporal descriptions of land condition. This is based upon the mathematics for spatial and temporal relationships. However, an important part of the work will be to understand common terminology as used by land resource experts and scientists to describe land attributes.

The decision tool must be developed early in the project, and work to include spatial-temporal qualification in the knowledge base would have to continue throughout the project. This tool and knowledge base can be used later in the project to evaluate management decisions in Helidon Hills. For instance, it may be appropriate to evaluate *hot spot* hazards or unsustainable practices. It will be necessary to engage the community through structured focus sessions to evaluate ecosystem management decisions. Thus, an involved local community is a necessary prerequisite for the effective implementation of this approach.

Conclusion

It is possible to identify sources of unsustainability in forested ecosystems. We argue that a focus on key sources of unsustainability allows scarce resources to be used most effectively in ecosystem management. This prevents the dissipation of resources away from areas of greatest need. However, this process requires appropriate quadrat-based biophysical data (see McKenzie *et al.*, 1991; 1996) as well as appropriate computer-based models applicable to the entire study site. This process will allow the quantification of the spatial and temporal dimensions of ecosystem threats and hazards, and the development of an intelligent decision tool to identify unsustainable land management practices.

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Creating Effective Partnerships

Keynote Presentation

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Community and Science: Partners for Success

Conservation of biodiversity, whether it be in south eastern Queensland or in Iceland, cannot be achieved unless there is cooperation between all stakeholders, from scientists, researchers, all levels of governments, utilities, non-government organisations, community groups and individuals. Much can be done independently by individuals, organisations and groups. However, even more can be achieved by working together.

This paper discusses the partnerships that have been established between the School of Natural & Rural Systems Management (The University of Queensland - Gatton) and the Lockyer Valley community, principally through the Lockyer Catchment Centre, and the benefits that have resulted to the University, the students, the Lockyer Valley community and for biodiversity conservation.

Background

I have had a long history of working with the broad community in the conservation of our natural and cultural resources. I was a Wildlife Extension Officer with the New South Wales (NSW) National Parks & Wildlife Service for 15 years. In this position I dealt with a range of wildlife/farmer issues such as ducks on rice fields, protecting orchards from fruit bats (flying foxes), kangaroo management on rural properties and generally integrating nature conservation into overall property management.

I administered the Wildlife Refuge Scheme, the forerunner to the Land for Wildlife Scheme, which provided opportunities for rural landholders to conserve wildlife habitats in association with rural production.

After a three stint in Landcare as the NSW State Landcare Coordinator I spent two years as Manager, Community Nature Conservation, in the then Queensland Department of Environment and Heritage. In this position I oversaw the establishment of the first Nature

Refuge in Queensland, Berlin Scrub, on Dick and Doris Scanlan's property, in the Lockyer Valley. I was very fortunate to meet Dick and Doris on the first inspection of their property with ranger Ron Turner.

Over the last five years I have been a lecturer at Gatton campus, teaching subjects such as *Community Nature Conservation, Extension and Interpretation* and coordinating the School's *Industry Placement Program*.

Natural & Rural Systems Management

The School of Natural & Rural Systems Management has been in operation for about 10 years turning out graduates and post-graduates in the broad disciplines of natural systems management, farm management and agribusiness. Since coming to Gatton I have endeavoured to provide real-life examples for my students in their studies. Below are some examples of where students have interacted with the community for the benefit of all participants.

Class work

Community Nature Conservation

This subject deals with the conservation of small "reserves" containing native plant and animal communities and the sociology of managing volunteers to achieve these ends. As well as field trips to The Lockyer Catchment Centre and Berlin Scrub Nature Refuge guest speakers from the community (e.g. Greening Australia, NatureSearch, and Australian Trust for Conservation Volunteers) are brought into the classroom.

One example of providing the students with practical experience was in the collection of ecological information for endangered species occurring in the Helidon Hills. Several visits were made to a range of properties to look at the occurrence of particular species and to talk to the property owners about their needs and wants in regards to management and conservation.

Specific A4 "Fact Sheets" were produced for each species selected and the information about occurrence, conservation and management was presented back to these landholders.

Lake Apex has been an excellent site for students and the community to be involved in conservation. Students doing Community Nature Conservation have prepared plans for: Management of this lake; Vegetation Establishment; and Interpretation/Public Contact.

Restoration Ecology

Restoration Ecology deals with the principles and methods of restoring degraded and/or alienated landscapes. It has a high field component and students work in groups to design programs to restore selected sites back to a more natural condition. Consequently, interaction and involvement has been with the Lockyer Catchment Centre, Landcare, golf clubs and individual landholders.

Case Studies

This is a full year subject in which groups of students investigate current issues in natural and cultural resource management. It involves guest speakers and experts who set the scene for

students to undertake a 'case study' approach to an issue. In the last few years issues such as salinity, tree clearing and feeding wildlife have been investigated. This subject cannot be completed without a huge input from all the stakeholders involved with the issues being studied.

One example that was completed a few years ago was the assessment of native vegetation in the Laidley Shire. Steve Fox was one of the authors and the report was presented to the Council.

Extension & Interpretation

Finally, in this subject students acquire knowledge and expertise in communication. Through the Lockyer Catchment Centre a small group of students designed and mounted the Biodiversity Recovery Project Display that you see in the foyer. They received an 80% assessment for this project and the Centre can use the display at future functions, field days and conferences.

Industry Placement

Third year students undertaking this subject must spend a full semester with an organisation doing an agreed project under the direction of a daily supervisor and an academic supervisor. The end result is a report for the organisation and also for taking to job interviews. This is an excellent example of science and community working together to achieve biodiversity conservation. This year we have students:

- in South Africa working with the South African Wildlife College on wildlife, water and plant management interaction;
- working on biodiversity plans with Greening Australia;
- doing ecological research into goats and foxes at the NSW Agricultural Research Centre, Orange;
- involved in species recovery plans with Queensland Parks & Wildlife Service; and
- assessing blue gum (*Eucalyptus tereticornis*) stands in the Lockyer Valley

In previous years the Helidon Hills Fire Management Plan was compiled by Industry Placement student, Marc Gardner (1998). It is a useful document for landholders, Local Government and community groups. Sally Stelfox completed a project on restoration and weed management of the Welk Remnant, Mt Berryman in 1999.

Vacation practical work

Other students gain experience and provide much needed help to fauna sanctuaries, Greening Australia, National Park managers and to community groups (Landcare and nature conservation) during vacations.

Research

We listened earlier to what Dr. Luke Leung is doing on predator research in the Helidon Hills. Other researchers such as Dr. Greg Baxter (birds and wallabies), Dr. Steve Johnston (koalas) and Dr. Peter Murray (vertebrate pests) are conducting studies in the community on species

important to science and to biodiversity conservation. How many of you have talked to these researchers about doing some research in your area?

Benefits

Projects completed: Projects that otherwise would not be undertaken because of other higher priority ones or because of lack of finance can be done to a very high level.

Learning and information exchange: All people, organisations and groups may learn more about our natural resources by being involved in joint projects. There is also information exchange between all parties involved that increases knowledge and understanding of different issues. For example, a more scientific approach being adopted by a community group and a greater level of awareness of community's values and constraints gained by the student.

Respect and trust: Respect and trust is gained by all who become involved in university/community projects. Some landholders who were involved in the Helidon Hills endangered species field trips offered students to come back to their properties to do more investigations - a benefit for both student and landholder.

Application of techniques: The joint projects provide the students with an opportunity to apply techniques learned in the classroom and thereby learn the nuances of application under different conditions.

Holistic approach: Undertaking joint projects can give a holistic approach not achievable in the classroom examination.

Employment: Students who have participated in the joint university/community projects have gained employment quicker than other students. The university's image benefits by having recent graduates gain employment.

After graduation

The benefits for the students from working with the community are evident in the following examples. The Fact Sheets produced on the endangered species occurring in the Helidon Hills were taken a step further by one student. Upon graduation, Katrina Warman was contracted by the Lockyer catchment Centre to produce this information as a guidebook. The result is *A landholder's guide to The Rare and Threatened Species of the Helidon Hills*, which is a very useful guide for landholders, community groups and researchers. Katrina now works for the Department of Primary Industries on sustainable land and pasture management in the Roma district.

Steve Fox, one of the authors of the Laidley Shire vegetation Assessment report has been working at the Catchment Centre since graduating. The other authors: Richard Johnson is a Conservation Officer with Queensland Parks & Wildlife responsible for the accelerated on farm conservation scheme in the Roma district; David Patmore is working at Environment Australia in Canberra; while Dan Murphy is employed by the Environmental Protection Agency on the Atherton Tableland. He is working with CSIRO, local landholders, TREAT (Trees for Evelyn and Atherton Tableland) and the Centre for Tropical Forest Restoration on establishing wildlife corridors using the "framework Species" method developed by Nigel Tucker and Steve Goosem.

Marc Gardner (Helidon Hills Fire Management Plan) has worked for a number of Local Governments in the environment field since graduating.

The above examples indicate that students who have worked with the community during their university studies have benefited to the extent of being preferred for jobs over other graduates.

Conclusion

In terms of biodiversity conservation, much can be done independently. However, more can be achieved through the whole community working together. The School of Natural & Rural Systems at the Gatton Campus of The University of Queensland has a system whereby undergraduate, post-graduate and researchers can work with the broader community to achieve biodiversity conservation and academic goals. The above discussion indicates that students, university and cooperating landholders, organisations and community groups can all benefit in a variety of ways.

As the old advertisement said...*"Why don't you call?"*

Acknowledgements

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The Human Factor in Biodiversity Conservation

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

A case study based on the Sustainable Management of the Helidon Hills Project, by Helidon Hills landholder Graeme Burkett.

The Helidon Hills are around 33,000 ha of continuous bush and one of the largest bushland areas in South-East Queensland. The area has tenure of around 66% freehold title and 33% State Forest, with the State Forest proposed for conversion to some form of conservation reserve.

Many industries over many years have operated in the Helidon Hills, such as timber harvesting, extractive industries, explosives manufacture and farming, and people are now looking at new enterprises such as ecotourism and native floriculture.

In 1997 the Sustainable Management of the Helidon Hills Project was begun. The objective of the project was to provide a process for the Helidon Hills community to focus its collective energies on sustainable management of the Helidon Hills area. The project was funded by the National Heritage Trust (NHT) and managed by WESROC (Western Sub-Regional Organisation of Councils).

In this case study, the project is used to demonstrate how essential “human factor” planning and in particular participant ownership of the process was and remains the key to the success of the project. One of the key factors in the success of any conservation activity, be it biodiversity or not, is how participants react throughout all facets of the study.

The Sustainable Management of the Helidon Hills Project has been an outstanding success by any standards, due to a large extent by the care taken in community and landholder consultation throughout its conduct.

However, an uninformed outside observer may perceive intrigue, deceit and conflict that could win a gold Logie for any television sitcom plot. A few relevant facts could lead to that perception: towards the end of the project the original Project Coordinator felt morally obliged to resign, the replacement Project Coordinator, whilst well credentialed, didn't enjoy full support of the participants, and the Interim Implementation Committee “folded”, leaving no formal Implementation Committee.

Some participants then formed The Helidon Hills and District Regional Association Inc., with a much broader vision than that originally envisaged by the project, and recently other participants formed The Helidon Hills Landcare Group to concentrate on implementing environmental aspects of the projects' recommendations.

SO HOW CAN THE PROJECT BE CONSIDERED AN OUTSTANDING SUCCESS???

From its inception, the community of the Helidon Hills and other interested parties had significant input into the study, with a view to developing ownership of the process so that it could carry on long after the project team had completed its work.

The project team were sensitive to the diverse interests of all stakeholders in the project, and together with the stakeholders identified and documented 12 relevant issues: *Landholder Rights, Nature Conservation, Enterprises (Farming, Timber, Tourism, Extractive & Explosives Industries), Cultural Heritage, Water, Infrastructure, Fire Management, Property Management & Planning Schemes.*

Perhaps it is just by chance, but the two implementation groups that have evolved each cover the above issues, with the incorporated association being active on the broader longer term aspects in conjunction with Government agencies. Whilst the Landcare Group has a main focus on the “nuts & bolts” activities of nature conservation (e.g. lantana eradication), its membership have practical commitments that cover most of the 12 issues.

So these two groups have the potential to complement one-another's activities. Highly motivated individuals who are totally committed to their perception of the 12 issues form each. It is this degree of commitment and the positive activity, albeit to diverse aspects of the project, that will continue to ensure success. The potential for conflict between the groups can be minimised now and in the future by careful management and open communications.

The Helidon Hills community and other interested groups have a marvellous model before us and we are confident of continuing to reap the benefits from its implementation.

Conclusion

Biodiversity conservation, by its very nature evokes strong and **diverse** emotional responses from those involved.

Whilst the methodologies of working with the natural environment appear to be developing exceedingly well, the understanding and coping skills that we currently have in managing the diversity of human responses to such activities need careful planning and sensitive implementation if success is to be assured. Taking account of the human factors and nurturing participant ownership of the process from the outset have been the key factors in the success of this project.

What Do You Do When You Can't Give \$72,000 Away?

Rick Galbraith, Project Officer, Sustainable Management of the Helidon Hills Project,
PO Box 31, Crows Nest, Q, 4355.

The Natural Heritage Trust funded project, "Sustainable Management of the Helidon Hills" contained a component of \$72,000 that was made available to landholders of the Helidon Hills by means of a devolved grants program to address conservation and natural resource management issues. (The Helidon Hills is an area of 33,500 hectares of high conservation significance and contains a large number of rare and threatened flora and fauna species). Despite creating an awareness of the availability of funds, there was a very limited take up by landholders. Some reasons for this were; concerns property rights would be eroded by accepting funds from the Commonwealth Government, lack of knowledge on how to address natural resource management problems, lack of resources (time and money) and difficulty in filling out application forms.

A four part series of workshops were held to assist landholders understanding and awareness. These workshops covered Habitat and Biodiversity, Fire Management Planning, Voluntary Conservation Agreements and Landholder Assistance Programs and Understanding and Managing Weeds.

This process combined with developing a relationship based on trust and respect has seen a number of high quality applications submitted that will lead to significant on-ground outcomes.

Introduction

The area known as the Helidon Hills is a large contiguous geological and ecological unit of land located stretching across the north of the Lockyer Valley, approximately 100 kilometres west of Brisbane. Covering 33,500 ha (335 km²), the area spans the north of Gatton Shire and extends into the neighbouring Esk and Crows Nest Shires. The area is approximately two-thirds private freehold and one-third State Forest.¹

The Helidon Hills is mostly continuous native bushland. It is one of only a few large bushland areas left in South-East Queensland, and has high conservation significance with a large number of rare and threatened flora and fauna species.² The area also has high cultural heritage significance.

Competing against these significant natural and cultural values are a range of impacting land uses. These include sandstone mining, timber harvesting, farming and explosives manufacturing. Public utility infrastructure such as a high-voltage powerline easement, gas pipeline and proposed realignment of the main western railway line all have impacts or

potential impacts on the region. In addition, weeds and feral animals have been identified as problem issues, and control programs are needed.³

The Western Sub-Regional Organisation of Councils (WESROC) was instrumental in obtaining funding through the Natural Heritage Trust (NHT) to prepare a Draft Management Plan for the Helidon Hills. Contained within this project was a component of \$72,000 that was made available to landholders of the Helidon Hills by means of a devolved grants program to address conservation and natural resource management issues. A part time project officer was employed to develop and administer the devolved grant program.

Devolved grants

The Guidelines for the Natural Heritage Trust outline the requirements for an organisation when implementing a devolved grants scheme. The guidelines state *“If you are an ... organisation, possibly with formal responsibility for natural resource management, and supported by State and Local Government, the Commonwealth will consider passing on (devolving) the responsibility for the delivery of on-ground works or other activities identified in Regional Strategies through a devolved grant.”*

*“An example of the sort of project that might be considered is one involving priority activities which are part of a regional plan, for example small groups and landholders would receive individual grants for fencing to protect remnant vegetation from the body receiving the Trust funding”.*⁴

Funding made available for landholder assistance through the devolved grant process consisted of:

- \$7,000 for the installation of firebreaks;
- \$8,000 for habitat restoration programs;
- \$30,000 for installing fences to facilitate grazing control in significant areas;
- \$20,000 for assistance with management issues such as weed infestations to overcome impediments to sustainable land use; and
- \$7,000 for the preparation of property management plans.

Community ownership and involvement

The on-ground works component of the project commenced in September 1999 with all known landholders being mailed an information package outlining the opportunity to access financial assistance. Public meetings of the Interim Helidon Hills Landholders Group were attended to further explain the funding opportunity and process. Property visits were also undertaken to assist landholders in formulating projects. At the same time, the community of the Helidon Hills were attempting to form a community group to further develop and implement the management plan for the Sustainable Management of the Helidon Hills. Eventually two groups were formed, “The Helidon Hills & District Regional Association” and the “Helidon Hills Landcare Group”.

After the first round of applications for funding closed, with no applications submitted, it was obvious that there were some underlying causes that led to this lack of response.

It became very apparent that if the project were to meet its objectives, some changes would have to be made in order to deliver satisfactory project outcomes. The challenge then was to address the issues in a positive way, which empowered the community and gave them ownership of the project. How then did we address the issues?

Identify problems early and respond in a positive way

Talking to community members and others associated with the project identified a number of potential reasons for the lack of project success. These reasons included:

- level of community understanding of the issues confronting the region;
- lack of community ownership of the funding process;
- project officer lived outside the Helidon Hills area;
- perceived erosion of landholder rights as a result of accepting funding;
- stage of development of the community group that was seeking to implement the plan;
- availability of landholder resources to address the issues; and
- landholder difficulty in understanding and filling out application forms.

It was critically important to address the underlying issues confronting the successful implementation of the project and to involve the community in the process. Landholders needed to be encouraged and affirmed that they could control their destiny and that they were in most cases, seeking to implement responsible land management activities.

Build relationships based on mutual respect and trust

People are often wary that there are hidden agendas behind the offer of resources including funding. *“The conflict between environmental protection and the economic and social needs of landholders (needs to be resolved) in ways that benefit both the environment and the needs of the landholder. With creative and lateral thinking, win-win solutions can be found for even the most complex of issues.”*⁵

Good people skills are crucial to the success of any project, so time needs to be spent getting to know the client base (in this case the residents of the Helidon Hills). An aggressive hard sell approach is destined to failure, whereas a friendly approach that develops a partnership approach, based on mutual respect is much more likely to result in positive outcomes. Reassurance needed to be given to landholders that they would continue to maintain management control and ownership over their properties.

*“The key to successfully developing proposals that benefit landholders has been to involve landholders in the decision making process from day one, and to develop landholder ownership of project outcomes.”*⁶

Assist the community to identify problems and issues and provide the necessary support and training to address them

Many people choose to live in the Helidon Hills for lifestyle reasons. Often they come from an urban background with little understanding of natural resource management processes and issues. To achieve positive outcomes for landholders, it was important that they first

understood the issues, and then took ownership of them before finally developing a management strategy/process to address them.

A four-part series of workshops was devised to facilitate community understanding of the natural processes that were occurring on their properties. Once there was basic understanding of these processes, landholders were then in a position to better manage them. Workshop presenters were considered to be experts in their fields. The workshops covered the topics of:

- An Introduction to Habitat and Biodiversity;
- Fire Management Planning and how to prepare a fire management plan for your property;
- Landholder Assistance Programs (covering funding options and voluntary conservation agreements; and
- Understanding and Managing Weeds.

The social benefit of these workshops should never be underestimated. They were all held on Saturday afternoons as many people worked off their properties during the week. After the workshops concluded, a sausage sizzle was held with a gold coin donation to cover costs. Events such as this can contribute to the development of a “sense of community” in that people get to know one another and have a good time in a relaxed atmosphere.⁷ The benefits of this can reach far beyond natural resource management.

Be creative - often it's how we see things

It has been said that a problem is the result of an absence of ideas. When confronted by a problem, the challenge is to turn it into an opportunity, to be innovative. Sometimes we can become too close to problem or situation and lose sight of what the original objective or goal was. It helps to stand back and reappraise the situation and where we are going. Talking over the project (or issues and problems) with other people can help to clarify what can be done to overcome the barriers or impediments. A sense of humour and the ability to laugh at oneself also helps. The author Andrew Matthews writes, “*Start anywhere you can. Give your best shot to whatever is in front of you, and opportunity will begin to find you.*”⁸

Encourage and affirm

Often, encouraging and affirming people can obtain the best results. By building people's belief in themselves, they can be encouraged to overcome barriers and obstacles and achieve meaningful results. Too often landholders are portrayed as mining their lands resources and managing them poorly. Many landholders have a wealth of practical experience that is derived from managing their land sustainably - often over a number of generations. If these people can be encouraged to share their experiences, and be recognised for it then we all can benefit - the so-called win-win situation.

Link to other programs

In the past, devolved grant programs have operated in isolation to other potential support programs. Landholders have made a commitment to responsible natural resource management and yet there has been no follow up contact or support provided to them. There are now a number of programs available for landholders to participate in. Programs and organisations include Landcare, Land for Wildlife, Greening Australia, NatureSearch, World Wide Fund For Nature (WWF), Nature Refuges and many others. As project officers and

program managers, we all have a responsibility to ensure that landholders are aware of the support programs and resources that are available to them and encourage their active participation.

The end result

Following this process has seen a flurry of project applications for funding through the devolved grant program “Sustainable Management of the Helidon Hill”. A wide range of projects has been funded including:

- fencing off areas of significant remnant vegetation;
- revegetation and bushland rehabilitation;
- feral predator control;
- preparation of property management plans; and
- construction of fire lines.

Several of the properties involved are now progressing towards having their properties declared a nature refuge, most have joined the Land for Wildlife program (a voluntary nature conservation program) and all are involved with either the Helidon Hills Regional Association or the Helidon Hills Landcare Group.

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Regional Biodiversity Planning

Keynote Presentation

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Regional Biodiversity Management Planning: Four Fundamental Principles

Introduction

While the concept of a Regional Biodiversity Management Plan (RBMP) has been discussed for several years, there is no clear description of what such a plan would look like. Here I outline the elements of a RBMP, *with examples*, in the hope of providing a clearer framework within which the process can proceed.

Before defining a RBMP two things are worth noting: First, the boundaries of the region covered in a RBMP should not be an issue. RBMPs can exist at spatial scales from the catchment to the entire continent as long as there is integration across scales. For example some Local Councils may wish to have their own plans and these plans would draw on RBMPs at a larger spatial scale. Ideally regional boundaries have biological meaning, like a river, mountain range or one of the biological boundaries in the Interim Biogeographical Regionalisation of Australia (IBRA). However in many cases political and/or management boundaries are more convenient. The planning process should not get bogged down in deciding the appropriate boundaries!

Second, I will not discuss the *process* of creating a RBMP here, only the product. Such a process will involve community ownership, technical experts, local priority definition and many other socio-political issues. This document is about getting the science right.

In this paper I suggest four scientific principles that should underpin a good RBMP. In particular I focus on:

1. Equitable conservation of habitats/ecosystems.
2. Species of significance.

3. The value of large reserves.
4. Strategic threat management.

What is a RBMP for?

The scientific push for Comprehensive, Adequate and Representative (CAR) reserve systems has crystallised many aspects of nature conservation in Australia. A Regional Biodiversity Management Plan (RBMP) is about moving towards a CAR reserve system for every region (where a reserve is interpreted as any area managed primarily for nature conservation), strategic threat abatement and threatened species recovery planning. A RBMP is for setting priorities for action to protect and restore biodiversity in a region. Nature conservation has been hampered for the past two decades by a lack of priority setting. Priority setting is crucial when the list of actions that can conserve and restore biodiversity is large but the funding is small. Our biggest problem has been the inability to decide what the most cost efficient actions are; we are great at making long lists of actions and then partially achieving just a few of the actions. The key to a good RBMP is to fully achieve the highest priority actions. *The highest priority actions are those that generate the greatest marginal gain in biodiversity per unit effort.* This idea of cost-effective action underpins the current Natural Heritage Trust, where Australia has committed itself to a more business-like approach to nature conservation.

Ecologists accept that the biodiversity of Australia will continue to decline. Planning and action now will not halt the decline but it can minimise the total loss of biodiversity and take us more rapidly to a point where the rate of biodiversity loss is equalled by the rate of biodiversity gain.

A good RBMP will direct effort to projects that are most important from a biodiversity perspective. In particular it will define the specific parts of a region where specific actions will create the greatest biodiversity benefits. This will assist decision-making by funding agencies.

Finally RBMPs are about setting a vision for the future of a region's biodiversity. Too often nature conservation is seen as the spoiler, the philosophy and interest group that is reactive. *A RBMP is proactive nature conservation, it is about defining a community vision of how a region's biodiversity can be protected and ultimately restored.*

The examples in this paper are based on work carried out in the South East of South Australia (Croft et al. 1999). However the principles are generic.

The four fundamental principles

1. Equitable conservation of Habitats/Ecosystems

The first and most important principle of nature conservation is to ensure that equitable proportions of each habitat/ecosystem type are protected. To achieve this goal we need to define and map the habitats of the region. These habitats may be vegetation types defined by cluster analysis, landform classes, soil types, or whatever other broad scale classifications are believed to most directly affect biodiversity. Which habitat definition we choose will usually be defined by the availability of data. For the south east of South Australia DENR (1994) has already defined a set of vegetation types (see Table 1). Given time such classifications should be reviewed and one could use more than one classification.

For each habitat type we need to find the pre-European area, the area that remains intact (with a relatively diverse understorey), the area that is degraded (over storey species present at a reasonable density with some understorey elements), and the location and size of the largest blocks of this vegetation type. If possible the land tenure of the intact vegetation should be obtained (Table 1).

Some attempt should be made to determine relationships between vegetation types. For example in the south east of South Australia pink gum woodland is ecologically similar to pink gum low woodland and to a lesser extent blue gum woodland. The different types of Melaleuca shrubland are also ecologically quite similar.

Highest priority should be directed to those habitat types that have the lowest percentages conserved and/or intact. Protection should focus on the habitat types that have been most modified, restoration should focus on habitats that are poorly conserved but where degraded tracts still remain.

Table 1. Habitat data for a sample of the vegetation types of the southeast of South Australia (DENR, 1994).

Vegetation type	Pre-European extent (ha)	Total area intact (ha & %)	Area intact & conserved (ha)	Largest single patch	Degraded area
River red gum woodland	190,000	3,000 (2%)	1,150	?	?
Grey box woodland	20,000	100 (<1%)	0	?	?
Pink gum woodland	100,000	2,000 (2%)	1,360	?	?
Pink gum low woodland	100,000	7,000 (7%)	4,660	?	?
Brown stringybark low woodland	260,000	20,000 (8%)	12,530	?	?
Banksia low woodland	60,000	200 (<1%)	100	?	?
White mallee open scrub	180,000	20,000 (12%)	10,920	?	?
Samphire	5,000	5,000 (100%)	990	?	?

2. *Species of significance*

Using national, state and local information each species with any conservation rating needs to be listed. These ratings should be assembled in tabular form. *While this process identifies the species of significance in the region, it does not identify the significance of the region for these species.* The latter concept is more important when setting conservation priorities. Realising the significance of a region for each species is what is most lacking from conservation reports.

For example, for the south east of SA Croft et al (1999) have listed bird species of conservation significance. Each has been given a National and State rating based on existing lists.

1. Compare the malleefowl and little lorikeet. The little lorikeet is very rare in the southeast and is close to extinction as a breeding species. The malleefowl is still relatively common in the western side of the upper southeast and is secure in the short term. On a local scale the little lorikeet is more threatened but it is common in other parts of Australia whereas the malleefowl fowl is nationally threatened. Indeed the malleefowl populations in the upper southeast are nationally significant. Conservation action for malleefowl deserves a higher priority than conservation action for little lorikeets in this region even though the Little Lorikeet is rarer.
2. Compare the chestnut-rumped and shy hylacolas. Both are nationally uncommon and have a history of decline. Because the shy hylacola is far more common in the southeast, possibly an order of magnitude more common than the chestnut-rumped hylacola, the significance of the southeast shy hylacola population is greater from a national perspective.

Each species should be ranked in terms of the *local and global* significance of conservation actions for the population in that region.

Once each species has been ranked, threats to the species and the key habitat types favoured by the species should be defined. The national priorities are the highest priorities (Garnett and Crowley 2000).

3. *The value of large reserves*

We know that the long persistence of many species will rely on well-protected and managed habitat big enough for a “viable” population. In a few loosely connected smaller patches of habitat may be sufficient for long-term viability. (For this to be successful species must be capable of colonising across relatively inhospitable habitat.) However the ability of many species to colonise in this way is uncertain. For birds evidence suggests that contiguous areas of thousands of hectares may be required for long-term persistence.

The largest areas in a region with generally contiguous intact vegetation should be identified and mapped. These areas need to be chosen so that they cover the region geographically and they broadly represent the major habitat and landform types. These areas will be the nodes of long-term conservation efforts in a region. For example in the southeast of South Australia key areas might be:

- Big Heath Conservation Park (CP)/Bool Lagoon;
- Little Dip CP and surrounds;
- Messent through to Gum Lagoon CP; and
- Bangham CP and heritage areas to the west.

The issue of core areas and shape can be dealt with by mapping increasing value away from edges, or identifying the largest blocks of habitat more than one hundred metres from modified habitat.

4. *Strategic threat management*

There are a series of common threats to biodiversity. These include feral predators, weeds, salinity, herbivory and human interference. Each threat should be briefly described and the susceptibility of each species to each threat needs to be assessed. In many cases such assessment may be speculative, however this should not deter the ecologist from the application of wise speculation based on ecological principles. For example we can be confident that foxes threaten ground-nesting birds, and grasslands and grassy woodlands are susceptible to weed invasion, without further research.

With respect to weeds and pests we need to take a long-term view. History dictates that few feral vertebrates or weeds have been eradicated. Consequently quarantine is the most effective means of minimising the impacts of invasive organisms. Regions need weed and feral animal “hit squads” prepared to eradicate any new invasion.

Integrating the data layers to set priorities

Once all the data layers and elements have been assembled we should be able to rate each pixel of land in terms of the appropriateness of action. Two broad classes of actions should be considered - habitat reconstruction and biodiversity protection in relatively intact vegetation.

The integration phase is somewhat subjective and a process like this is difficult to do in the abstract so here I present a couple of possible scenarios.

Habitat reconstruction

Each pixel in the GIS can be rated in terms of its reconstruction potential:

1. **Rarity value.** Pixels, which once contained vegetation types with less than a few percent of their original extent intact, should be rated highly for protection and reconstruction (with a sliding scale down to 15%).
2. **Context value.** Pixels adjacent to existing intact vegetation should be rated highly (with a sliding scale down to about one km). Extra value for pixels close to the conservation foci identified in as habitat for threatened fauna.
3. **Threatened fauna value.** Pixels that would support vegetation that is significant to the greatest number of significant fauna should be rated highly.
4. **Recoverability.** Pixels that are more recoverable, that is they contain degraded vegetation that appears capable of natural recover, should be rated highly.

Conservation in intact vegetation

Each pixel of intact vegetation can be rated in terms of its value for conservation action. The rating system would follow similar principles to principles listed above. Key areas would be in rare and threatened habitats, conservation foci, and where there are known populations of significant species. The actions should match the needs of the site. For example blue gum woodland in the Bangham area, river red gum and manna gum woodland in Glen Roy CP, patches of Casuarina woodland along the Coorong.

Conclusion

Ultimately the success of RBMPs will be their ability to be bold, visionary and captivating to the local community. The scientific principles outlined here are brief and hopefully straightforward. Interim plans can be developed with limited data collection because the need or efficient action is now. Ultimately communities will be more responsive to nature conservation needs if they can see that actions are placed within realistic economic constraints.

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South East Queensland's Regional Nature Conservation Strategy: Working Together to Conserve Biodiversity

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A Regional Nature Conservation Strategy is being developed for South East Queensland. Several principles which underpin this Strategy are outlined and the methodology for determining the areas of nature conservation significance in the region is described. The key elements and main actions to be undertaken by stakeholders are described and the ongoing process for developing the strategy outlined.

Introduction

South East Queensland is one of the most species-rich and biologically diverse parts of Australia. It is in a broad climatic overlap zone with many species at their northern and southern limits and some being found nowhere else. However, this biodiversity is under considerable pressure from human induced changes to the landscape within the region. Land clearing, one of the most visible causes of biodiversity loss, fragmentation and degradation, arises from the economic, resource and lifestyle demands of the region's increasing population. Other significant threats include invasive plants, feral animals, diseases, changes in catchment hydrology and the deterioration in water quality from diffuse and point source pollution discharges. The biodiversity losses experienced in South East Queensland are not always the result of simple cause-and-effect relationships however. They are frequently due to multiple interacting pressures and hence actions to prevent and/or minimise these losses require an integrated planning and management approach involving all tiers of government, many non-government agencies, developers and community organisations.

It is in recognition of the considerable values that attach to South East Queensland's biodiversity and the numerous pressures that are being placed on this diversity, that a Regional Nature Conservation Strategy for South East Queensland is being prepared in collaboration with government and community. The purpose of this paper is to briefly outline the principles underlying the Strategy, to describe the basis on which the areas of nature conservation significance are being identified and to address some of the more important outcomes and actions which are to be undertaken to conserve the region's biodiversity.

Principles on which the strategy is based

One of the more important principles which underpin the Strategy is the need to *conserve and manage the region's biodiversity, in situ* (that is, in its natural environment), and at all levels - regional, ecosystem, species and genetic - so that ecological processes, opportunities for

survival, and potential for continuing evolutionary adaptation are maintained and restored. Further loss or degradation of the biodiversity values of the areas of identified nature conservation significance is to be avoided.

Secondly, the Strategy recognizes the need for *sustainable human use of areas of biodiversity significance*. This approach recognises that much biodiversity remains within the care of private landowners and that its survival depends on their day-to-day management approaches. Hence *cooperative partnerships* are promoted as an essential foundation for achieving the conservation of biodiversity. These will occur through encouraging collective responsibility for nature conservation by all levels of government in co-operation and with the support of the whole community. Aligned with this is the need for *integrated management and administration* to ensure that issues and processes relevant to biodiversity conservation (including plan making and decision making), are co-ordinated and integrated across all levels of government and within the community, and that the Strategy's map of areas of significance for nature conservation is used as a decision support tool to ensure sustainable biodiversity outcomes for the region.

The Strategy also recognizes the need for a *precautionary approach* which emphasises that lack of full knowledge should not be used as an excuse for postponing action and that decisions should be guided by careful evaluation to avoid, wherever possible, serious or irreversible damage to biodiversity through an assessment of risk-weighted consequences. The need for *research and information* is also recognised as it is assumed that better knowledge of biodiversity will provide an improved basis for planning within the region. Lastly the Strategy aims to incorporate *transparent and equitable processes* related to the allocation of resources and environmental management and planning and provides guidance on Local Government planning and assessment of proposed changes of use in areas of nature conservation significance.

How are the areas of nature conservation significance identified?

The Strategy identifies areas of nature conservation significance by applying the Common Conservation Classification System (CCCS), which was developed by Chenoweth Environmental Planning and Landscape Architecture, with the support of the Environmental Protection Agency (EPA), Department of Natural Resources (DNR) and the South East Queensland Subregional Organisation of Councils (SEQROC). The CCCS classification system is a significant step forward, surpassing the various classification systems which have been used within Queensland to assess the relative significance of natural areas.

The CCCS classifies the significance of mapped remnant vegetation units for nature conservation purposes, with standardised criteria and levels of data collection that can be consistently applied throughout the region. The system is robust, objective, transparent and reliable, and although the number of options appears initially complex, the outputs are easy to understand and capable of flexible use in regional and Local Government planning and conservation management.

The CCCS provides a set of criteria (Table 1) for assessing the conservation value of all remnant areas of vegetation within a specified geographical area. To determine relative conservation significance, a series of sequential data queries is required. Because of the large and complex data sets used in analysis, computer-based analyses have been specifically developed to enable the methods to be applied across the entire region.

Table 1. Diagnostic criteria used in the Common Conservation Classification System to define conservation significance.

Diagnostic criteria		Supplementary criteria	
Criteria	Description	Criteria	Description
A	Essential habitat for ‘at risk’ species	H	Other habitat for ‘at risk’ species
B	Ecosystem value	I	Habitat for other species
C	Remnant size	J	Localised contribution to biodiversity
D	Relative size of ecosystems	K	Corridor links
E	Integrity	L	Geomorphological variation
F	Community diversity	M	Other ecosystem values
G	Context and connection		

The analysis in the Strategy is restricted to identifying regional (i.e. South East Queensland using the broader Southeast Queensland bioregion for context) and sub-regional (province) significance. Local conservation significance can be determined by individual Local Governments through incorporating data gathered for use at Local Government level in the CCCS data sets and generating CCCS queries for local conservation significance.

The primary source of data identifying remnant vegetation is Queensland Herbarium regional ecosystem mapping, which provides regional ecosystem maps across the region at a consistent scale of 1:100 000 using standardised techniques to produce a seamless coverage of pre-clearing vegetation and remnant regional ecosystems. This data layer is chosen because of the lack of other seamless digital products covering the entire study area at a larger scale at the time of analysis. Remnants are used as the base unit for assessment in the CCCS.

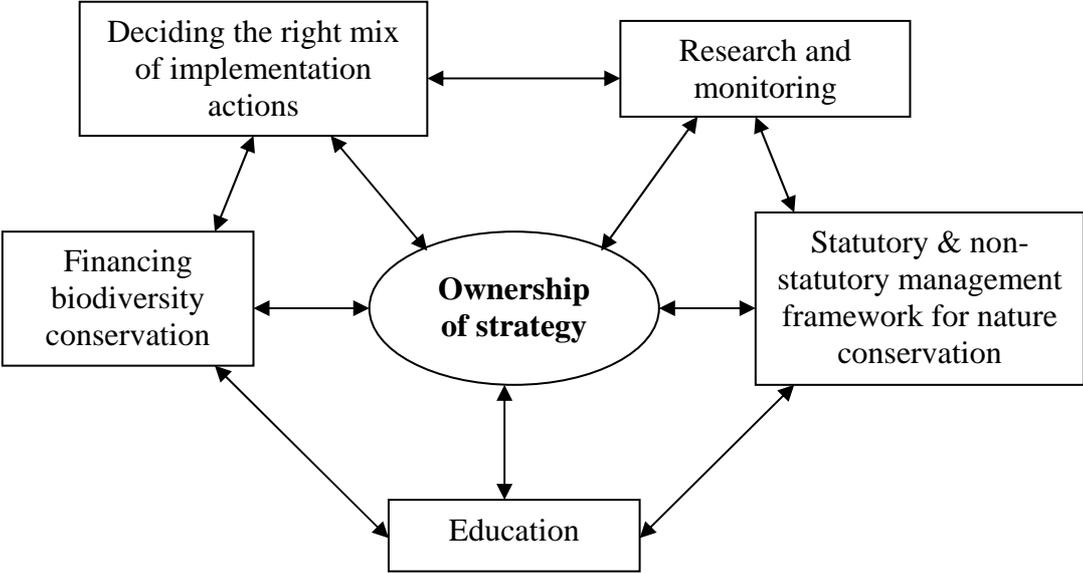
The output of analyses to define regional and sub-regional nature conservation significance is indicated on the Biodiversity Planning Assessment of the South-East Queensland Region map (Appendix 2). The main spatial pattern that can be observed in this map is the fragmented and at times isolated nature of the remnant patches in the region. This is particularly evident in the Brisbane area and in the growth corridors to the south and north of the city. Several large tracts of vegetation are found on the off-shore islands, in the D’Aguilar Range, Helidon Hills and Main Range area. An important outcome of the Strategy is to interconnect and enhance the viability of the remnants in the region. Also evident is the large area of cleared land within the region. Much of this land will have biodiversity value at the local level and the Strategy allows for these areas to be recognised as locally significant and aims to develop a range of co-operative partnerships to better conserve and manage these biodiversity values across the region.

Some of the main actions to be undertaken

The Strategy identifies key areas where actions are needed to bring about improved biodiversity outcomes. These include approaches which involve the statutory and non-statutory management framework, education, research and monitoring, and effective financing of biodiversity (Figure 1). The Strategy also advocates selecting the “right mix” of mechanisms or tools to effectively implement its objectives. These range from tenure or

property rights related mechanisms, to regulatory mechanisms and voluntary management tools.

Figure 1. Links between and among the mechanisms and actions of the Strategy.



Statutory and non-statutory management framework

The Strategy aims to strengthen and improve existing approaches and initiatives (e.g. on-ground activities, legislation, policies and extension), provide direction for future action and encourage landuses that are compatible with nature conservation. As an effective, integrated biodiversity information management system is necessary, the Strategy sets in train a process for resolving institutional requirements for information sharing and providing cost-effective options for data dissemination. Emphasis will also be placed on the continued development of the CCCS and the incorporation of data at a finer scale of resolution.

Effective implementation will also be based on establishing regional partnerships, particularly between government and the community to better manage areas of nature conservation significance. These partnerships will utilise existing forums, where possible, to identify relevant and effective implementation strategies.

Particular emphasis is also placed on ensuring that Local Government planning schemes comprehensively address biodiversity conservation. Hence the Strategy states that Local Government should identify areas of nature conservation significance using the CCCS methodology and apply appropriate landuse allocations for these areas.

The Strategy endorses the continued development and implementation of a comprehensive, adequate and representative reserve system by extending the area of parks to include poorly conserved examples of landscape elements and regional ecosystems. The off park conservation programs will also be directed to areas of nature conservation significance through continued promotion of schemes such as Land for Wildlife, voluntary conservation agreements, covenants and the like.

Education

Successful implementation of the Strategy requires a community that is both informed about biodiversity issues and encouraged and supported to participate in conserving it. Thus education is critical for promoting sustainable development and improving stakeholders' capacity to address biodiversity and development issues. Both the formal and non-formal education sectors, which are indispensable to changing attitudes, will be targeted. The Strategy aims to ensure that education and extension programs are comprehensive in terms of the range of stakeholders included (e.g. land holders, school students, households, clubs, industry, public land managers and opinion leaders) and are targeted at and developed in response to the specific needs of the particular audience. This may involve developing a range of tools and training programs (e.g. for elected representatives, technical staff, outdoor staff etc.). Because the Strategy recognises that much practical knowledge in protecting and managing biodiversity rests with landholders, the education strategy will be designed around sharing, extending and consolidating this knowledge and experience. Where possible, group-based and action learning principles will be used to enhance biodiversity awareness. This will enable the group to share information and experiences and will provide an effective way to introduce research-based information through contact between researchers and users. A further focus will be on identifying, documenting, sharing and promoting "best practice" in on-ground biodiversity conservation and management and on identifying areas where current best practice falls short of what is required for ecologically sustainable management.

Education and extension programs also require tools and products such as information kits. These will be developed and implemented in partnership with relevant agencies (e.g. Local and State Governments, regional organisations, industry, developers and landholders), will include a range of products (e.g. information sheets, guides, booklets, pamphlets), and will be formatted in a style to suit the target audience.

Research and monitoring

The biodiversity research and monitoring effort is to be coordinated and a more collaborative approach implemented. Research priorities for the region may include reviewing the likely distribution, overall population size and ecology of selected species and threatening processes, investigating management requirements for threatened species and identifying corridor and buffer requirements. A coordinated system to provide information and ongoing feedback on biodiversity values within the region will continue to be developed.

Funding biodiversity

Conservation of the region's biodiversity will require a commitment to continued financial support by governments to implement a comprehensive, adequate and representative reserve system and to encourage private landholders to become partners in conserving biodiversity as part of sustainable land management and farm production. The success of the Strategy will rely primarily on the Strategy's partnerships delivering more efficient use of resources for biodiversity conservation from State and Local Government and community groups, and targeting funding to the region's nature conservation priorities. Specific actions that the Strategy will promote include investigating mechanisms for implementing economies of scale in government biodiversity program delivery in the region, for example through cost-sharing arrangements, collaborating on community education and consultation and developing integrated statutory instruments and integrated monitoring and environmental reporting programs. Market-based mechanisms currently being developed by the Commonwealth and

States to promote biodiversity conservation by means of environmental banking and payment for environmental services (e.g. carbon sequestration) will also be investigated. Further, governments will be encouraged to remove any inappropriate disincentives to biodiversity conservation.

Where to from here

The Strategy includes performance indicators which aim to guide the implementation of the Strategy and allow for ongoing response to changing circumstances and issues and achieving the Strategy's outcomes. The outcomes include the following:

- native species and communities are conserved in areas of nature conservation significance;
- the conservation status of threatened species and endangered and of concern regional ecosystems in the region is improved or maintained;
- a common understanding of the nature and extent of regional and sub-regional biodiversity significance and values is achieved;
- stakeholder action groups identify, formulate and advance actions that can be implemented to protect, maintain and rehabilitate areas of conservation significance, both "on reserve" and "off reserve" by individuals, communities, government and non-government agencies;
- a process for ongoing refinement and updating of the identification, conservation and management of the areas of nature conservation significance is developed and implemented;
- all land managers have improved capacity to make informed and high quality decisions in relation to biodiversity in the region;
- a comprehensive system of parks and reserves is established and managed effectively for conservation in a coordinated manner by Local Government and State land management agencies;
- a higher level of community commitment to achieving on-ground results for conservation (e.g. through voluntary conservation agreements and the Land for Wildlife program) is accomplished; and
- more strategic direction and increased levels of funding are applied to identified conservation priorities in the region.

It is anticipated that the current draft will be available for extensive public consultation until approximately March 2001. This will provide an opportunity for smaller community groups and individuals to meet and discuss issues of relevance for the conservation of biodiversity in South East Queensland. It is anticipated that following a review of these comments the Strategy will be finalised by mid 2001. Community input is an essential and valued component in the Strategy's development and on-going implementation.

New Multi-species, Local and Regional Approaches to Recovery Planning

Keynote Presentation

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Multi-species Local Recovery Planning: Benefits and Impediments

Introduction

The introduction of the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* has substantially strengthened the role and effectiveness of threatened species and ecological community recovery planning. Arguably the most significant innovation is the ability to prepare multi-species, local or regional recovery plans. These new approaches and their benefits are introduced in the Environment Australia booklet *How to Go About Preparing a Recovery Plan*¹:

Traditionally recovery plans have been prepared for a single species covering its entire range. This may not always be the most effective way of taking action to protect threatened species or ecological communities. Where feasible, the Commonwealth is therefore encouraging the development of multi-species, local or regional recovery plans that focus on particular actions to protect the populations of threatened species in a specific area. Often species that occur in the same region are subject to the same threats. A set of actions directed towards combating those threats will benefit multiple threatened species. The advantage of a local, multi-species or regional approach is that it can focus efforts on specific populations of animals and plants and can develop local community campaigns to help implement the necessary recovery actions. Further benefits include the avoidance of duplication, greater efficiency and cost-effectiveness, and the ability to bring together a broader range of interested groups and individuals.

The favoured approach for scoping a recovery plan should be one that most efficiently meets the particular recovery requirements of the species, group of species or ecological communities covered.

The *Recovery Plan for the Threatened Species and Ecological Communities of Gatton and Laidley Shires, South-East Queensland 2001 - 2005* is being prepared as a multi-species local

recovery plan. This recovery planning process is one of three in southern Queensland to use the new multi-species, local or regional approaches. The others are:

- the World Wide Fund For Nature (WWF) South-East Queensland Rainforest Recovery project, which is preparing a multi-species regional recovery plan for the threatened rainforests of the South-East Queensland bioregion; and
- the WWF Southern Brigalow Belt Reptile Recovery Plan project, which is preparing a multi-species regional recovery plan for threatened reptile species in the Southern Brigalow Belt bioregion.

The *Recovery Plan for the Threatened Species and Ecological Communities of Gatton and Laidley Shires, South-East Queensland 2001 - 2005* implements the multi-species and local approaches by carrying out recovery planning for all of the threatened species and ecological communities within defined Local Government areas:

Local recovery planning

The recovery plan covers the Local Government areas of Gatton and Laidley Shires and focusses on actions to combat the common threats to the threatened species and ecological communities in the Gatton and Laidley Shires area.

Multi-species recovery planning

The recovery plan covers all of the threatened species and ecological communities within Gatton and Laidley Shires, including species and ecological communities listed at Commonwealth and State levels and species with regional significance.

Gatton and Laidley Shires are located within, and comprise most of the land area of, the catchment of Lockyer Creek. The Lockyer Catchment is located approximately 100 km west of Brisbane, South-East Queensland and is part of the wider Brisbane River Catchment.

Parts of the 295,400 ha Lockyer Catchment have been cleared for intensive agriculture and grazing, resulting in the extensive loss and fragmentation of native vegetation communities on the alluvial creek flats and adjacent low hills. The Lockyer Catchment uplands retain good native vegetation cover, including the 35,000 ha Helidon Hills in the north of the catchment and large continuous habitat areas along and adjoining the Great Dividing Range in the south and west of the catchment. Overall, approximately 50% of the catchment retains native vegetation cover, with this vegetation hosting a large number of rare and threatened species and ecological communities.

Background

The preparation of the *Recovery Plan for the Threatened Species and Ecological Communities of Gatton and Laidley Shires, South-East Queensland 2001 - 2005* was an initiative of the Lockyer Watershed Management Association Inc. - Lockyer Landcare Group (LWMA - Lockyer Landcare). The recovery plan preparation was a component of a larger recovery planning and on-ground conservation works project funded from the Threatened Species Network (TSN) Community Grants Program, which is a joint program of the World Wide Fund For Nature Australia (WWF) and the Commonwealth Government Natural Heritage Trust (NHT).

The recovery team for the *Recovery Plan for the Threatened Species and Ecological Communities of Gatton and Laidley Shires, South-East Queensland 2001 - 2005* project has been chaired by the Lockyer Watershed Management Association (LWMA) Inc. - Lockyer Landcare Group. Members of the recovery team include representatives from Landcare and Catchment Management Groups, the Queensland Parks and Wildlife Service (QPWS) and Environmental Protection Agency (EPA), Gatton and Laidley Shire Councils, The University of Queensland Gatton Campus, the University of Southern Queensland, the Toowoomba Bird Observers Group and Greening Australia.

Threatened species and ecological communities covered

The *Recovery Plan for the Threatened Species and Ecological Communities of Gatton and Laidley Shires, South-East Queensland 2001 - 2005* covers 41 flora species, 50 fauna species, and 12 ecological communities. This consists of:

1. All of the species in Gatton and Laidley Shires listed as extinct, endangered or vulnerable under the Commonwealth EPBC Act - a total of 11 flora species and 23 fauna species.
2. All of the species in Gatton and Laidley Shires listed as endangered, vulnerable or rare under the *Queensland Nature Conservation Regulation 1994*.
3. All of the ecological communities (as defined by *The Conservation Status of Queensland's Bioregional Ecosystems*²) in Gatton and Laidley Shires that have a status of endangered or of-concern under the *Queensland Vegetation Management Act 1999* and *Queensland Vegetation Management (Freehold Lands) Regulation*.
4. Species in Gatton and Laidley Shires identified by the recovery team as having regional significance (within the South-East Queensland bioregion). Included are species where biologists have expressed concern about decline or potential decline, species that have recently been removed (downgraded) from Commonwealth and/or Queensland threatened species lists and species with a restricted or disjunct occurrence in the South-East Queensland bioregion.

Overview of the recovery plan

The recovery plan has four sections:

Section 1 - Introduction

Section 1 introduces the aims and scope of the recovery plan and provides details of recovery project background, the recovery plan preparation process and integration with other plans and strategies.

Section 2 - Threatened species and ecological communities

Section 2 has concise location, habitat and threats information for the 41 flora species, 50 fauna species, and 12 ecological communities covered by the recovery plan. The species habitats identified in Section 2 are the host Regional Ecosystems (as defined by *The Conservation Status of Queensland's Bioregional Ecosystems*²) for the particular species.

Section 3 - Recovery action plan

The recovery action plan identifies actions to address all of the threats that were identified in Section 2. The actions are grouped under:

1. Actions to address vegetation clearing.
2. Actions to address inappropriate fire management practices.
3. Actions to address invasion by weeds and exotic pasture species.
4. Actions to address the impacts of problem animals.
5. Actions to address lack of awareness.
6. Actions to address inappropriate grazing practices.
7. Actions to address inappropriate timber harvesting or timber thinning practices.
8. Actions to address impacts on wetlands and riparian areas.
9. Actions to address lack of knowledge.
10. Actions to address other threats.
11. Supporting actions.

Section 4 - Implementation program

The implementation program consists of:

1. Implementation work plan. This subsection takes all of the actions from Section 3 and specifies responsibility and timelines for their implementation.
2. Monitoring, reporting and review. This subsection establishes monitoring, reporting and review processes for both the progress in implementing recovery plan actions and the efficacy of recovery actions.
3. Local Government Planning Scheme measures. This subsection recommends threatened species and ecological community conservation measures for incorporation into the Planning Schemes and Policies of Gatton and Laidley Shire Councils. The measures aim to protect the threatened species populations, threatened ecological communities and threatened species habitat values identified in the recovery plan from development threats (e.g. clearance, inappropriate fire regimes, weed invasion).
4. Threatened species and ecological community management principles. These management principles establish the base measures that are continued necessary for the continued survival of the threatened species and ecological communities covered by the recovery plan. The management principles apply to the Local Government Planning Scheme measures in the previous subsection, and are also being incorporated into property management planning programs operated by the Lockyer Catchment Centre. The management principles are grouped under Regional Ecosystem habitat areas which enables the principles to be used in conjunction with the 1:25,000 scale Regional Ecosystem mapping for Gatton and Laidley Shires.

The recovery plan is currently in preliminary draft form and undergoing technical review by the recovery team. Once the technical review is complete, a consultation draft will be circulated to community groups, landholders, State Government agencies, Environment Australia and other stakeholders for comment.

Benefits and impediments

The multi-species local recovery approach has so far been found to offer a substantial degree of benefit:

1. *Concise and focussed recovery action plan.* Developing actions that are directed towards common threats has produced a concise and focussed recovery action plan, even though the recovery plan covers a large number of threatened species and ecological communities.
2. *Increased understanding, awareness and ownership.* Working at a local level has increased landholder and community understanding, awareness and ownership. This will be further developed as the recovery team engages landholders and local Landcare and community groups in recovery actions.
3. *Whole-of-landscape whole-of-biodiversity recovery.* Taking the multi-species/ecological community approach has created something that approaches a whole-of-landscape whole-of-biodiversity recovery plan, which is what we need to achieve if we are serious about arresting biodiversity decline. The traditional single-species approach has seen resources focussed on a relative handful of critically endangered species while large numbers of other species and their habitats are rapidly declining towards the critically endangered category.
4. *Incorporation of threatened species and ecological community conservation measures into Local Government Planning Schemes.* Preparing a recovery plan that covers Local Government geographic areas has facilitated the incorporation of threatened species and ecological community conservation measures into Local Government Planning Schemes and Policies. The new draft Gatton Shire Planning Scheme has fully incorporated the recommended Local Government Planning Scheme measures and threatened species and ecological community management principles from Section 4 of the recovery plan. Laidley Shire Council has just commenced the preparation of their new Planning Scheme and the recovery team is hopeful that they will similarly incorporate the measures and principles.
5. *Identification of previously unknown species.* Preparing the list of threatened species to be covered by the recovery plan involved conducting an exhaustive audit of all of the threatened species known to currently exist, have once existed or potentially exist within the Gatton and Laidley Shire area. This audit revealed a considerable number of species that we had not previously been aware of. If we had not taken the multi-species approach our conservation actions would have continued to ignore the needs of these species.

There are, however, several impediments that must be overcome for multi-species local recovery planning to realise its full potential:

1. *Poor resourcing.* The Commonwealth states that it is “...encouraging the development of multi-species, local or regional recovery plans...”¹. We have, however, been unsuccessful in our attempts to secure Commonwealth funds to implement further actions from our multi-species local recovery plan. Two funding applications have been submitted - one to the Natural Heritage Trust (NHT) one-stop-shop and the other to the TSN Community Grants program. Both applications were well supported through the assessment process,

but could not be funded because of the small amounts of funding available in both the NHT Bushcare program and TSN Community Grants program.

Clearly, the Commonwealth should significantly increase the level of funding for these programs. Additionally, if the Commonwealth is serious about encouraging the development of multi-species, local or regional recovery plans then it should consider establishing targeted funding programs that fully support projects such as ours from the conception stage through to the delivery of on-ground outcomes.

2. *Incorporation of species and communities of State and regional significance.* If multi-species local recovery plans are to be linked to Local Government Planning Schemes and other local, regional or State processes then they will need to reflect and be compatible with priorities, policies and processes at these levels. Recognising this, the recovery team decided to include species and communities of State and regional significance. We could not find anything in the new recovery plan *Content Requirements*³ that we felt specifically excludes this course of action, but nor could we find anything that specifically embraces it. The recovery plan *Content Requirements* should be revised so that they encourage the incorporation of species and communities of State and regional significance.
3. *Identification of critical habitat.* Regulations under the Commonwealth EPBC Act require a recovery plan to identify, to the extent practical, areas of habitat that are critical to the survival of the EPBC-listed species or ecological communities covered by the plan. Regulation 7.09 lists the matters that may be taken into account when identifying critical habitat. Section 2 of our recovery plan identifies Regional Ecosystem habitat areas considered important to the survival of the threatened species and ecological communities covered by the plan. However, while the Regional Ecosystem habitat areas can be expected to either correlate with or contain the “critical habitat” areas, we are not in a position to define critical habitat because:
 - there is an insufficient level of knowledge available in regard to the matters identified in Regulation 7.09 to allow for an accurate determination of critical habitat; and
 - most of the EPBC-listed threatened species and ecological communities covered by this recovery plan have only part of their range within the Gatton and Laidley Shire area - an accurate determination of critical habitat would require the matters identified in Regulation 7.09 to be assessed across the full range of each species.

To address the current information shortfall, our recovery plan has:

- identified, as recovery plan actions, the determination of critical habitat and the further research necessary for the determination of critical habitat; and
- identified aspects of critical habitat where this has been possible, for example, the need for tree hollows for the nesting of some species.

However, the resources needed to identify critical habitat in accordance with Regulation 7.09 will be considerable. I would argue that our limited resources are better spent on mitigating threats than on lower priority research, and that our approach of conserving Regional Ecosystem habitat areas will achieve the intent of the EPBC in regard to the conservation of critical habitat. The Commonwealth should consider reviewing Regulation 7.09 with these issues in mind.

Conclusion

The Commonwealth Government and the staff of Environment Australia are commended on the introduction and development of the new multi-species, local and regional approaches to recovery planning. The multi-species local recovery approach has so far been found to offer a substantial degree of benefit including a concise and focussed recovery action plan and the ability to readily incorporate threatened species and ecological community conservation measures into Local Government Planning Schemes. There are, however, several impediments that must be overcome for multi-species local recovery planning to realise its full potential, including poor resourcing and difficulties in regard to the identification of critical habitat.

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World Wide Fund For Nature

South-East Queensland

Rainforest Recovery

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The South-East Queensland Rainforest Recovery project is a project of the World Wide Fund For Nature (WWF). The project is funded by Bushcare, a program of the Commonwealth Government Natural Heritage Trust (NHT), and in Queensland by the Environmental Protection Agency, the Australian Macadamia Society and the Horticultural Research and Development Corporation (HRDC).

Rainforest Recovery aims to conserve threatened rainforest ecosystems and species throughout the South-East Queensland bioregion, bordered in the north by Gladstone, the west by Gayndah and Kingaroy and the south by the New South Wales - Queensland border. This area covers 6,600,000 hectares. The South-East Queensland bioregion is one of the most bio-diverse areas in Australia. It is a hot bed of threatened and endemic species, with many species unique to South-East Queensland and occurring nowhere else in the world. Many other species reach their southern or northern limits in this region.

The pre-clearing extent of rainforest in the South-East Queensland bioregion is estimated to have been 665,000 hectares, and today there is approximately 276,000 hectares remaining. Today 30 different rainforest ecosystems are recognised by the Queensland Herbarium, five of which are 'endangered' (less than 10% left remaining of the original pre-clearing extent) and 8 are 'of-concern' (less than 30% left remaining of the original extent).

These ecosystems are also home to approximately 150 threatened flora and fauna species such as the black-breasted button-quail, the red and grey goshawks, Richmond birdwing butterfly, Coxen's fig-parrot, the cascade tree-frog, barred frogs, Mary River Cod and many other species.

The Rainforest Recovery project is working with landholders who have remnant rainforest on their property to provide technical advice on the management of these complex ecosystems and their inherent species.

On-ground recovery

Weeds

Weed such as green panic, madeira vine, cats claw creeper, asparagus fern and coral berry are just some of the worst weeds degrading rainforest remnants. Weed management can be resource intensive and management techniques are not well established. WWF may assist

with engaging skilled contractors to assist landholders with weed management and advise on appropriate weed management programs.

Fire

Fire is another threatening process to rainforest and the project may provide funds for fire break construction as well as technical advice on fire management around rainforest remnants. Regular burning of adjoining grassland gradually eats away at the rainforest leaving it exposed to wind and light and weed penetration resulting in further management problems.

Regeneration/revegetation

The final main threat to rainforest is loss of regeneration to replace mature trees. This usually is a result of over-grazing, which prevents natural regeneration through seedling growth. The project may assist landholders to fence their remnant patches to facilitate natural regeneration.

Applying for assistance

The project provides assistance to landholders throughout the region through an application process describing the proposed project and budget required. For an application form or to discuss the possibility of putting together an application for rainforest recovery assistance contact WWF 'South-East Queensland Rainforest Recovery'.

For further information please contact: Keryn Hyslop, South East Queensland Rainforest Recovery Officer, PO Box 42, Kenmore, Q, 4069; Ph: 07 3202 0251, Fax: 07 3202 6844, email: keryn.hyslop@env.qld.gov.au, Mobile; 0429 377 399.

Recovery planning

To assist rainforest land managers further a recovery plan is being prepared by the South-East Queensland Rainforest Recovery Team, with the draft due in March 2001. This plan will outline the threats to rainforest and outline recovery recommendations, whilst also being a valuable source for rainforest information within the South-East Queensland region.

Addressing Reptile Biodiversity Decline in the Southern Brigalow Belt Using a Multi-species, Bioregional Approach to Recovery Planning

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*Wide scale habitat clearance and modification in Queensland's Brigalow Belt has occurred alongside substantial agricultural and pastoral economic gains. Extensive clearing of native vegetation including brigalow (*Acacia harpophylla*) dominated ecosystems and vine thickets occurred during land development schemes initiated after the Second World War. Vegetation clearing is now focusing on remnants and regrowth as part of improving farm productivity. This fragmentation of landscapes has resulted in severe range reductions and localised extinctions of many fauna and flora species. A matter of increasing concern is the affects of developmental pressures on reptiles. Up to 17 species of reptiles are considered at risk of extinction or of conservation concern in the southern half of the Brigalow Belt alone. Little has been done to address this conservation concern to date.*

This paper will outline the approaches being used in the development of the World Wide Fund For Nature (WWF) Southern Brigalow Belt Reptile Recovery Plan, instigated in an attempt to halt the further decline of reptile species in the bioregion. With a recovery plan focusing on a suite of species across a whole bioregion, the importance of the initial planning stages of a project cannot be stressed enough. Clearly defined and prioritised objectives, criteria and actions are essential to develop clear targeted education, conservation and research activities and to ensure different organisations/groups can readily undertake various components of the plan. Ensuring a recovery plan is as straightforward and transparent as possible will vastly increase the capacity for community and stakeholder involvement in the recovery project.

Introduction

The southern Brigalow Belt Bioregion (SBB) covers approximately 28,000,000 hectares and encompasses much of the 500-750 mm per annum rainfall country from northern New South Wales through much of south central Queensland (Thackway *et al.*, 1995). Major regional centres in the SBB include Rockhampton, Toowoomba, Biloela, Taroom, Dalby, Roma, Mitchell and Inglewood. Currently, reserves account for approximately 2.5-2.7% of the bioregion, State Forests/Timber Reserves 9.2-9.7%, with the remainder comprising mostly freehold or leasehold titles (DNR, 1996).

The Brigalow Belt is characterised by brigalow (*Acacia harpophylla*) which forms forest and woodlands on clay soils. However large areas of the bioregion are also characterised by a range of ecosystems including eucalypt forest and woodland, grassland, dry rainforest, cypress pine woodland and riparian communities. Since World War II the Brigalow Belt has become a major pastoral and agricultural area. As a result, rapid and extensive loss of habitat has occurred accompanied by declines in species populations.

Table 1. Reptiles of conservation concern in the Southern Brigalow Belt Bioregion (where E = Endangered; V = Vulnerable; R = Rare; ARLS = At Risk Local Scale; DD = Data Deficient; LR = Lower Risk).

Common name	Taxon	IUCN ¹	EPBC ²	NCA ³	Covacevich et al. (1998)
Fitzroy turtle	<i>Rheodytes leukops</i>	V	V	V	V
Frilled lizard	<i>Chlamydosaurus kingii</i>				ARLS
South-eastern lined earless dragon	<i>Tympanocryptis pinguicolla</i>		E		ARLS
Golden-tailed gecko	<i>Strophurus taenicauda</i>			R	V
a legless lizard	<i>Delma plebeia</i>				DD
Collared delma	<i>Delma torquata</i>		V	V	Not assessed
Brigalow scaly-foot	<i>Paradelma orientalis</i>	V	V	V	V
a worm-skink	<i>Anomalopus brevicollis</i>			R	V
a worm-skink	<i>Anomalopus leuckartii</i>				V
Five-clawed worm-skink	<i>Anomalopus mackayi</i>	V	V	V	E
Yakka skink	<i>Egernia rugosa</i>		V	V	DD
Shingle-back	<i>Tiliqua rugosa</i>				ARLS
Woma	<i>Aspidites ramsayi</i>	E		R	ARLS
Common death adder	<i>Acanthophis antarcticus</i>			R	LR
Ornamental snake	<i>Denisonia maculata</i>	V	V	V	V
Dunmall's snake	<i>Furina dunmalli</i>	V	V	V	V
Grey snake	<i>Hemiaspis damelii</i>				V

¹ The 1996 World Conservation Union (IUCN) Red List of Threatened Animals.

² Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

³ Queensland *Nature Conservation (Wildlife) Regulation 1994*.

The Brigalow Belt remains the bioregion with the highest rate of clearing in Queensland (and therefore Australia). During the 1997-1999 period it contained 59% of the total area cleared throughout the State (DNR, 2000). It is now apparent that broadscale land clearing on the scale still practiced in Australia, and especially in Queensland, can destroy entire ecosystems. The Brigalow Belt has the dubious record of containing the largest number of threatened regional ecosystems (REs) in Queensland. Of the 163 REs represented in the Brigalow Belt, 27 have less than 10% of their original extent remaining and 43 have between 10% and 30% intact (Sattler *et al.*, 1999). This means that 70 of the 163 REs in the Brigalow Belt are threatened with extinction.

Furthermore, the focus of tree clearing in the Brigalow Belt is shifting from the essentially cleared Brigalow ecosystems on fertile soils to the eucalypt woodlands on poorer soils.

Consequently the survival of dry woodland species with limited geographic ranges and/or specialised habitat requirements remains uncertain.

McFarland *et al.* (1999) implicate habitat loss, habitat degradation through fire, grazing and pasture improvement, introduced predators and changes in river flow regimes as the major threatening processes effecting all fauna groups across the region. Currently, 17 reptile species are of high conservation concern in the southern half of the Brigalow Belt. One species (*Strophurus taenicauda*) is endemic to the SBB, 9 species have their core area centered in the region, 6 species are widespread but have declined in the region, and one vulnerable species endemic to South-East Queensland (*Delma torquata*) has disjunct populations in the region. The conservation status of these species is summarised in Table 1.

The SBB reptile recovery plan

To address the problem of reptile decline in the region the WWF southern Brigalow Belt reptile recovery plan is being developed. The aim of the plan is to provide a forum and framework to enable different interests to work together in reptile conservation.

The SBB Reptile Recovery Plan introduces a new and innovative multi species approach to threatened species conservation at a scale relevant to local communities. This recovery plan focuses on groups of reptile species with similar threats and ecosystem requirements and aims to strategically coordinate conservation action for these species and their habitats. This approach is more efficient given the number of reptile species of conservation concern in the region and the overlap in their ecosystem requirements.

Methodology

During the development of the recovery plan a number of stages were identified. These are represented in this discussion paper numerically in order of application. After completion of stages 1-5, a more informed understanding evolved as to the inherent constraints potentially effecting and opportunities contributing to the recovery of the species, including the refinement of conservation priorities and the identification of the most effective methods to apply. This information is being used in the development of the planning components (stage 6): the objectives, criteria and actions.

1. Derivation of the species list.

- Initial literature review: Five authorities afforded special conservation status to reptile species from the Brigalow Belt (McDonald *et al.*, 1991; Cogger *et al.*, 1993; Queensland *Nature Conservation (Wildlife) Regulation 1994*; Covacevich *et al.*, 1998; McFarland *et al.* 1999).
- Application of IUCN criteria for threatened species: used to ensure consistency in the species list. Scientific opinions often differ as to which species are more a priority than others. For example, both the Frilled lizard and the Shingle-back are widespread species, however it is presumed their ranges have contracted in the BB as a result of land clearing. If you include one species, then you have to include the other.

- Ensure the species total geographic range and impacts of threatening processes in that area are assessed, as some species, such as *Anomalopus leuckartii* may be found quite often on reserved land and have a range that extends to mid NSW, but its abundance on non-reserve land is largely unknown. Also not all the species on the list will require the same amount of conservation effort. The example is *A. leuckartii* and *Paradelma orientalis*. The status of *P. orientalis* may be downlisted with scientific review and *A. leuckartii*, given further review, may not require threatened species status. However species with numerous records like *P. orientalis* may be an interesting analysis to determine patterns of decline over time.
- Retain flexibility in the species list throughout the development of the recovery plan as new information may become available.

2. Identification of constraints that may affect aspects of the plan.

For example:

- Many people do not like reptiles, particularly snakes. Therefore a major component of the recovery project should be raising the profile of reptiles in the region through a community education and extension program.
- Even though surveys need to be undertaken to determine where to concentrate conservation effort for these species, expertise is required to accurately identify a number of the reptiles. This may adversely affect community participation in reptile surveys. Therefore identification courses may be required.
- The size of the region, the number of species of conservation concern and the commonality in threatening processes across the region necessitate the creation of a strategic regional recovery plan. Individual action plans should then be created for smaller sectors within this region to make actions more local. For example, the Darling Downs community would not be able to assist in the recovery of the Fitzroy turtle or the Ornamental snake, as both species occur in the Fitzroy basin. Therefore community participation in this stage of the plan's development is naturally constrained by the strategic nature of the plan itself.

3. Derivation of groups of species based on geographic location, habitat and threatening processes common across the species and their habitats.

- Forming groups of species with similar habitat requirements and geographic range was useful to break the species list down into more manageable, local lists (Table 2.). Microhabitat requirements could break the lists down even further. For example, rocky hillsides and ridges around Tara and Milmerran (dry woodland/open forest) could be potential habitat for *Egernia rugosa* and *Delma torquata* (although *E. rugosa* also occurs on sandy soils further west).
- Dependent on the habitat type, some threatening processes may not be relevant. For example, due to recent Queensland vegetation clearing guidelines, it can be assumed species commonly associated with brigalow communities (e.g. *Furina dunmalli* and *Acanthophis antarcticus*) may not be severely effected by clearing any more (in these habitat types). Whereas, the same species may be effected on eucalypt woodland open forest habitat types.

Table 2. Example of species groups based on geographic location and habitat.

Focal area	Taxon	Broad vegetation group
Darling Downs	<i>Tympanocryptis pinguicolla</i> <i>Anomalopus mackayi</i>	Native grasslands Grassy woodlands
South-East/ Condamine River	<i>Strophurus taenicauda</i> <i>Delma plebeia</i> <i>Delma torquata</i> <i>Anomalopus leuckartii</i> <i>Egernia rugosa</i> <i>Tiliqua rugosa</i> <i>Acanthophis antarcticus</i> <i>Furina dunmalli</i> <i>Hemiaspis damelii</i>	Dry woodland/open forest Dry woodland/open forest Dry woodland/open forest Dry woodland/open forest Dry woodland/open forest Dry woodland/open forest Dry woodland/open forest/Brigalow Dry woodland/open forest/Brigalow Riparian woodlands/dry woodland/open forest

4. Conducting a regional analysis.

- The SBB was assessed from a landscape perspective to identify the over-riding problems facing landscape health in the region.
- Regional conservation priorities were identified to determine what other issues are currently being addressed to determine how the reptile recovery project could contribute to these regional conservation initiatives. For example, this project could contribute to the development of property management plans and a Regional Vegetation Management Plan (RVMP), as a major objective of this project is to identify and protect high-value reptile conservation areas.
- This could also raise awareness of the existence and needs of the recovery project within organisations/ agencies represented during the development and consultation phases of the RVMP. A result could be that other organisations undertake various actions of the recovery plan.

5. Conducting a stakeholder analysis.

General guidelines followed:

- Identification of the main stakeholder (SH) groups.
- Identification of the SH actions affecting the species.
- Determination of how the SHs could modify their management procedures to benefit the recovery project.
- Identification of the constraints preventing the SHs from changing their ways (their problems are our problems).
- Identification of the methods which have worked best in the past with the SH group. Application of similar methods may help modify SH procedures.

6. Developing the objectives, criteria and actions.

- Having established what the threatening processes to the species are; reviewed them in the light of the regional perspective (whether these processes are continuing); identified who the main stakeholder groups are and how their practices are linked with the threatening processes, it was easier to begin defining the objectives, performance criteria and actions.
- The objectives identified in order of priority are:
 1. Fostering a cooperative approach to reptile conservation in the community.
 2. Identifying and protecting critical habitat.
 3. Developing management options for land managers to maintain reptile habitats.
 4. Managing the recovery project.
- The actions continually changed throughout the development of the recovery plan, flexibility was essential. Many of the actions identified can be incorporated into existing programs with minimal effort and a number of small, short-term community extension projects and research projects have been identified.

Conclusion

Addressing declining levels of biodiversity in the Brigalow Belt presents a challenge because of the extent to which some landscapes have been cleared, and the fragmented nature of remnants. The protection of biodiversity requires the development of integrated conservation strategies to encourage landholders to retain and maintain a proportion of total tree cover on their properties and to modify management practices if necessary.

The southern Brigalow Belt reptile recovery plan currently being developed by WWF aims to ensure reptile recovery effort in the bioregion is strategic, comprehensive, prioritised and incorporating the full range of species of conservation concern in the region. The identification of these actions will vastly increase the capacity for community and stakeholder involvement in reptile recovery by making the recovery program clear and targeted. Individual actions need to be identified first before they can be undertaken.

This project can also contribute to property planning management and regional vegetation management planning in the Brigalow Belt principally by providing threatened species values to habitat at risk of clearing or modification. This information can be incorporated into a comprehensive system of vegetation management to ensure protection of biodiversity whilst striving for ecologically sustainable development and planning certainty for landholders, industry and the community.

The Southern Brigalow Belt Reptile Recovery Plan will be finalised by March 2001.

Acknowledgments

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Community Biodiversity Conservation - Challenges, Success Stories and Good Ideas

Establishment of the Rosewood Scrub Arboretum

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Philosophy

We can ill afford to lose the genetic diversity of the flora of the Rosewood Scrub. Listings of various remnants along roadside verges and on private property have revealed there are many plants which are uncommon in the scrub - one, two or three specimens!

Original scrub

The dry vine scrub stretched from Haigslea west to Plainland and from Rosewood in the south to Lowood in the north. Today approximately 2.5% remains. Hence the effort to have every species found, propagated and planted in the arboretum.

The beginnings

In 1994 the Society for Growing Australian Plants (Ipswich Branch) applied for and received funding from the National Landcare Program (NLP) "Save the Bush" scheme and over the last three years funding has been supplied by the Natural Heritage Trust (NHT). Money received has been used to buy some plants, mainly from Bremer TAFE nursery, to pay Australian Trust for Conservation Volunteers (ATCV) groups at times, to purchase and lay copper logs, and supply fertilizer and mulch for plants. Being in a Council owned park, we have access to ample water.

Plantings

Most planting has been undertaken by SGAP folk, as well as maintenance. Local schools and Rosewood Scouts have been involved in a minor way.

Maintenance

ATCV groups have been employed, but most has been done by SGAP folk on monthly working bees. Weed species such as asparagus fern and green panic have caused trouble.

Naming and labelling

Most trees have been tagged and named with Tytag labels, then followed up with numbered aluminium tags to match numbers on handouts. However children who use the park have removed lots of labels, pulling them off.

Vandalism

It's a public park, open to anyone. Three years ago nearly all trees were vandalised - smashed down or pulled out - except the prickly ones. Vandalism is an ongoing problem.

Education

A set of slides has been produced from colour photos showing the arboretum from 1994 to 1999, local flowering trees and shrubs, and local patches of scrub around Rosewood, Tallegalla and Mt. Marrow. These have been shown at schools and service clubs. Two brochures have been printed giving brief details of the plants. More to come. Monthly guided tours are not well patronised.

Feature gardens

In the last 18 months a start has been made on feature gardens. They are:

- plants that are worthy of cultivation in the nursery industry,
- rare and threatened plants from South-East Queensland,
- settlers timber trees,
- bush tucker,
- bush medicine,
- other plants used by Aborigines,
- uncommon trees and shrubs in the scrub,
- butterfly host plants, and
- plants with prickles and spines.

It's hoped to produce handouts for these gardens too.

The future

NHT funding is finished, but planting and maintenance will continue for a few years. Nearly 110 of the 200+ species identified in the scrub have been planted. The challenge is now to propagate those uncommon species and the "difficult to propagate" species.

Epilogue

Saturday 28 November 2000 - we counted eight different species in flower, and a further eight have flowered and are setting seed! In our original submission for funding - "a safe refuge and a source for propagation material in future years".

Juggling-balancing Tourism and Biodiversity in a Small, Valuable Reserve - Mary Cairncross Scenic Reserve

Ian Smith, Coordinator, Mary Cairncross Scenic Reserve, 41 Mountain View Road, Maleny, Q, 4552.

At a similar conference to this several years ago a report was presented on the management of Mary Cairncross Scenic Reserve reporting a positive future outlook. Many of the aspirations in that report have been achieved, but maintaining a balance between community access and biodiversity protection is an ongoing challenge.

The primary aim of the Reserve has to be to preserve biodiversity, particularly in view of the number of rare, threatened and locally endemic species in the Reserve and its value as a high quality refugium. However, the Reserve is beautiful, accessible and is therefore the target of increasing number of international and interstate visitors. This raises the threat of not only direct damage, but also the introduction of exotic pathogens. Intensive management will be needed to ameliorate these threats and ensure biodiversity protection. Actions include:

- *construction of boardwalks;*
- *co-operation with Landcare groups to ensure protection and enhancement of corridor links and nearby remnants; and*
- *development of good neighbour policies, particularly using the strengths of a community-based management committee.*

The Reserve also provides great opportunities to present high quality interpretation of rainforests and of biodiversity protection in general. The support of community volunteers is critical to interpretation.

Introduction

Mary Cairncross Scenic Reserve is a small (55ha) Local Government managed reserve at Maleny in Caloundra City, South East Queensland. Despite its small size, it is extremely rich and diverse, representing one of the few areas in sub-tropical Australia where complex rainforest and associated communities have been preserved under optimum conditions of high rainfall and rich basalt-derived soils on a flat plateau. The natural values of the Reserve have been recognised by its inclusion on the register of the National Estate. The vegetation of the Reserve consists primarily of a cooler montane variant of subtropical rainforest (Complex Notophyll Vine Forest) with some remnant flooded gum (*Eucalyptus grandis*). In the wetter areas is a feather palm forest of Bangalow Palm (*Archontophoenix cunninghamiana*) and a

small, unusual (and probably unique) area of swamp mahogany (*E. robusta*) with a sedge understorey.

Despite, or perhaps because of, these high biodiversity values Mary Cairncross Reserve has one of the highest visitation rates in Queensland with an estimated 300,000 visitors a year enjoying the rainforest on flat walking tracks, which are suitable even for elderly or disabled visitors. However, balancing the desires of these visitors for a rich experience with protection of biodiversity, particularly in view of the number of rare, threatened and locally endemic species in the Reserve and its value as a high quality refugium is a difficult juggling act.

The challenges of popularity

The primary aim of the Reserve has to be the preservation of biodiversity. This is not only a moral duty, but also a requirement under both the Queensland *Nature Conservation Act 1992* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* in respect to threatened species. However, the Reserve is beautiful, accessible and is therefore the target of increasing number of international and interstate visitors. The surrounding area is also becoming popular as an area for large rural residential homes. The range of problems raised by high visitor numbers and proximity to housing some possible solutions to these are presented below.

Challenges	Solutions
<ul style="list-style-type: none"> • Direct damage and lack of water infiltration to tree roots through foot compaction. 	<ul style="list-style-type: none"> • Construction of boardwalks to remove direct contact with forest floor.
<ul style="list-style-type: none"> • Introduction of exotic pathogens. This is probably the most serious potential challenge. 	<ul style="list-style-type: none"> • Construction of boardwalks to remove direct contact with forest floor. Monitor disease trends and introduce foot-baths if direct evidence of problems.
<ul style="list-style-type: none"> • Disturbance of fauna. 	<ul style="list-style-type: none"> • There is no baseline data on pre-visitor occurrence. However normally shy species are easily seen by visitors and are apparently habituated. Twenty years ago there was little access control. Access is now confined to tracks and large areas are now free of visitors.
<ul style="list-style-type: none"> • Introduction of weeds from adjoining properties and on visitors clothing 	<ul style="list-style-type: none"> • There appears to be few weed problems within the forest and these can be addressed by reactive removal. The problems of aggressive edge weeds from neighbouring properties needs to be addressed by education.
<ul style="list-style-type: none"> • Sewerage and other nutrient enrichment from upstream homes affecting freshwater crayfish and frogs. 	<ul style="list-style-type: none"> • Not addressed at this point in time. Education in short term and progressive replacement of septic systems in longer term.
<ul style="list-style-type: none"> • Feral animals, especially foxes, cats and domestic pets 	<ul style="list-style-type: none"> • Trapping and a neighbour education program.

Extreme caution is needed in addressing many problems of management. Lantana (*Lantana camara*) is a weed of the edges of the Reserve. Although this is a weed that should be removed, in Mary Cairncross it provides important shelter to brush turkey (*Alectura lathami*) chicks (Goth, pers comm). This does not mean that the weed should be left, but that careful planning and shelter substitution is needed if lantana is to be cleared. A similar situation arises in the links from Mary Cairncross Reserve to other remnants and rainforest patches by a network of rainforest gullies and small copses of trees. These are critical to feeding and movement of rainforest birds. Many of these areas are made up primarily of camphor laurel (*Cinnamomum camphora*), privet (*Ligustrum lucidum*) and Chinese elm (*Celtis sinensis*). The berries of camphor laurel and these other species are a food source for many frugivorous birds. The recovery of several species of pigeons with depleted numbers following rainforest clearing has been attributed to the spread of camphor laurel (Frith 1982). Once again, this does not mean these pest species should not be removed. Instead it calls for a carefully planned program of replacement of pest species by native rainforest species while preserving links and food sources.

The Reserve within a human landscape

Mary Cairncross Scenic Reserve was donated to the then Landsborough Shire Council by the Thynne family in 1941. There is high local awareness of the Reserve and it is valued by the local people as “their Reserve” - an island of rainforest highly visible from all parts of the district. The fact that the Reserve management is directed by a community-based management committee and staffed by 42 local volunteers is a critical factor in maintaining this link to the surrounding community. This link is essential in other ways. It provides an opportunity for locals to interact with other locals in such issues as domestic pet management and weed control. It also provides the link to coordinate with Barung Landcare (the local Landcare group) in the replanting and rehabilitation of corridors on both public and private land.

As an example of these links, one of the volunteers is coordinating a Neighbours’ Day in April 2001 where all those residents with any connection or relationship with the Reserve will be informed of future intentions for the Reserve, given tours of the Reserve and be given the opportunity to view displays by Barung, local conservation groups, local provenance native plant nurseries and by suppliers of resource management-related equipment and opportunities such as cat runs, software, etc.

Another way in which cooperation works is in use of the Reserve as a propagule source. Because the Reserve is not a National Park, it is possible for Barung Landcare to collect seed. This seed is used for planting of corridor links as part of Barung projects and for some sale to private landholders for their own properties. This sale subsidises Barung projects and ensures that local plantings are utilising local genetic material.

Another important use of the Reserve is the opportunities it provides to present high quality interpretation of rainforests and of biodiversity protection in general. The best natural history interpretation should:

- provide accurate information;
- enthuse the audience both for the subject area in particular biodiversity protection in general;
- place the area being interpreted into an overall context with the region;

- be concise and well thought out; and
- be entertaining without being overdone.

The best way to meet the above criteria is by direct human contact supplemented by appropriate interpretive material. The critical human contact in Mary Cairncross is our 42 trained volunteers of whom eight are trained as guides supplemented by a paid coordinator and caretaker - ranger and a direct link to Caloundra City Council through the Senior Nature Conservation Officer. A range of signage and written interpretive material has also been developed. Another important outreach has been the use of the Reserve interpretive centre by Barung Landcare for a series of public education nights on a variety of subjects.

Conclusion

Mary Cairncross Scenic Reserve can fulfil its role as a nationally important biodiversity reserve as well as a centre for ecotourism and education. However, to fulfil these dual roles it will require careful attention to potential threats as well as the continuing support of the community and all levels of government to maintain and improve corridor linkages, protect wildlife and continue high quality education.

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Re-discovering Plants Used by Aboriginal People

Brenda and David Parsons, North Branch Road, Maryvale, Q, 4370.

This paper is about the vegetation regeneration being undertaken on a private property at Maryvale with particular emphasis on the process of re-discovery of plants used traditionally by Australian Aboriginal people. The primary purpose of the regeneration activity is to help to acknowledge and value the original owners of this land in today's society.

Introduction

The authors wish to acknowledge the Traditional Elders and the Aboriginal People of the areas around Gatton where this conference was held.

Brenda is of Aboriginal descent and David is of entirely European descent. We live on and manage a property at Maryvale near Warwick. We have two major interests in the property:

- regeneration of the plant life and any consequent changes in fauna; and
- the ways in which the land sustained Aboriginal people in traditional times.

The property is on Bundjalung land. Bundjalung is the name given by Europeans to a group of closely-related languages spoken in the area extending from about Warwick in the north to beyond Lismore in the south. We acknowledge that the land we occupy is Aboriginal land because it was taken from them without their agreement. We also acknowledge the cooperation in our venture of local Gidhabal Elders. Gidhabal is one of the Bundjalung languages.

Location and nature of the property

The property which we manage is on the western side of the Great Dividing Range about 8 km from Cunningham's Gap. It has an area of about 190 Ha with two intersecting creeks, North Branch Creek and Hann's Creek. North Branch Creek is an almost permanent stream fed from the rainforest on the top of the range and Hann's Creek is a normally dry creek. The country is mainly open forest country with mainly grassy ground cover. Dominant large trees are Ribbon Gum (*Eucalyptus viminalis*), Forest Red Gum (*Eucalyptus tereticornis*), Ironbark (*Eucalyptus crebra*), and Stringybark (*Eucalyptus eugenioides*). The country is basaltic uplands comprising shallow dark grey and brown cracking clays with rocky outcrops. A consequence of this is that the soil is very erodible.

History of land use

The area was grazed as part of the early selection known initially as Gladfield Station (starting in the 1840s) with dairying occurring in the mid 1900s and cattle grazing again since

about 1970. As a consequence of this use, the state of the creek was assessed in 1995 by the State of the Rivers Report as follows:

Reach Environs	Poor
Bank stability	Moderately stable
Channel diversity	Poor
Bed & bar stability	Moderately stable
Riparian vegetation	Poor
Aquatic vegetation	Moderate
Aquatic habitat	Moderate
Scenic & recreational	Moderate

Our use of the land has been to graze it with moderate intensity from 1979 to the early 1990s with only small areas excluded from grazing since about 1990. Lighter grazing occurred until 1999, when about two thirds of the area was fenced to exclude grazing with the help of a Greening Australia grant.

Vegetation regeneration

Since we started lighter grazing, many plants are regenerating significantly, particularly along the moister areas adjacent to the creek. There are also evident signs of change in the shape of the water course as plants grow in shallower areas and gradually stabilise the bed of the creek, causing water to flow in a more tortuous path.

Aboriginal-use plants

We have identified many different species of plants, which are now growing on the property and which had traditional Aboriginal use for food, fibre, fun or medicine. The process used to determine this information has been to identify the plants and then to establish their traditional use from either this or any other area. There is a lot of published material now available on the subject and local Elders have been able to confirm the use of some of the species.

The remainder of this paper is a selected list of the plants identified with brief notes on their use. This list is significantly smaller than the list of Aboriginal-use species in the area generally because it has been restricted to those found on this particular property.

Table 1. Plants growing on Maryvale property which were used by Aboriginal people

Botanical name	Common name	Aboriginal uses
<i>Adjuga australis</i>	Austral bugle	Bruised leaves soaked in hot water and used to bathe sores and boils to aid healing
<i>Imperate cylindrica</i>	Blady grass	Leaves used to weave bags and thatch huts Sugar in below-ground stems given to children as sweets
<i>Bulbine bulbosa</i>	Bulbine lily	Starchy tubers eaten

Table 1 (continued).

Botanical name	Common name	Aboriginal uses
<i>Thysanotus tuberosus</i>	Common fringed lily	Underground tubers cooked and eaten.
<i>Lycoperdon</i> sp.	Puff balls	Eaten when young, firm and white.
<i>Ficus coronata</i>	Creek sandpaper fig	Rough leaves used to polish wooden tools. Fruit eaten.
<i>Gahnia aspera</i>	Saw sedge	Seeds ground into flour.
<i>Stephania japonica</i>	Tap vine	Stems, leaves and berries pounded and put into water to poison fish.
<i>Clematis glycinoides</i>	Headache vine	Crushed leaves or inner bark soaked in water and drunk or put on skin for colds, aches.
<i>Alocasia macrorrhizos</i>	Cunjevoi	Very poisonous but rhizomes soaked, pounded and cooked in a lengthy process to remove the toxins before eating.
<i>Pandorea pandorana</i>	Wonga vine	Stems used for spear shafts.
<i>Lomandra longifolia</i>	Mat rush	Leaves used to weave baskets, make net bags, bind wounds.
<i>Pimelea neoanglica</i>	Riceflower	Bark used for weaving.
<i>Pteridium esculentum</i>	Bracken fern	Flour extracted from rhizomes. Young fronds cooked and eaten. Juice of young stems relief for stings.
<i>Eustrephus latifolius</i>	Wombat berry	Pulp of fruit eaten. Tubers eaten.
<i>Cyperus</i> sp.	Club rush	Tubers made into cakes.
<i>Juncus australis</i>	Austral rush	Woven into baskets.
<i>Exocarpus cupressiformis</i>	Native cherry	Wood made into bullroarers. Sap applied to snakebites. Berries eaten.
<i>Portulaca olearia</i>	Pigweed	Seed ground and cooked into cakes.
<i>Bursaria spinosa</i>	Sweet bursaria	Wood used to make clubs.
<i>Casuarina cunninghamii</i>	She oak	Wood for boomerangs, shields and clubs. Young shoots allay thirst.
<i>Dianella longifolia</i>	Flax lily	Leaves woven. Berries eaten.
<i>Dodonea viscosa</i>	Hop bush	Juice from leaves mildly anaesthetic. Chewed for toothache.
<i>Myoporum debile</i>	Devil's marbles	Fruits eaten.

Table 1 (continued).

Botanical name	Common name	Aboriginal uses
<i>Polygonum hydropiper</i>	Pink knotweed	Plant crushed and in water. Stupefied fish.
<i>Dendrobium speciosum</i>	King orchid	Flour extracted from base.
<i>Geranium</i> sp.	Cranesbills	The cooked taproots were eaten.
<i>Glycine tabacina</i>		The taproot has the flavour of liquorice and was chewed by people.
<i>Mentha australis</i>	River mint	Decoction for coughs and colds. To bring on abortion. Sniff for headaches.
<i>Smilax australis</i>	False sarsparilla	Ripe fruit eaten raw. Stems used as firesticks.
<i>Typha</i> sp.	Bulrush	New summer shoots were eaten as a salad. The underground rhizomes were steamed and starch eaten. Long tough fibres rolled into string and made into nets.
<i>Oxalis corniculata</i>	Yellow wood-sorrel	Plant eaten as greens.
<i>Xanthorrhoea</i> sp.	Grass tree	The resin from the base of the trunk used to glue stone axe heads to wooden handles. Stalks used as butt piece for spears. Fire was made by friction in the hollow stem of a dead grass tree. The soft stalk was “drilled” with hard stick to make fire. The bases and growing points of young leaves were eaten raw or roasted. Nectar from the flowers was eaten. Flowers were soaked in water to make a sweet drink. Pith from the interior of the stem was also eaten. The tough leaves were also used to cut meat.
<i>Urtica incisa</i>	Native stinging nettle	The leaves were cooked between hot stones and eaten as a vegetable. The leaves were also used to make poultices.
<i>Swainsona galegifolia</i>	Darling pea	A warm poultice was prepared from the crushed leaves, stems and roots of this plant and applied to bruised or swollen areas.
<i>Rumex brownii</i>	Native dock	The leaves were eaten as a vegetable and the seeds were used for making flour for cakes. The juice also used to relieve insect stings.
<i>Sonchus oleraceus</i>	Common sowthistle	People ate the leaves.
<i>Rubus parvifolius</i>	Native raspberry	Fruit eaten raw. An infusion of the leaves can be taken throughout the last six months of pregnancy to ease the pain of childbirth.

Table 1 (continued).

Botanical name	Common name	Aboriginal uses
<i>Hardenbergia violacea</i>	Sarsparilla or Purple coral pea	The flowers were eaten in spring.
<i>Eucalyptus crebra</i>	Narrow leaved ironbark	The timber was used to make clubs and spears.
<i>Eucalyptus tereticornis</i>	Forest red gum	The timber was used to make shields.
<i>Eucalyptus</i> sp.	Gums	Gum applied to cuts, sores, burns, and aching muscles. The dry gum was powdered and applied to sores to dry them up.
<i>Eucalyptus eugenioides</i>	Stringybark	The inner bark used as fibre for making bags and nets. The outer bark was crushed to powder for starting fire. Gum from the base dissolved in hot water had medicinal value.
<i>Eucalyptus viminalis</i>	Manna gum	Manna collected from the ground eaten. The relatively soft wood was used for making shields. The hollowed out burls were used for water vessels and leaves were smoked over fire for the treatment of fever.
<i>Calandrinia balonensis</i>	Parakeelya	The leaves, stems and roots were eaten. The seeds were ground into a paste and cooked as cakes.
<i>Cyperus rotundus</i>	Nutgrass	The roots were eaten raw or pounded, mixed with water and roasted.
<i>Brachychiton populneus</i>	Kurrajong	The bark used as a fibre for making bags and hunting nets. The seeds were eaten. The young plants have a thick tuberous root which was eaten. The roots were also a valuable source of water.
<i>Angophora floribunda</i>	Apple tree	The kino or gum was dissolved in water and taken for diarrhoea.
<i>Amyema pendula</i> and other sp.	Mistletoe	The fleshy but sticky fruits of various mistletoes were eaten as fruits.
<i>Acacia melanoxylon</i>	Wattle	Areas affected by rheumatism were bathed in an infusion made from the bark. Bark and twigs used as a fish poison. Wood used for spear throwers.

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Lockyer Roadside Conservation Project

Steve Fox, Technical Officer (Roads and Creeks), Lockyer Catchment Centre,
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In some parts of Queensland, including parts of the Lockyer, roadsides are the only remaining areas of native vegetation. In these cases, roadside vegetation is a valuable community asset which provides us with a number of services. These include scenic amenity, protection against soil erosion, protecting water quality, wildlife habitat and corridors, protection of the area's natural heritage, and the provision of shade and wind breaks.

With support from the Natural Heritage Trust (NHT), the Lockyer Catchment Centre is working with Gatton, Laidley and Esk Shire Councils to identify and conserve roadsides and public areas that contain significant environmental values. The precise locations of threatened and significant species (flora and fauna) and communities on Council lands are being mapped via existing records and on site surveys. Also, stretches of roadside that retain vegetation with significant habitat values are being identified and mapped. These maps will be provided to each Council.

To date, about 1,000km of Laidley and Esk Shires' road network has been assessed by Catchment Centre staff and volunteers. Approximately 40 km has been identified as having high conservation value. Many unmade road reserves are also widely used as recreation corridors and provide scenic backdrops to residential and rural residential communities.

Options for improving the recognition and conservation status of some of these public assets are already being considered by the Councils. Managing roadsides for conservation outcomes can also reduce Council expenses, especially where minimal disturbance techniques are used. The project also involves assisting Councils as they manage and protect these significant environmental areas. In some cases this assistance will include the provision of training for Council Officers and staff.

If you are aware of a roadside or other public land area in the Lockyer Catchment that you believe has environmental, cultural, historic or recreation values please contact Steve Fox at the Lockyer Catchment Centre on (07) 5465 4355.

Woodland Birds of Queensland Project

David Rounsevell¹ and Peter Sparshott².

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²Peter Sparshott, Project Coordinator, Birds Australia / Queensland Parks and Wildlife Service, PO Box 731, Toowoomba, Q, 4350.

The Woodland Birds of Queensland Project is a Birds Australia project which has been operating for a year from the Toowoomba Queensland Parks and Wildlife Service (QPWS) Office. The Project Officer is Peter Sparshott and the project is supported by Birds Australia, through major private sponsorship, and the QPWS. Using brigalow woodlands, the project is raising public awareness of rapid declines in the abundance and variety of native birds being experienced in woodlands throughout Queensland and Australia. The project is guided by a steering committee of representatives from Birds Queensland, the Toowoomba Bird Observers, World Wide Fund For Nature, Queensland Conservation Council and the NatureSearch program of QPWS.

The project is conducting a regional and State media campaign in print, radio and television and networking with Landcare and Greening Australia, Shire Councils, landowners and others to raise the perceptions of landowners and managers of the importance of native woodland as bird habitat, our continuing loss of bird biodiversity, and how to prevent it. It is also monitoring local changes in bird biodiversity by conducting surveys for landowners in association with other organisations like the Queensland Herbarium and the Toowoomba Bird Observers. This develops specific examples of bird decline in the region to back up the need for action to conserve native woodlands in Queensland. The project has produced a poster and a brochure detailing how woodland can be protected and managed to sustain native bird populations. It is also helping to promote the awareness and involvement of people in appreciating birds and working to recover threatened species that occur in the region - species like the Swift Parrot, Regent Honeyeater and others whose particular needs are not being met. They are in need of urgent action now, but urgent action is also needed to maintain native woodland habitat generally in Queensland for a larger group of bird species whose populations are also shrinking rapidly. The survival of twenty-four species of threatened woodland birds from southern brigalow woodlands in Queensland is currently at issue. One species, the Paradise Parrot, once found only in the region has not been seen since the 1930's and is presumed extinct. However dozens of other species are rapidly declining in range and number because of the loss of habitat through the continued clearing and fragmentation of woodlands.

Birds Australia is a scientific organisation focussing on the welfare of birds nationally. In partnership with State and Federal Governments (QPWS and Environment Australia) it has, this year, completed the second national assessment of the status of all 1,247 kinds of Australian birds. It showed 264 kinds are extinct or at risk of extinction and that most had island or woodland habitats. Over the past eight years since the previous assessment was done in 1992, the total number of near threatened species (82) has increased by 18 because of declining populations, and the rate of decline and loss is increasing rapidly as habitats, particularly woodlands, are depleted and fragmented. Speckled Warbler, Hooded Robin,

Brown Treecreeper, and Crested Bellbird have disappeared from large tracts of southern woodland that up until recently no one had the slightest concern about and similar declines are occurring in Queensland. Native bird species are key indicators of the health and sustainability of the natural environment, their populations are readily monitored and most people are familiar with them and many appreciate them as a valuable natural resource. The project will continue to welcome partnerships with landowners and other people who can help us to promote the retention and maintenance of native woodlands for birds.

Project summary for Year 1

After nearly one year of the Woodland Birds of Queensland Project there has been high degree of accomplishment of major aims and objectives. The project aims were: raising the community awareness of pressures placed on woodland birds and temperate woodland landscapes; provision of training workshops and information days; collection of significant information on threatened species and general monitoring of Queensland's woodland bird population through the Bird Atlas Project and NatureSearch; and bringing together all levels of the community for the recovery of temperate woodland landscapes.

One of the major successes of the project in the first year has been the delivery of key aims through extensive use of the media. The project to date has delivered the message of woodland conservation through local and regional print, regional and State radio, regional television and articles in conservation journals and on the Internet. The monthly radio session where woodland bird calls are played and listeners call in to identify the calls has proven highly successful and given the project great coverage and publicity through the southern section of the State. During the course of the monthly radio broadcasts examples have been given by farmers of the importance of woodland birds in their production systems and the value of remnant native vegetation. The radio segment has been used to describe the key threats facing woodland birds and the communities in which they live. The publication of posters and brochures has also assisted in the delivery of key information for the project.

Working with Local Council, the Department of Main Roads and Environmental Protection Agency (EPA) for placement of "significant environmental area" signage was another highlight for the project with regard to declining bird significance. In recent years the Jondaryan site is a known Painted Honeyeater (near threatened status in the Action Plan for Australian Birds) stopover point during late spring and early summer.

The arrival of Swift Parrots to Toowoomba mid-year resulted in several opportunities for media coverage on bird decline and woodland conservation. Along with local media coverage of this very rare vagrant to Queensland, media articles on the swift parrot and woodland conservation were also published in various State and interstate conservation newsletters including Landcare, Land for Wildlife and Community Biodiversity Network.

Summary Table for 2000

Activity description	Number
Networks created with: Birds Queensland, QPWS (Park rangers), DNR & DPI officers, CSIRO (Brisbane), USQ, Toowoomba Bird Observers, Greening Australia project officers, Landcare project officers, Qld Herbarium, WWF, WPSQ (Dalby and Taroom), Field Naturalist Groups (Toowoomba, Stanthorpe and Chinchilla) and most importantly landholders.	
Development of a project and promotions strategy.	1
Plan and prepare project launch in Toowoomba.	1
Working with EPA and Main Roads Department for the securement of signage “significant environmental area” for a known Painted Honeyeater site.	1
Launch of project in Toowoomba.	1
Woodlands article: Internet.	1
Radio interviews (Interstate, State and Local).	4
Radio airtime for woodland bird calls and talkback session.	4.5 hours
TV Coverage.	2
Print Media, newsletters.	10
Presentations to departmental groups.	6
Presentations to community groups and Birds Congress 2000.	20
Show presentation.	1
Seminar attendance (Gunnedah, Gatton, Taroom and Rockhampton).	4
Production of posters and pamphlets (1500 & 2000).	
Greening Australia woodland sites available for monitoring and surveying in 2001.	> 100
Presentation to schools.	2
Steering committee meetings.	4
Woodland Bird identification training for community members.	10
Bird monitoring at “Dukes Plain” Theodore.	2

Conservation of Darling Downs Remnant Native Grasslands

Alison Goodland, World Wide Fund For Nature, PO Box 1306, Toowoomba, Q, 4350.

Bluegrass grasslands of the Darling Downs

Extensive cultivation of the highly fertile, arable lands of the Darling Downs has reduced the original Bluegrass (*Dichanthium sericeum*) grassland community to 1.25% of its original extent - making it the most endangered ecosystem in the region. Today roadsides, railway easements and stock routes comprise a significant portion of these endangered remnants.

These grassland remnants support plant species from both temperate and tropical environments, including at least 7 rare and threatened plant species, making it a diverse and unique community. The grasslands were habitat for a number of small mammals and reptiles such as the Common Dunnart (*Sminthopsis murina*) and the Small-eyed Snake (*Cryptophis nigrescens*), however their presence is questionable today.

Threats

Key threats to the grassland remnants are:

- vegetation destruction by road and utility construction and maintenance;
- change in historic management (e.g. lack of fire);
- adjacent landholder impacts (e.g. grazing, slashing); and
- lack of awareness.

Project aims

This project aims to conserve grassland remnants by:

- increasing awareness of the importance of the grasslands and the ecosystem's threats,
- changing the management of roadsides, rail easements and stock routes (Best Management Practices, developing roadside management guidelines), and
- preparing management agreements/contracts (Memorandum of Understandings, Nature Refuges, Land for Wildlife).

The project addresses the lack of awareness, knowledge, training and coordination of associated agencies, roadside workers and the general community through consultation and involvement in grassland conservation.

Project outcomes

The project outcomes are:

- grasslands quality/integrity assessments of the 4 significant grassland stock routes;
- survey of 300+ rare and threatened species sites, with database digitized on Environmental Protection Agency's GIS and available to all stakeholders;
- development of management guidelines for the conservation of significant sites and their incorporation into contract obligations and strategic planning;
- distribution of "Grassy Ecosystem Significant Sites of the Darling Downs, Queensland - Locations and management Recommendations" report to stakeholders and interested parties;
- development of a Memorandum of Understanding between Department of Main Roads and the Environmental Protection Agency, covering 1000 hectares of remnant grasslands and open poplar box woodlands;
- training for Department of Main Roads and Council managers and roadside workers;
- extensive awareness raising activities including presentations, displays, field days, children's activities and media; and
- interest from majority of stakeholders and the private sector.

Greenhide Rainforest Remnant

Bruce Lord, Project Officer, Brisbane Valley - Kilcoy Landcare Group,
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Protection of a small rainforest remnant - a beginners perspective

The Greenhide Scrub remnant is a small but significant patch of dry rainforest, representing one of the few intact softwood scrub communities on the alluvial floodplains of the upper Brisbane River. With excellent natural boundaries and links to surrounding scrub communities it supports a great diversity of plants and acts as a valuable habitat area for local wildlife. Greenhide Scrub remnant is Regional Ecosystem (RE) 12.9/10.15 which is classified as endangered.

Following a successful application to the Natural Heritage Trust, the Brisbane Valley - Kilcoy Landcare Group has undertaken a staged program of weed removal to allow revegetation with locally occurring native plants. In addition to the threats posed by invasive weeds such as Chinese Celtis, Lantana, Wandering Jew and numerous vines, this unique area is also subject to human impacts such as soil removal and disturbance by worm - diggers and the occasional thoughtless dumping of rubbish.

The Landcare group hopes to work through these challenges and that the project will encourage the sustainable use of the Greenhide Scrub for increasing community awareness and involvement in the management of remnant vegetation and riparian corridors. We are fortunate to have had considerable assistance from Greening Australia in both planning and on-ground works and by building on these existing strengths and involving local schoolchildren and volunteers, the project aims to generate community ownership of this important place of local natural heritage.

Demonstration Site - Brisbane Rainforest Action and Awareness Network (BRAIN)

The Greenhide Scrub also provides a demonstration site for edge - sealant species to protect and conserve the edges of subtropical rainforest remnants:

1. Project description. Conservation gains made by NHT projects in rainforest areas are threatened by environmental and ecological changes that occur at remnant edges as a result of fragmentation and isolation. Using on-ground works this project will develop specialised revegetation techniques to seal edges in remnant rainforest and reduce the impact of microclimate changes that occur at remnant edges.
2. Project objectives. To maintain ecological integrity, and reduce the maintenance required to protect and conserve biodiversity values within isolated rainforest remnants in South-East Queensland.

3. Project workplan:

- to document rainforest species which act as edge specialists;
- to revegetate remnant edges at six rainforest sites in South-East Queensland;
- to monitor lateral branching, foliage growth, canopy development and light exclusion as edge plantings mature; and
- to promote the results of the species that perform as “edge sealants” in subtropical rainforest remnants.

4. Edge species used at Greenhide Scrub demonstration site:

<i>Acacia aulacocarpa</i>	Hickory wattle
<i>Acacia melanoxylon</i>	Blackwood
<i>Acmena smithii</i>	Lilly pilly
<i>Alphitonia petriei</i>	White ash
<i>Alyxia ruscifolia</i>	Chainfruit
<i>Aphananthe philippinensis</i>	Rough-leaved elm
<i>Backhousia citriodora</i>	Lemon-scented myrtle
<i>Canthium odoratum</i>	Shiny-leaved canthium
<i>Citriobatus pauciflorus</i>	Orange thorn
<i>Elaeocarpus reticulatus</i>	Blueberry ash
<i>Ficus coronata</i>	Creek sandpaper fig
<i>Guioa semiglauca</i>	Guioa
<i>Lomandra</i> sp.	Matrush
<i>Mallotus discolor</i>	Yellow kamala
<i>Mallotus philippensis</i>	Red kamala
<i>Parachidendron pruinosum</i>	Snowwood
<i>Pittosporum rhombifolium</i>	White holly
<i>Sarcopteryx stipata</i>	Pitted-leaved steelwood
<i>Syzygium leuhmannii</i>	Cherry satinash
<i>Tristaniopsis laurina</i>	Water gum

Tools for Securing Successful Outcomes

Conserving Threatened Species and Ecosystems: A Local Government Approach

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Local Governments across Australia are increasingly taking on a greater policy, planning and management role in relation to the conservation of Australia's rich and diverse natural assets. Recent Commonwealth and State legislative and regional planning initiatives provide a very clear role for Local Government in biodiversity conservation; in particular threatened species and ecosystem conservation.

Whilst Local Government may be in a good position to support or facilitate effective conservation outcomes for threatened wildlife at a local level, there are several challenges that must be overcome. These are particularly pertinent for Brisbane City, given its bio-diverse status.

Recent legislation in Queensland requires Local Government planning schemes to protect "valuable features"; including ecological features, and seeks to protect these at local, regional, State and wider levels.

Brisbane City Council's response has been to develop the Natural Assets Planning Scheme Policy and Conservation Action Statement initiatives. These new, innovative tools will inform and guide land use planning, development assessment and land management across the City.

Beyond rates, roads and rubbish: Local Government and biodiversity conservation

Local Governments across Australia are increasingly taking on a greater policy, planning and management role in relation to the conservation of Australia's rich and diverse natural assets. In part, this is a reflection of the unique position of Local Government to influence land use outcomes at the regional and local levels.

At the National level, the *National Local Government Biodiversity Strategy* recognises that Local Government is a key partner in biodiversity conservation in Australia.

In Queensland, recent legislative and regional planning initiatives provide a very clear role for Local Government in biodiversity conservation. For example, the *Integrated Planning Act 1997* seeks to achieve ecological sustainability, through the integration of local, regional and State planning dimensions in Local Government planning schemes.

The recently proclaimed *Vegetation Management Act 1999* also presents statutory obligations for Local Government regarding the assessment of clearing of threatened vegetation

communities on freehold land through the Integrated Development Assessment System (IDAS).

Initiatives such as the *Regional Nature Conservation Strategy for South-East Queensland 2000* and *Draft Freshwater Strategy for the Control of Exotic Pest Fish in Queensland 2000* recognise the significant role that Local Government can play in the broader community with respect to biodiversity protection and management of threatened species.

Whilst Local Government may be in a good position to support or foster effective conservation outcomes for threatened wildlife at a local level, there are several challenges to be overcome relating to information sharing, resources, legislative support and effective planning tools. For Brisbane City Council, the need to have such tools is particularly relevant.

Brisbane: A bio-diverse capital city

Brisbane City is one of the most bio-diverse capital cities in Australia. Covering over 1221 square kilometres of land, the City supports some 2000 native plant species, 523 animal species (excluding marine) and thousands of invertebrate species. Currently, the City supports 30 nationally rare or otherwise threatened vascular plant species.

The City supports 28 regional ecosystems and 39 vegetation communities spanning three provinces of the Southeast Queensland Bioregion: Moreton Basin, Southeast Hills and Ranges, and Southern Coastal Lowlands. Within these provinces occurs a diverse range of ecosystems, including wet and dry sclerophyll woodlands and open forests, heathlands, freshwater wetlands and grasslands.

Brisbane City Biodiversity Strategy

In 1998 Brisbane City Council brought together the various policy, planning and management initiatives that were underway in the City into one Strategy, the *Brisbane City Biodiversity Strategy*.

The Strategy encompasses a range of initiatives including Bushland Acquisition, Voluntary Conservation Agreements, Environmental Grants and the Vegetation Protection Local Law.

With respect to planning scheme provisions (ie Town Plan), Brisbane City Council has introduced a number of initiatives in recent years that address, to varying extents, biodiversity conservation issues. These have included the introduction of a Conservation Zone, Local Planning Policies and Strategic Plan maps identifying important areas of habitat and wildlife movement corridors across the City.

In October 2000, the former *City of Brisbane Town Plan 1987* was superseded by the *Brisbane City Plan 2000* (City Plan). As part of City Plan, two new, innovative planning tools were introduced to address emerging biodiversity conservation issues, including threatened wildlife and vegetation communities in Brisbane City.

Brisbane City Plan 2000: New tools for a new century

The *Integrated Planning Act 1997* requires Queensland Local Government planning schemes to protect “valuable features”, including ecological features and seeks to protect these at local,

regional, State and wider levels. Valuable features include threatened wildlife and vegetation communities.

In response to this opportunity to better define the City's valuable or significant ecological assets, and what their conservation requirements are, Brisbane City Council introduced two new planning tools into City Plan. These being the *Natural Assets Planning Scheme Policy* (Policy) and *Conservation Action Statement* (Statement).

Natural Assets Planning Scheme Policy

The overall intent of the Policy is to integrate the protection of the City's natural assets with economic and social planning dimensions. Specifically, the Policy seeks to do this by:

1. Guiding the assessment of development applications.
2. Informing land use planning on private and public lands across the City.

The Policy addresses these two key objectives through the following strategies:

1. Defining "significant ecological features" that need to be protected and appropriately managed to maintain Brisbane's natural assets in the long term.
2. Providing information to Council and other Government stakeholders, the community, industry and other interested groups on the conservation status of ecological features across the City.
3. Providing information on the management intent for significant fauna and flora species, and vegetation communities.

Natural Assets Register

Strategy 1 above is addressed in the Policy through *The Natural Assets Register*, which includes schedules of significant flora species, fauna species and vegetation communities.

The species and communities listed in the schedules are those that occur within Brisbane City and identified in Commonwealth or State legislation as threatened, or otherwise regarded by a recognised authority as significant at either a local or regional level. Recognised Authorities consulted in the development of the Register included the Queensland Museum, Queensland Herbarium, Queensland Parks and Wildlife Service and specialist researchers.

Species and vegetation communities listed in the Register include, amongst others:

- Brown goshawk (*Accipiter fasciatus*);
- Red-bellied black snake (*Pseudechis porphyriacus*);
- Squirrel glider (*Petaurus norfolcensis*);
- Purple-spotted gudgeon (*Mogurnda adspera*);
- Lancewood (*Dissilaria baloghoides*); and
- Melaleuca nodosa open scrub.

The Register represents an innovative attempt to compile a comprehensive schedule of threatened wildlife species and vegetation communities that are under threat and considered at risk of extinction, within Brisbane City, if their conservation requirements are not met.

Conservation Action Statements

Strategies 2 and 3 above are addressed through the Conservation Action Statement, an innovative application of contemporary recovery planning principles and practices at the local scale.

The format and content draws on contemporary multi-species and ecosystem approaches to recovery planning adopted by State and Commonwealth governments, but is tailored to Local Government needs and priorities.

Brisbane City Council will prepare Statements that address each species and vegetation community identified in the schedules. Each Statement will address Strategies 2 and 3 by:

1. Providing a clear Management Intent for the long term conservation of the species or vegetation community.
2. Detailing strategies and actions that optimise the species' or vegetation communities' long term survival in the wild in Brisbane.
3. Providing guidance for fostering development and land management practices that maintain or restore habitat for these species and vegetation communities.

The Statements cover fundamental matters such as: ecological assessment requirements, life cycle requirements, habitat protection measures, land management protocols, research needs and community participation and education opportunities.

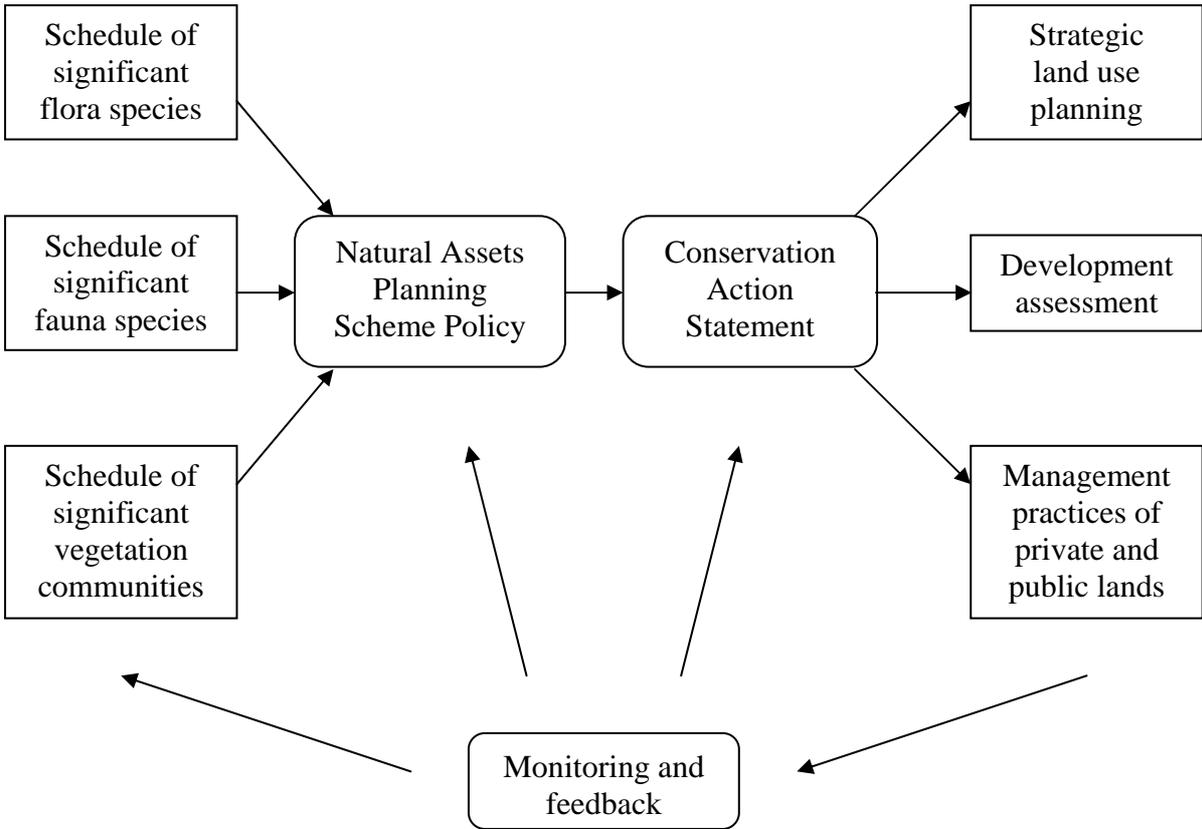
An important element of each Statement is the *Land Management Protocols*. These protocols address key aspects of the species' or vegetation communities' ecology. These protocols transform habitat and life cycle requirements into clear, practical land management guidelines.

The scope of the Land Management Protocols is broad, covering issues such as: protection and management of breeding sites or habitat, weed and fire management regimes, fencing and other infrastructure design and location, pedestrian and vehicular movement patterns, lighting regimes and habitat maintenance.

Conservation Action Statements provide certainty and practical guidance to the development industry, private landowners, land managers and the community regarding land use planning and land management practices needed to secure the long term viability of threatened species and vegetation communities in the wild in Brisbane.

A simplified flow chart showing how the new tools will influence key areas of Council activities (ie land use planning, development assessment and land management) is described in Figure 1.

Figure 1. A simplified flow chart showing how the new tools will influence key areas of Council activities.



Challenges

As noted previously, Brisbane City Council, like most other Local Governments across Australia, faces a number of important challenges in addressing emerging biodiversity conservation issues at the local level. Key challenges that need to be addressed are:

1. Regional and provincial conservation status for flora and fauna species: currently there is inadequate legislative recognition (or formal process to determine) of the regional or provincial conservation status of Queensland flora and fauna species, and the need to approach wildlife conservation at these levels.
2. Greater cooperative approach to information acquisition and dissemination: an integrated approach to research and greater information sharing is needed if Local Government is to effectively monitor emerging conservation issues and take pro-active steps in a timely manner.
3. Integrated approach to management and monitoring of threatened species and vegetation communities: the scale of monitoring and management auditing is beyond the capacity of any individual Local Government. A coordinated regional approach is needed.
4. Resourcing biodiversity conservation initiatives: Local Governments have relatively limited financial and other resources to effectively deal with threatened species conservation. Innovative and cooperative initiatives are needed to allow Local Government to play a greater role in biodiversity conservation.

Conclusion

Local Government's across Australia are recognised as being in a unique position to contribute positively to emerging biodiversity conservation issues. However, it is unrealistic to Local Government to fulfil this role unless significant impediments relating to resources, legislative frameworks, cooperation and information sharing are removed.

In addition, complimentary new tools are needed within planning schemes if Local Government is to address threatened species and vegetation community conservation in a meaningful manner.

Given the scale of the task, there is a need to clearly identify and prioritise conservation actions for threatened species and vegetation communities, especially in Brisbane City.

Brisbane City Council's approach has been to develop the Natural Assets Planning Scheme Policy and Conservation Action Statement initiatives. These new tools will inform and guide land use planning, development assessment and land management across the City.

These tools will facilitate this outcome by:

1. Defining the City's significant ecological features.
2. Providing a conservation status for these features.
3. Specifying clear, practical approaches to management.

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Biodiversity Monitoring: The Why's and How's

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Introduction

Biodiversity monitoring can be a valuable tool for anyone involved in the management of our native plants, animals and ecosystems. The reasons for monitoring the changes in biodiversity are many and varied. Monitoring may be designed to assess:

- changes in the distribution or density of a single plant or animal of conservation significance,
- changes in biodiversity levels in a given area over time, or
- impacts of a management regime such as bushland regeneration, fire management or stocking rates.

Monitoring also can be undertaken at different spatial scales - it may be localised or over a wide area or even over large regions. Whatever the reason for conducting a biodiversity monitoring program, the 'how' to do it depends heavily on the 'why'.

To get the most out of any monitoring program, there is one important step that is often overlooked - using the information to improve management practices. For this reason, it is important to identify the 'why' of biodiversity monitoring so that there are clear aims for the management of the area or species to be monitored. Once the aims of the monitoring are identified, then the next step is to develop a monitoring plan - the "how" of biodiversity monitoring.

Presented here are some step by step ideas on developing the "why", deciding on the "how", and then importantly preparing a plan where you keep the aims in mind during the monitoring and use your results to change management practices if it becomes necessary.

1. Develop the question

The question you want to answer is the first important step in developing the why of your monitoring plan. This involves two separate parts:

What is the 'impact' you want to monitor?

It may be something like:

- the recovery of significant species or ecosystems;
- the effectiveness of a weed control technique;
- the impacts of grazing or fire on native vegetation; or

- The changes following bushland rehabilitation activities.

What do you consider as the important aspects of the area?

For example:

- the density of weeds;
- the number or distribution of an endangered plant;
- the habitat value of the area to fauna;
- the diversity of grasses / trees / all vegetation; or
- regeneration rates of a species or group of species.

Then your question becomes: “How does the “important aspect” change in response to the “impact”?”

2. Collect background information

Take a close look at the area you want to monitor and how the “important aspect” that you want to monitor fits into that area. It is difficult to generalise on the things you should note, as it will depend on what your important aspect is. If your important aspect is a plant or number of plant species, take a look at the distribution of the species in the area. Do they occur in any particular places such as in shade or associated with a particular topography, are they wide spread or localised?

It’s then a good idea to find out more about the subject you want to monitor. For example, what time of year is the best time for seeing or identifying your aspect of interest? There is little point surveying for an annual plant or seasonal animal species at the wrong time of year. You might find out from your research that the populations are very dynamic and you should expect wide differences in results independent of your management activities. You may find that others are working on a similar monitoring program and you may be able to use their methodologies and gain valuable information from their experience.

Things to find out might include:

- Has anyone done or doing similar monitoring?
- Are there people or publications that will help you with planning your program?
- Do you know about the life histories of the plants or animals you want to monitor?

Do you have any ideas on what you expect to see happen? Write them down.

3. Plan your monitoring activity

- **Choosing the monitoring method**

Presented here are four simple methods for monitoring:

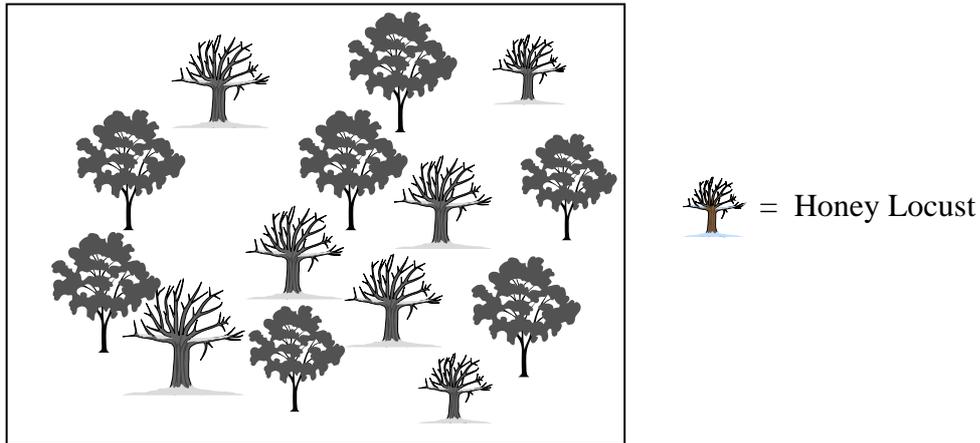
1. Counts.

Counts can be used for sampling of plants or animals that are easily recognisable as individuals. It can be a quick way to sample and is easy to replicate in a number of areas. This method doesn’t work well for trailing ground covers and

vines, or dense thickets of herbs or shrubs where it is difficult to quickly recognise individual plants, nor does it work well for fauna in large numbers.

An example - monitoring the number of Honey Locust, *Gleditsia triacanthos*, before and after foliage application of herbicide. Mark out an area (preferable more than one area) on the ground of 30 x 40 metres. Simply count the number of living Honey Locust trees before treatment and then repeat at 3-month intervals after spraying.

Figure 1. Pre-trial plot - Honey Locust trees

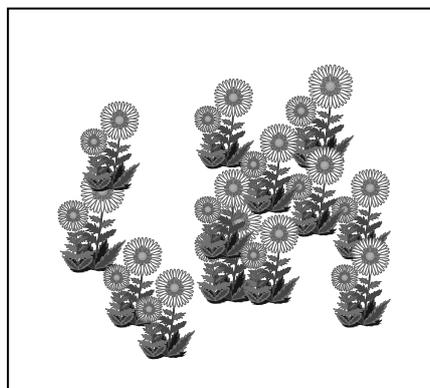


2. Proportions.

Proportions are a useful measurement in situations where it is difficult to recognise individuals. This type of measurement is also particularly useful where monitoring is used to assess the spread in distribution of a plant species. You will need to define an area and estimate the proportion of that area covered by the aspect that you are monitoring.

An example - monitoring the number and spread of the vulnerable hawkweed plant, *Picris euae*. A 5 x 5 metre plot was pegged around the clump of plants and the proportion of the quadrat covered by the plant estimated at 30 percent. Monitoring is planned at 3-monthly intervals to assess the increase in the abundance of the plant species.

Figure 2. Monitoring the number and spread of the vulnerable hawkweed plant, *Picris euae*.



3. Scores.

Scoring systems are a good way to assess a number of attributes at any one time. It may be something broad like the habitat value of an area for wildlife, or the changes in native vegetation at the same time as the reduction in weed vegetation.

It usually takes a bit of work establishing your scoring system, but once that is done, the monitoring can become quick and easy. What you will need to do is determine the important features that you are looking at and set some guidelines on giving a higher score to positive attributes than negative attributes. The following is an example of a scoring simple scoring system that has been taken from the Bushland Assessment Kit for south east Queensland to assist with monitoring habitat quality of bushland.

Figure 3. Habitat Assessment Sheet - “Eucalypt woodland”.

Site name:

Date:

	None (score 0)	Few / Bit (score 1)	Many / Lots (score 2)
POSITIVE ATTRIBUTES			
Number of trees with hollows (including dead trees)			
Number of large, mature gum trees			
Range of sizes (heights) of gum trees			
Presence of native grasses in the ground layer vegetation			
Fallen branches, logs, rocks on the ground			
NEGATIVE ATTRIBUTES	None (score 0)	Few / Bit (score -1)	Many / Lots (score -2)
Number of different weed species present			
Level of weed species cover			
Mown grass			
Level of human impact (i.e. too many tracks, rubbish, hang-out areas, excessive trampling of vegetation)			
Evidence of soil disturbance or erosion			
Total Score			

4. Photography.

Photography provides a simple method to keep a record of the impact of activities on changes in vegetation composition and habitat structure. You will need to identify and mark fixed position(s) and height so that each photo is of exactly the same area. It is important to be able to ‘capture’ the area and vegetation you are monitoring, so think ahead to what you expect to see over some time to ensure

that the correct area is captured from the outset. Don't forget to keep good records of the dates of each photo.

- **Choosing your sampling area(s)**

1. How large should each sampling area be?

This really depends on what you are monitoring and your choice of measuring method. As a general rule, choose an area that is achievable to sample given the method you have chosen and your time constraints, and also an area that is large enough to be able to measure change with some confidence.

2. How many sampling areas do you need?

Having a number of sampling areas is a positive thing to do if it is possible. It's also really worthwhile trying to keep a 'control' area in which you can collect the same information without management intervention to help assess whether it is your management actions that are contributing to the results you are finding. The exact number of sites will depend on how large the area is that you are working in. Try to get enough sampling areas to cover the different environments that you want to monitor (i.e. south and north facing areas, gully and midslope area) and if possible, include replicates of each environment.

3. Where should the sampling areas be placed?

Choose positions that best represent your 'important aspect' and try to avoid the 'edges' of your area unless you have a lot of sampling areas so that you sample both edge areas and interior areas.

- **Setting your alarm level**

The 'alarm' level forms part of the 'why' of biodiversity monitoring and is there to help you decide when you need to address a problem. If you are monitoring the impacts of a management activity, you need to choose some point where you re-assess the success of your management.

Look back to your notes you made collecting background information and decide on the answer to the question, *What result do you expect?*

Remember to allow for natural occurrences when setting your alarm level. For example, some annual plants may appear to be absent at some times of the year, and it is quite natural for some species to increase and decrease under different weather conditions – some of this natural variation can be readily observed if you have one or more control areas to compare your 'test' areas with.

Above all, set your 'alarm' level at a point when recovery from the impact is still possible.

- **When and how often to monitor**

Monitoring is usually a long-term activity that may last several years. Determining the timing and the interval between each monitoring survey are important parts of your monitoring plan. Again, it will depend on what you are monitoring and why you are monitoring. Choose the time of year when it is easiest to observe your aspect of interest – quite often this will be the flowering time of a plant, or breeding time for an animal, but use the information you gained from your background research to make this decision. If you are monitoring more general habitat changes, it may not be critical when you monitor, and you might be able to choose a set time interval that

covers a range of seasons. Just remember why you are monitoring and choose a time and time interval that will pick up changes and will let you know if you are approaching your alarm level.

4. Putting your plan to paper

First up, get a notebook or set up a computer document to write down your plan and record your monitoring results. Things to include:

- your question;
- relevant background information and contact details of people that can help;
- your goals (or what you expect to happen);
- your alarm level;
- a map of the area to be monitored and mark your chosen sampling area(s) on to it;
- your chosen method (in enough detail so that someone else could use your method); and
- a recording sheet for entering your results and other important events (fire, rainfall, change of management practice etc).

5. Start monitoring

The research is over, the plan is on paper, the only thing left to do is start putting the plan into action. This should all be straight forward - although you may need to make some modifications to your monitoring plan after trying it out on the ground.

1. Mark out your sampling areas on the ground using something that is relatively permanent. Surveyors tape, star pickets or a spot of spray paint on a tree trunk might be useful. You will need to sample the exact same area each time you go back, so mark it well and jot down some notes on where each sampling area is if you need to.
2. Follow the monitoring plan that you've prepared. It is important to stick closely to your plan so that if someone else takes over the monitoring, or the same plan is used elsewhere, the results can be compared and provide useful information. If you do change anything, write the changes into your plan with a date and reason for the change.
3. Don't forget to write down anything that might be relevant (weather patterns, fire event etc).
4. Check your results at the end of each monitoring session. Is what you expected happening? If not, are there obvious reasons why?
5. Check your results against your alarm level. Alter your management practices if necessary.

And that provides some step-by-step guidelines on preparing and implementing a monitoring plan. After a few monitoring sessions - start to share your results - the plan itself, your management techniques and how effective they are, and the results of your monitoring.

The South-East Queensland Fire and Biodiversity Project

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The South-East Queensland Fire and Biodiversity Consortium aims to gather and disseminate information on fire management practices that will support conservation of the region's biological diversity. The Consortium includes representatives from many Local Governments throughout SEQ: the Rural Fire Service, QPWS, DNR, DPI, Landcare, and universities. A literature review to assist in determining ecologically appropriate fire regimes has recently been completed. Brochures and a Powerpoint presentation on fire ecology and its implications for management are in draft form. We are also developing a best practice fire management manual, including an individual property planning kit. The project hopes to catalyse research projects to fill gaps in our understanding of the fire ecology of local vegetation types. Messages we hope to convey include: that fire plays a vital role in renewing many SEQ ecosystems; that both too frequent, and too infrequent burning can cause species to become locally extinct; that different vegetation types are adapted to different fire frequencies; that variability in the intervals between fires is important; that a mosaic of vegetation in different stages of post-fire development will help provide habitat for a range of fauna species; and that there are ways to minimise risk to both life and property, and biodiversity.

The South-East Queensland Fire and Biodiversity Project is a Natural Heritage Trust (NHT) funded project which aims to gather and disseminate information on fire management practices which will support conservation of South-east Queensland's biological diversity. We cover the area from Noosa to the NSW border, and out to the Great Dividing Range.

The project operates under the wing of the Fire and Biodiversity Consortium, which came into being in 1998. This group includes representatives from many South-East Queensland Local Governments, the Rural Fire Service, Landcare (notably the Lockyer Catchment Centre), Greening Australia, and State land management agencies - the Department of Natural Resources (DNR), the Department of Primary Industries (DPI), and the Queensland Parks and Wildlife Service (QPWS).

This impressive group came together because they perceived a gap: an information gap, and a consequent gap in natural area management. The Rural Fire Service provides a wealth of information about minimising risk to life and property. However very little local information has been available on fire management practices to support retention of native plants and animals.

As a first step, the Consortium contracted Cuong Tran and Clyde Wild, from Griffith University on the Gold Coast, to conduct a literature review (Tran and Wild 2000). The review, which was completed in September 2000, summarises studies which throw light on ecologically appropriate fire regimes for major South-East Queensland vegetation types. It

includes information from approximately 150 published, and a number of unpublished studies, as well as input from people with practical experience. The authors found that there was indeed research from the South-East Queensland region, but that it was relatively scant in comparison to work done in some other parts of Australia. The next step in this aspect of the project is to produce Ecological Guidelines which synthesise what we know from here and elsewhere into a series of “best estimate” recommendations for ecologically sustainable fire regimes - and in particular, to generate suggested fire frequencies for a range of broad vegetation types.

The literature review was funded by contributions from twelve of the Consortium’s member agencies. More recently, the Consortium received NHT funding, which allowed my position of Project Coordinator to be filled in March 2000. The project is managed by Logan City Council, on behalf of the Consortium. The NHT funding is for two years, so we’re about a third of the way through at present.

The project has a number of components, which sit with various Consortium working groups. These groups cover Research and NHT, Monitoring, Fire Management Planning, and Education.

The Education Working Group is focussed on ways to disseminate the information we have gathered. We plan to produce several fact sheets. The first of these - which is almost ready for production - will provide introductory information on fire and biodiversity conservation. The second, which is in an early draft, will tell the story of fire and the bush in detail. It will be of a similar level of complexity to the Land for Wildlife Tech Note “Fire as a Wildlife Habitat Management Tool” which was developed collaboratively by the Consortium and Land for Wildlife (Moran and Watson 2000). We have also developed a Powerpoint presentation on fire ecology and its implications for management, which we can show to community groups.

Messages we hope to convey include:

1. That **fire plays a vital role in renewing many SEQ ecosystems**. This basic point still appears to need emphasis in some quarters. We want to help people to appreciate the role of fire, and encourage them to value it as an integral part of our fire-adapted ecosystems.
2. That **both too frequent, and too infrequent, burning can cause species to become locally extinct**. This is a clear message from the literature (Gill and Bradstock 1995, Keith 1996). Shrub species which rely on seed regeneration after a fire and which take some years to reach reproductive maturity are one vulnerable group. Fabaceous plants which need heat to break seed dormancy are also at risk. Animals and birds which rely on the denser vegetation of the later years in the fire cycle can’t find a home when burning is very frequent. On the other hand, if a fire-adapted system is left without a burn for too long, some disturbance-dependent short-lived species may disappear, while others get shaded out. In South-East Queensland, some vegetation types will be taken over by other vegetation types in the absence of fire. This includes wet sclerophyll forests, and some *Themeda* woodlands. Animals dependent on these vegetation types will be lost from these areas. In Brisbane Forest Park, Pretty Faced Wallabies have reportedly disappeared as ridge-top grassy woodlands have thickened up due to less frequent burning (David Kington, pers. comm. 2000). Research in North Queensland has identified several bird species at risk of losing their habitat due to rainforest advance into wet sclerophyll (Chapman and Harrington 1997).

3. That **different vegetation types are adapted to different fire frequencies**. We're still working on the frequencies we want to recommend in our Ecological Guidelines. There will always be some guesswork in these figures, although we know enough for our guesses to be educated (Bradstock *et al.* 1995). We're probably looking at about 3-7 years for grassy dry forests and woodlands, 7-25 years for shrubby forests and woodlands, 6-16 years for coastal heath; and 15-30 years for *Melaleuca quinquenervia* wetlands. The wet sclerophyll forests are the most enigmatic vegetation type: fire frequencies of at least 20 years and perhaps much more are often suggested, although there are concerns that if these forests are left unburned for as long as 20 years, they may be unable to carry a fire due to advanced colonisation by rainforest species. We're recommending that rainforests, scrubs and creekside vegetation shouldn't be burned, although sometimes in a big fire this will be unavoidable.
4. That **variability in the intervals between fires is important**. This is another clear research finding, both from field (Morrison *et al.* 1995) and modelling studies (Bradstock *et al.* 1996). Logically, it makes sense: even within one community, different species favour somewhat different fire regimes, and variability provides opportunities for all elements of the community.
5. That **encouraging a mosaic of vegetation in different stages of post-fire development will help provide habitat for a range of fauna species**. Different fauna species prefer different stages of post-fire regeneration (Hannah *et al.* 1998, Woinarski 1999). Some love the young green growth in the initial months and years, others feed on shrub flowers and seeds in the middle stages, and others need the dense vegetation that develops some years after fire for shelter. Having a range of stages of post-fire regeneration means a diverse population of birds, mammals, reptiles and invertebrates can be supported. Mosaics need to be planned across a fairly broad landscape, for practical reasons.
6. That **there are ways to minimise risk to both life and property, and biodiversity**. If people who make their homes amongst the gum trees make sure that they have appropriate property protection measures in place in and around their home, then nearly bushland can more confidently be managed through fire regimes appropriate for biodiversity conservation - which generally involve longer inter-fire intervals than those appropriate for property protection purposes.

Our second major task is to produce a Fire Management Manual which addresses the question of balancing fire safety with bushland conservation. This is the province of the Fire Management Planning Working Group. We intend to produce the Manual in modular form, with three "levels": strategic, individual property, and operational.

The strategic level of the Manual will be targeted to those working at a landscape scale, such as Landcare and catchment groups, and Local Councils. It will include information about planning and development measures that councils can put in place to minimise conflict between life and property and biodiversity. The Gold Coast City Council and Gatton Shire Council have been leaders in relation to this aspect of fire management planning. The idea is to assess the fire proneness of potential development sites, and to link assessments to planning scheme provisions. These may include excluding buildings from high hazard areas. Certainly it means requiring that subdivision design and building construction are appropriate for bush-fire prone areas. This level of the manual will also include information on fire ecology and its implications for management, on fuel and fire-line management, and on co-operation in fire management. (This is an issue which crops up again and again. Wildfires

don't respect property boundaries, and options for fire management planning are generally much greater at a landscape scale than at individual property level.)

The second element of the Manual is an individual property fire management planning kit, primarily targeted to private landholders and managers, although we hope it will also be of use to those responsible for public natural areas. The original version of this document was developed by the Yarra Ranges Shire Council in Victoria (Hunt and Gooding 1998), as a way to handle conflicts around fuel management on private property. Consortium member Marc Gardner added a biodiversity dimension, and used it to work with landholders in the Helidon Hills in June this year. It's now moving through further drafts, as we test it out and get feedback from around South-East Queensland.

The third element of the manual will cover practical fire management activities such as fire line maintenance, and planned burning.

As the project progresses, we plan to move increasingly into outreach mode. We have ideas for workshops and field-days, and many people who have indicated an interest in coming along. This element of the project should really get going around March next year.

The project also has a research and monitoring component, which is the responsibility of the Monitoring Working Group. One aim of this group is to develop a simple guide which can be used by those who wish to monitor fire events and their effects on vegetation and fauna habitat.

The project also hopes to generate interest in scientific research projects which will help fill gaps in our understanding of the fire ecology of local vegetation types. I think it's fair to say we're on our way to developing a culture of fire ecology research in South-East Queensland. There are some studies underway, but there are also many questions yet to be tackled. Forestry has a series of long-term fire experiments, which are overseen by Alan House from DPI, with DNR funding. We also have a number of academics and agency staff who have undertaken fire ecology research at some point in their career, and who still have an interest.

In August 2000, the Consortium brought together researchers and land managers to develop research priorities. Our aim is to get four to six priority research projects up and running by the end of the project, each under the guardianship of an individual or agency with the interest and energy to see it through to completion, including publication. The Consortium's role will be to provide linkages between the universities, researchers outside academia, land managers who can provide access to research sites, and potential post-grad students. We have some money for equipment, a good reference collection, and people willing to lend a hand with putting in quadrats. Enquiries from potential post-graduate students are welcome.

To keep people up to date with Consortium activities, we produce a newsletter, distributed primarily by e-mail. If you would like to get on the mailing list, contact Kathy Julian on (07) 3202-0259, e-mail kathy.julian@env.qld.gov.au or myself on (07) 3826-5696, e-mail envserv@logan.qld.gov.au.

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Achieving Land for Conservation: The Effect on Landholders

Russell Turkington, Lagoon Creek Road, MS 371, Greenmount, Q, 4359.

Some history

Our family have owned and been custodians of land for 110 years. My Grandfather was required to clear 10% per year to meet the obligations of Government Guidelines. At the time, this land was lightly timbered: it was mostly brush and wattle. There was little grass as a result of wild cattle in large numbers (a residue of Pilton Station occupancy).

More recently, we have developed a Property Management Plan in consultation with the DPI, Environment Department, Cambooya Shire & Gatton Shire councils. Both councils found it acceptable.

Pre-purchase frustrations

Early this year (2000), we were offered more land on our north and northeastern boundaries which we eventually bought. Prior to purchase, we made enquiries regarding likely effects on the new property from proposed Tree Clearing Guidelines and also Rare and Threatened Species Guidelines. After extensive enquiries I could not get any indications from any public servant as to the conservation status of the proposed new property.

Eventually I contacted Peter Lawson (Dept. of Environment and Heritage) and in conjunction with Bruce Boyes an on-site inspection was made. As a result of the inspection, the area and extent of Pink Boronia was identified. A plan was devised for placement of a 3.1 km fence and firebreak, with the firebreak enabling access to facilitate fire management and fencing construction. The 3.1 km of 4-strand barbed-wire fence was to exclude stock from the area of Pink Boronia (a rare & threatened species).

The fence is completed and no large ironbark trees were cut down to achieve the line - in preference, $\frac{3}{4}$ inch galvanized steel pipe spikes were used and the trees left standing.

Assistance to approximately half of the total cost of fence construction (\$16,477.50) was envisaged. This would have comprised:

- Futureprofit funding dollar-for-dollar to a maximum of \$5000, and
- Threatened Species Network Community Grants funding of \$4,000.

However, the Threatened Species Network Community Grants funding was not approved. My contribution of \$11,447.50 to the project and Government assistance of \$5,000 is a bit of an imbalance as my understanding was that assistance would be approximately 50-50. At this time of drought, it has put a double burden on my family and myself. In addition to the costs

of this project, I have also previously spent about \$3,000 on another firebreak to protect the Pink Boronia on the adjacent “Treetop Sanctuary” property.

The job to achieve this solution was a lot of work in difficult terrain. However, I feel pleased to have accomplished the project which will be of lasting value. I wish to thank Peter Lawson (Department of Environment and Heritage) and Bruce Boyes for their help in finding a solution in a time of flux. As a family we are pleased to finish this project. The area of land excluded from grazing is approximately 200 acres gorge and gorge-rim land with a number of species identified as valuable in “as it was” condition. We intend to register it as Land for Wildlife.

Conclusion

As well as a lack of information and assistance for landholders, valuations and rules and regulations are another concern. Little is being done to provide incentives to landholders striving to “do the right thing” in meeting Government guidelines.

In some instances, it would give the impression that increased valuations and rules and regulations are a result of making an effort to “do the right thing” - landholders who have cleared all of their native vegetation are free from the imposition of the Vegetation Management Act and are further rewarded by lower valuations.

Summary of expenditure

Actual labour, machine hours and materials utilized	Cost
550 x 5'6" steel posts @ \$3.28	\$1,804.00
29 x coils barbed wire @ \$52.00	\$1,508.00
15 lengths x ¾ pipe (wire straining spikes for ironbark trees left standing)	\$299.50
B.J. & P. Carey access & firebreak	\$5,200.00
41 hours D4 dozer @ \$55.00 (tidy up & clear 3kms fence line)	\$2,255.00
301 hours labour @ \$15.00	\$4,515.00
10 hours Ford 5000 tractor & post driver @ \$ 40.00 per hour	\$400.00
7 hours @ \$20.00 - planning time & on-site inspection with DNR & Government Reps	\$140.00
8 hours @ \$15.00 labour - fitting four bush type gates	\$120.00
1 coil 4mm plain wire	\$70.00
2 coils 3.15mm plain wire	\$136.00
Total	\$16,447.50

Be Part of the Sequence - Consort With the Consortium: A Community-based Funding Initiative

Andrew Davidson, Lockyer Catchment Coordinator, PO Box 61, Forest Hill, Q, 4342.

Introduction

My presentation is about dollars. The issue of funding is age old. How do we achieve guaranteed funding for all the actions we are doing and propose to do to make our visions for biodiversity a reality? How do we make all this short term project funding into long term program funding? Natural Resource Management (NRM) Groups in SEQ have tackled this head on and are working to frame a bid for funding. The Groups have formed the South-East Queensland Integrated Natural Resource Consortium (SEQINRC). This is no an easy task when we are vying for a bucket of money that is also being used for health and defence etc. How do we put a monetary value on all the environmental things we do? This is something that the Consortium is attempting to do. The approach is regional so that we can combine our bargaining power and present a regional solution to the high priority issues we are addressing through Landcare and Integrated Catchment Management (ICM). It is not about a hand out, we are detailing our claim for support in a credible fashion. The bid will be an investment plan or a prospectus if you like that will show what sort of dividend the community and funding bodies will receive from every dollar put into to the Consortium. Our first approach will be to State Government and then the Natural Heritage Trust (NHT) as well as philanthropic, industrial and commercial contacts.

What is the consortium?

The consortium is a regional community initiative to continue the job of building social and environmental infrastructure to support sustainable communities.

For the last fifteen years governments have through ICM, Landcare Bushcare and Waterwatch worked with local communities to understand, plan for, and tackle the myriad of natural resource issues we are confronted by. The decade of Landcare is over, NHT is just about finished, and there has been no plans detailed about their replacements. The SEQINRC was formed to bridge the gap between current and future programs.

The aim of the consortium is to keep NRM funding at the same level as now so as not to lose the gains made over the last decade. The consortium is made up of over 15 Landcare, Catchment Care and Waterwatch groups with a proven track record of delivering results. The consortium members have developed plans and 2001/2002 financial year cost estimates, based on their priority actions in the SEQ Natural Resource Management Strategy. In effect we are costing out this Strategy.

The consortium will also be seeking support for our regional bid from philanthropic sources, industry, Local Governments and Federal Government. This process will help the government better plan its expenditure in SEQ on natural resource management and protect its investments in sustainable communities. The final bid will be audited by an independent source before presentation to funding bodies.

Summary

Individual landholders and community members cannot achieve our vision for biodiversity by themselves - funding and support is needed from governments and industry on behalf of the wider community. The SEQINRC is a proactive and ambitious project to document our claim to investment from government and industry in a credible fashion. This investment will be paid many times over as we continue building the social, environment and economic capital of our region.

Nature Refuges - “Top Shelf” Conservation Agreements

Craig Middleton, Nature Conservation Extension Officer,
Queensland Parks and Wildlife Service (QPWS), PO Box 42, Kenmore, Q, 4069.

In accordance with the Nature Conservation Act 1992, Queensland landholders have the opportunity to establish a Nature Refuge over part or all of their property. Under the Act, Nature Refuges actually become part of Queensland’s protected area estate and subsequently offer a very high level of protection for the conservation values of land subject to a Nature Refuge agreement.

The assessment, documentation and conservation agreement negotiations associated with a Nature Refuges are detailed and time consuming but the end result is a long-term (usually in perpetuity) and legally binding agreement that offers “top shelf” level protection of areas of high conservation value.

This presentation looks at what Nature Refuges are, how they are created and some of the benefits that they offer to landholders genuinely committed to the long-term protection of wildlife habitat on their property.

What is a Nature Refuge?

Under the *Nature Conservation Act 1992*, a Nature Refuge becomes part of the protected area estate. They are a legally binding agreement that is:

- attached to the Title of the land;
- a way of ensuring the long-term protection of the nature conservation values of land on privately owned property; and
- accompanied by a Conservation Agreement that is negotiated between the individual landholder and the Queensland Parks and Wildlife Service.

The Conservation Agreement is tailored to:

- suit the landholder and the management needs of the property; and
- ensure protection of wildlife habitat while also providing for commercial activities (grazing, timber, tourism etc) to continue in a sustainable fashion where appropriate.

Where are Nature Refuges currently located?

There are currently around 60 declared Nature Refuges across the State, covering a total area of over 30,000 hectares. These Nature Refuges are concentrated around Cairns and the Wet Tropics, the Proserpine area, the Rockhampton area and South-East Queensland. There are 12 declared Nature Refuges in South-East Queensland and 10 more currently being processed.

Process for establishing a Nature Refuge - from deliberation to declaration

The process steps are:

1. Initial contact between the landholder and QPWS extension staff (either may initiate) and a subsequent field assessment of the proposed area.
2. Proposal for Declaration.
3. New Area Evaluation (relatively detailed report on the nature conservation values of the land - may involve fauna/flora survey work).
4. Draft Conservation Agreement.
5. Final Conservation Agreement and signature by landholder and the Minister.
6. Declaration of Nature Refuge.

What are the benefits of having a Nature Refuge?

The benefits include:

- for most landholders genuinely interested in nature conservation, it is simply the knowledge that their “special patch of bush” is protected forever;
- advice on management of the area for nature conservation purposes including weed and feral animal control plans, fire management plans, maintaining special habitat requirements for endangered species etc;
- financial assistance for on-ground projects becomes available from time to time (e.g. proposed NHT project for financial assistance); and
- greater powers of enforcement against human threats to the values of the refuge area.

Assessment criteria

There are no “hard and fast” criteria that must be met but the following are all criteria that may be considered:

- Regional Ecosystem (RE) types and their status (“Endangered” or “Of Concern”);
- flora and fauna assemblages;
- rare and threatened species;
- regional perspective including connectivity to other bushland areas and protected areas; and
- miscellaneous criteria including catchment protection, aesthetic values, management considerations, geological features, habitat for migratory species, wetlands, etc.

Summary

A Nature Refuge is:

- negotiated with the landholder;
- tailored to suit the landholder and the management needs of their property; and
- a way to ensure the long-term protection of nature conservation values of an area.

A Nature Refuge does not:

- give ownership of the land to the Government;
- turn the land into a National Park;
- lock up the land, excluding its use for production; or
- give the public any right of access to the land.

Tourism and the Helidon Hills

Henk Hagedoorn, PO Box 2, Helidon, Q, 4344.

My name is Henk Hagedoorn. I live in the Helidon Hills. I was educated in Holland including Agricultural College. I worked, when not studying, on the family dairy farm and learned all about milking, cleaning toe bails and raising pigs. In other words, getting ones hands dirty. I migrated to Australia in January 1956 and I am an Australian Citizen.

My first Australian employer was the Stirling Bros. at “Breamar”, Brookstead, near Pittsworth, who were harvesting and sowing wheat and sorghum. From there on I moved into sheep shearing and mustering cattle on properties just this side of Quilpie. I managed my first sheep and cattle property just north of Traralgon, called Millbrook Station. Some years later I went back to Queensland and started contracting work.

The Helidon Hills

My family bought two properties in the Helidon Hills in 1994. From here on I am referring to “we” since 5 of my 6 children have an interest in it. We intended to continue growing trees on a commercial basis. However, we got caught up in this now famous project: Sustainable Management of the Helidon Hills. We have been involved with the project since day one.

We were introduced to tourism in two ways.

1. By a friend of ours, Ralf Bailey, designer of the now famous Kingfisher Bay resort on Fraser Island.
2. By being involved in the Helidon Hills project.

We were impressed by the beauty of the Helidon Hills and decided to steer away from timber harvesting. The majority of both properties are now to be listed as “The Hagedoorn Nature Refuge”. I apologize for the rather short introduction but it may give you a glimpse as to where we are coming from and where we are going.

The Sustainable Management of the Helidon Hills Draft Management Plan is a living document that influenced our lives and our appreciation for the beautiful surroundings we live in. The impact was gradual but dramatic. So much so that we got involved in the Lockyer Watershed Management Association (LWMA) Inc. - Lockyer Landcare Group and the Helidon Hills Landcare Group of which I am the Chairman.

So much to learn and so much to do.

The following is an extract from the Introduction statement of the Sustainable Management of the Helidon Hills Draft Management Plan:

The Helidon Hills is recognised as an area of very high nature conservation significance. It is one of the largest areas of mostly continuous bushland left in South-East Queensland, with a diverse and distinctive flora and fauna. A large number of rare and threatened

flora and fauna species are present, including endemic species. Scenic values are very high and include the following assets:

- forest and natural vegetation, including impressive wildflowers;
- hills and dramatic escarpments/cliffs;
- lushly vegetated natural springs;
- farming environments; and
- location, i.e. a short drive from major urban areas, offering an escape from high-stress lifestyles.

It comprises an area of 33,430 ha, one-third of it being State Forest. There is currently little tourism development in the Helidon Hills other than some recreational activities such as birdwatching and wild flower walks. It supports local community recreation including bushwalking, horse-riding, rock-climbing and orienteering. Participation tends to be restricted to those attached to clubs and others “in the know”. As a result there is no structured approach as to how the Helidon Hills should be used as a tourism destination. Tourism was identified through the public consultation process as having a major potential for the area.

As a result a number of landholders, including myself, are actively pursuing the possible establishment of a low impact “Nature Cabins” style of resort including various attractive activities and package deals. These would include such activities as:

- horse-riding safaris;
- 2 and 3 day bushwalks and orienteering;
- tours of the areas surrounding the Helidon Hills; and
- skydiving and ballooning.

A small group of five landholders have experienced the first taste of providing for and entertaining overseas tourists, namely 33 students from the University of Horishima, Japan. The visitors were provided with local experiences on nature study and Australian family life. It was an experience enjoyed by both parties and sure to be continued!

However, for any full-scale tourist projects to be successful, full Government and Local Council encouragement, support and incentive would be required. The government appears to be committed to a certain extent, but the incentive is missing. Incentives could be:

- tax holidays;
- low cost development loans;
- fee deferment; and
- tax rebates similar to the Australian film industry 500% tax rebate.

Also, it is not enough for a Local Council to say “Yes, this is a good idea, we will support you” and then do absolute NOTHING. No further encouragement and no further contact? Even your new Local Councillor has no idea at all what is going on. Is the system lacking? It again shows that success proceeds from the individual and his/her aspirations.

The First Inaugural Fred From AO Address

Introduction to the First Inaugural Fred From AO Address

*Alan Brimblecombe, Life Member,
Lockyer Watershed Management
Association - Lockyer Landcare Group*

Moira Farms, Forest Hill, Q, 4342.

It is a pleasure for me to introduce Dr. Julia Playford, who will shortly present to us the first inaugural Fred From AO Address on the theme *Biodiversity Conservation - From Vision to Reality*. As our minds will shortly be stimulated on this topic and we will be thinking about vision and reality it is probably good to pause for a moment and think about the man Fred From AO, and consider this man after whom this address was named.

Fred was raised on the land on a dairy farm at Lowood, and as a young man he went cane cutting until 1939. The Second World War began and Fred felt the call for country. He enlisted, and with the money he saved while he was a soldier bought his first farm at Buaraba. The Korean War captured the soldier in this man again and he enlisted in 1951. On his return a greater knowledge of agriculture was on his mind and he enrolled at The University of Queensland. He studied agriculture, obtained his degree in agriculture and left the University just prior to obtaining his PhD.

In 1964 Fred returned to the farm and continued in farming pursuits until very recently. Fred's vision led to the establishment of the Lockyer Watershed Management Association (LWMA) in the early 1980's. Fred's vision was for community involvement in catchment management with groups all over Queensland and Australia. His vision became a reality. Consider integrated catchment management and Landcare today and the emphasis that is being given those who pursue these activities.

The LWMA is a result of Fred's foresight and has emerged as an action oriented group. From humble beginnings, meeting as a loosely knit committee in 1981, it rapidly grew to a valley wide association. People helping people and learning from others activities has driven the success of this group, the vision to reality of Fred From's passion.

Thanks Fred for promoting us and stimulating and guiding us, and we honour you tonight for what you have done in this regard. The Lockyer is certainly a better place and a lot of what has happened here has rubbed off on the rest of this country.

The theme for the first inaugural Fred From AO Address is *Biodiversity Conservation - From Vision to Reality*. We have already heard a little about the vision of one man, the vision that became reality.

I would like you to welcome Dr. Julia Playford. Julia manages the Research Coordination Unit of the Queensland Parks and Wildlife Service and lectured in the Botany department at The University of Queensland from 1992 until this year. Her research experience is in the area of population genetics and ecology, particularly of rare species and weeds.

The 2000 Fred From AO Address

*Dr. Julia Playford,
Queensland Parks and Wildlife Service
& The University of Queensland*

Manager Research Coordination Unit, Queensland Parks and Wildlife Service, PO Box 155 Brisbane Albert Street, Q, 4002; Botany Department, The University of Queensland, Q, 4072.

Biodiversity Conservation - From Vision to Reality

I am very honoured to deliver the first *Fred From AO Address* on the theme *Biodiversity Conservation - From Vision to Reality*. I wish to interpret this ‘vision to reality’ statement as the marriage of theory and practice into a system for effective conservation. To me, this is the critical issue in addressing the need for effective solutions to the great environmental and social issues we face in the 21st century.

Introduction

The activities of humans, particularly in western countries, are changing the Earth’s ecosystems at a pace that is historically unprecedented. On a local level we see the problems of land degradation and urban expansion resulting in loss of production, loss of species, and loss of ecosystem services. As well as having major ecological consequences, these local problems translate into major social and economic upheavals, particularly in regions such as the Lockyer valley.

My background is in the theory side of conservation, specifically evolutionary genetics. This field is very reductionist in its approach. The unique value of the Hardy-Weinberg equation hardly raises a nod of recognition in an audience of conservation practitioners. Yet in conservation biology as a university research area, it is the one of the dominant fields. Perusal of any issue of the journal *Conservation Biology* for example will show many of its research papers are in this field. However, knowledge of the Hardy-Weinberg equilibrium has little value when dealing with the two sides of a farmer’s need to make a living versus the loss of a species or ecosystem. Instead you might need a degree in marketing!

Translating information

Theory and practice need to come together to result in the conservation of native species and natural ecosystems. The distance between science and practical activity is often publicised

with an air of defeat. Translating science into information that is useful to conservation practitioners is a slow process. This has always been a priority for many scientists who have communicated with groups interested in natural history or conservation but is becoming a real necessity because of the landscape's rapid degradation. A new journal has been established to link science and practice. *Ecological Management and Restoration*, first published in April 2000, should be a forum for continued dialogue between scientific aspects and practical outcomes. Conferences such as this are very important in improving the exchange of information between scientists and practitioners.

Remnant vegetation

Government-owned lands for nature cover a small area of Queensland. Although protected areas conserve representative areas of many ecosystems, they do not fully protect biodiversity. National parks currently protect about 69 percent of our regional ecosystems as surrogates for biodiversity. Increasing the National Park estate to five percent of the State could protect about 80 percent of the State's regional ecosystems (Sattler, 2000). The current situation has led to the need to manage small, often isolated, remnants within cleared land which leads to isolation and fragmentation of those sites. Off-park conservation needs to be promoted so these isolated fragments are connected and available habitat is expanded.

Many authors have discussed the need for nature farming designed for sustainable agriculture (Altieri, 1987; Khichar, 2000; Wilson, 1994). Surveys of farmers throughout the world indicate that the longer a family has been on a farm the more likely it is to want to conserve the remnant vegetation (Wilson, 1994). Long-term landholders may build up a "sympathy with the land and its remnant environments and are therefore more conservation minded than recent landholders who tend to exploit the land to its maximum for short-term returns". (McDowell and Sparks, 1989; Wilson, 1994). Long-term landholders may have a better understanding of forest ecology that allows them to implement sustainable management practices. However, general findings indicate less concern for the environment and a "more traditional approach" to land development among older farmers. This occurs in New Zealand (Wilson, 1994) America (Kellert, 1984) South Africa (McDowell and Sparks, 1989) and Norway (Lönstedt, quoted in Wilson, 1994). These data suggest that policies aimed at sustainable management should especially target older farmers, less educated farmers and new farmers in the district (of any age) (Wilson, 1994).

However, current approaches may not be very effective. A study conducted by the Tropical Savanna Co-operative Research Centre (Arnott, 2001) indicate that learning in the pastoral industry tends to be "*ad hoc*, unordered and highly individual". Land managers learnt informally and perceived this knowledge as common sense that is accepted without question or reflection. The landholders felt that knowledge was only useful when they trialed it themselves. The study concluded one-to-one relationships needed to be developed to transfer information, and learning needed to be located on nearby properties. The most effective communication strategy was seen to be by groups in a relatively small area conducting trials and learning from them.

Converting the theory of conservation into the practice of encouraging landowners to maintain remnant vegetation on their properties requires much extension and community involvement.

Restoration of vegetation

Solutions to the problems of ecosystem degradation, even on the local scale, are not simple or linear. We often need detailed information about a particular situation or more effective methods of restoration. However, even when these are available, they must be translated into a reality, often by people who have not been involved in gathering the information and developing the tools. Thus, those who have the vision and develop the theory are often not the ones doing the on-ground work and this leads to loss of complex information and a divide between the “thinkers” and the “doers”.

Researchers have developed very good information on the theory required for intensive replanting of vegetation by community groups. The research includes information on the need for concern for the genetic basis of the planting (Playford, 2000) and for the propagation and planting of these specimens (Eustace, 2000; Kooyman, 1996). Many groups such as Landcare and Integrated Catchment Management have used this information in the planting and maintenance of vegetation in Australia.

Research has also established information about conserving threatened species through examining individual characteristics and determining conservation actions appropriate to that species. For example the populations of *Austromyrtus gonoclada* have been very successfully expanded as a result of community replanting and replacing riparian vegetation containing the species. This involved the use of the theory (Shapcott and Playford, 1996) by a very active, community-based, recovery team. Other species, such as *Corchorus cunninghamii* require changes in fire regime for appropriate conservation (Simmonds and Playford, in press). The research has led to recommendations for recovery actions which have then been carried out by groups of volunteers and land managers.

The restoration of vegetation also has social, political and economic imperatives. Many of our current conservation practices can be carried out only for a small number of species and/or small areas. Replanting of rainforest using the techniques of Landcare groups on the east coast of Australia is not going to be possible on a large scale, and particularly not in developing countries. It is extremely expensive to replant, manage, weed and care for small patches of rainforest and this relies on a large number of keen volunteers and landowners

Broader conservation issues

The reality of these conservation activities is that they are all small scale and conserve or replant small fragments of vegetation. While all of us at this conference come from the more environmentally committed sections of society, most of us have cars, work in air-conditioned offices, and use excess resources. We know everything there is to know about how we should be reducing our consumption but the reality is that we do not wish to change our way of life significantly. Therefore we have look for more sustainable ways of reaching the same lifestyle outcomes.

In the first world, we live removed from the manufacture of virtually all the goods that we use. Hence we cannot modify the manufacturing process ourselves. In addition, the majority of the 100 biggest economic entities are not countries but businesses. All this points towards the need to encourage business, either through government regulation or through an education process towards sustainable production and use of resources.

One example of success is the example of energy use. Earth's Choice is the local example of a series of national sustainable energy programs. Since its establishment in March 1998 about 140 businesses and 1,400 residential users have enrolled in the program and have saved 150,000 tonnes of greenhouse gas emissions. This succeeds because it does not require individuals to change their lifestyle and is cheap at 2c extra per kilowatt/hour.

Conserving biodiversity requires major changes to the manufacture of goods and the use of ecosystems, even those ecosystem services such as clean water and air that we take for granted. This involves maximising the use of materials and minimising, or eliminating, the production of waste in manufacture (Hawken *et al.*, 1999). This is the more recent theory of biodiversity conservation which has yet to be put into practice by most of the business community.

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Actions to Take Biodiversity Conservation From Vision to Reality

Workshop Outcomes: Vision, Barriers and Actions

Taking Biodiversity Conservation “From Vision to Reality”

Workshops facilitated by Lockyer Catchment Centre staff and volunteers:
Andrew Davidson, Kaori van Baalen, Steve Fox, Gayle Drabsch, Patti Grant and Helen Smythe.

Just how do we take biodiversity conservation “From Vision to Reality” in South-East Queensland? Conference participants took the presentation messages and, with the background of their own knowledge and experiences, answered the following questions in workshop groups:

1. What is our vision for biodiversity in South-East Queensland in the year 2050?
2. What are the barriers to achieving this vision?
3. What actions are required to overcome these barriers?

What is our vision?

Workshop process

1. Conference participants were broken into four groups (Groups 1 to 4).
2. The members of each group were given 5 minutes to individually write their responses to the question “What is our vision for biodiversity in South-East Queensland in the year 2050?”
3. For the next 10 minutes each group member shared their visions within their group.
4. The four group visions were then combined into an overall agreed vision.

Vision - Group 1

By the year 2050 we will have shared knowledge, desire and commitment by the whole community including all levels of government and scientific community to protect biodiversity and recognise its contribution to our quality of life.

Vision - Group 2 (‘Save the Squirrel Glider’)

- Reserve system covering all land tenures:
represents landscape;
increases biodiversity, controls threats;
linkages; and
maintains ecological functions.

- Save the world.
- Education centred around reserve system to address social issues.
- Internationalism – eradicate poverty as a step to empowering people to fix the world.
- Full range and depth of ecosystem services.
- Halt bushland clearance.
- Save the SG (squirrel glider).
- Maintain areas outside reserves.
- Co-operative approach is valued.

Vision - Group 3

- Community empowerment in biodiversity conservation.
- Local Government input to fit hand in hand with biodiversity issues.
- For all Australians to love nature.
- Community awareness at all levels (age groups) of Australian biodiversity and ecology.
- Scientific assistance and organisation more directly involved with people.
- Conserve at least the variety of life for generations to follow.
- Long term visions/ budgets from all levels of government bodies.
- To allow for the increase of areas of endangered ecosystems.
- To promote community biodiversity ethos.
- Total biodiversity preference rather than individual species.
- More individual responsibility.

Vision - Group 4

- People learn to live with the land - to respect and cherish the diversity of life.
- Biodiversity conservation valued by all of the community.
- Community understanding of connection with landscape and biodiversity.
- Work towards sustainable environment continually improving and able to be enjoyed by future generations.
- Accessibility of information - free flowing - to allow exchange of info.
- Change attitude of all - realise we are only tenants of land and accountable for its use.
- Slow down processes that destroy and fragment balance of ecosystem until workable solutions.

Combined vision

Our vision for biodiversity in South-East Queensland in the year 2050
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.

What are the barriers to achieving this vision?

Workshop process

1. Conference participants returned to their four groups (Groups 1 to 4).
2. The members of each group were given 5 minutes to individually write their responses to the question “What are the barriers to achieving this vision?”
3. For the next 10 minutes each group member shared the issues they had identified within their group.
4. Group members were given three coloured dots, which they used to award three votes to the priority issue or issues of their choice.
5. The four groups joined together, and a spokesperson from each group shared the group’s issues with all workshop participants.
6. The whole workshop (all four groups combined) identified the top four barriers.

Barriers - Group 1

Top five barriers:

- Lack of shared values/vision.
- Lack of long term planning - changing Government - reactive planning.
- Lack of knowledge, desire, commitment.
- Inappropriate support for land managers.
- Increasing competition in the allocation of resources.

Other barriers:

- Lack of cohesiveness/coordination.
- Time.
- Population growth and needs.
- Profit driven society.

Barriers - Group 2 (SASS - ‘Save the Squirrel Glider’)

Top four barriers:

- Lack of understanding of biological system and appropriately knowledgeable people in decision making process.
- Current planning and legislative framework.

- Economic barrier - does not value biodiversity.
- Political will at all levels.
- Identity crisis - who we are and where we fit:
in the workplace;
in the broader ecosystem/ landscape.

Other barriers:

- Current planning does not differentiate between areas that are cleared or vegetated.
- Economic rationalism reducing control by individuals.
- Bandaid approach rather than protection - allocation of resources.
- Jim Elder and his carpet.
- Barrier between landholders and research/knowledge.
- Not acting with available information.
- Lack of business orientated visions.
- Ferals.
- Top down approach.
- Uneven distribution of resources.
- Legacy of historic decisions.

Barriers - Group 3

Very high barriers (received 4 votes):

- Enormity of the problem.
- Lack of resources.

High barriers (received 3 votes):

- Awareness.
- Poor town planning.

Medium barriers (received 2 votes):

- Current social system does not promote biodiversity.
- Lack of community education.
- Power plays.

Low barriers (received 1 vote):

- Life style - work, family time, priorities.
- Negative print media.
- Biodiversity is undervalued.
- Red tape.

Very low barriers (received no votes):

- The need of future farming and industrial requirements.
- Australian wildlife lacks glamour e.g. snakes.
- Legal hassles.
- Ingrained prejudices.
- Lack of opportunity to understand the issues.
- Lack of confidence in one's own ability.
- Unawareness of urgency.

Barriers - Group 4

Top five barriers:

- Lack of knowledge of biodiversity values and processes, education - community - isolation and differences.
- Funding limits because of low priority value by Governments, political whims and lack of will to make it a priority.
- Human attitudes of greed, narrow-mindedness and wastefulness - leave it to others, apathy.
- Inconsistency of values, direction and priorities, lack of planning, forward thinking and correct data.
- Media - lack of interest.

Other barriers:

- Threats - physical - clearing, erosion, etc.
- Lack of practical views among community groups.
- Economic wellbeing supplants biodiversity well being.
- The Mining Act.
- Lack of knowledge of how to work with the land to produce what we need rather than forcing the land to produce what we want.
- Insufficient policing and penalties.
- Low priority in school curriculum.
- Different issues of the same problem \square no continuity \square get nowhere.
- Resources including lack of landholder resources, \$\$\$ and time.
- Defining priorities and who makes those decisions.
- Wilson Tuckey becoming PM.

Top four barriers from combined groups

The major barriers to achieving our vision for biodiversity are:
<ol style="list-style-type: none">1. Lack of shared values and vision (and/or inconsistent values and vision).2. The economy does not value or undervalues biodiversity.3. Political priorities and will at Federal, State and Local Government levels.4. Awareness and/or education of community, government and media.

Other barriers from combined groups

- Identity crisis - who we are and where we fit into workplace and ecosystem as a whole.
- Inappropriate support for land managers.
- Planning and legislative framework at a Federal, State and Local level have a lack of resources and long term planning.
- Lack of scientific/technical knowledge of biodiversity values and processes - on ground, in management positions.
- Human attitudes of greed, wastefulness, apathy.
- Lack of resources - \$, time.
- Enormity of the problem.
- Commitment.
- Bandaid approach rather than protection.
- Current social system does not promote/ support biodiversity.
- This process identified four main issues/barriers to be addressed from the whole group.

What actions are required to overcome these barriers?

Workshop process

1. Conference participants returned to their four groups (Groups 1 to 4). Two groups worked on 'Lack of shared values' and 'Economic barriers', and the other two groups worked on 'Awareness raising' and 'Lack of political will'.
2. The members of each group were given 5 minutes to individually write their responses to the question "What actions are required to overcome these barriers?" Each group member then shared their proposed actions within their group.
3. For the next 10 minutes, the groups developed their actions and identified who would carry them out. Where possible, timeframes were also identified, being short-term (1-2 years), medium-term (2-20 years) or long-term (20+ years).
4. The two groups who were each working on the same issues then swapped half their membership to share discussion on their actions. Ranking of the high-priority actions was carried out in these shared groups.

5. The four groups joined together, and a spokesperson from each group shared the group's actions with all workshop participants.

Barrier 1: Lack of shared values and vision (and/or inconsistent values and vision)

Priority actions to address lack of shared values and vision (and/or inconsistent values and vision)		
Action	Who	When
Primary, secondary and TAFE curriculums incorporate biodiversity conservation issues.	<ul style="list-style-type: none"> • Wildlife Preservation Society Queensland (WPSQ) and Gould League. • Education Department, TAFE, University. • Teacher trainers. 	Short term.
Investigate partnerships between conservation and industry groups at a regional scale.	<ul style="list-style-type: none"> • LCCC, Bremer CCC, Upper Brisbane CCC and others (trial zone). 	Medium term.
Work more closely with other community based groups on common issues.	<ul style="list-style-type: none"> • For example LCCC and LWMA. 	Ongoing.

Other actions:

- Educate community regarding social and real dollar value of habitat/biodiversity
- Keep the ABC independent and resourced.
- Encourage and organise activities to help young people and other cultures to participate in on-ground biodiversity activities.

Barrier 2: The economy does not value or undervalues biodiversity

Priority actions to address the economy not valuing or undervaluing biodiversity		
Action	Who	When
Valuations of land need to encompass a land capability / habitat retention category.	State member via LCCC Valuations Sub-Committee with assistance from Department of Natural Resources.	Short term.
Change tax incentives to support conservation.	Federal member through the LWMA.	Short term.
Rate rebate incentives / introduce differential rating to acknowledge private land conservation.	Local Government.	Medium term.

Other actions:

- Encourage/subsidise/fast track biodiversity-friendly developments.
- Introduction of biodiversity credits.
- Adoption of the triple bottom line accounting in business and government.
- Remove subsidies for degrading industry.

Barrier 3: Political priorities and will at Federal, State and Local Government levels

Priority actions to address political priorities and will at Federal, State and Local Government levels	
Actions	Who
GOOD NEWS STORIES AND SOLUTIONS	
In welcome packages to new residents e.g. with rate notices.	Local groups, Councils.
To politicians and give pat on the back for positive actions.	Groups.
To demonstrate power of community involvement.	
Erect signs for areas where environment repair work undertaken.	
TV campaign similar to Slip, Slop, Slap.	Landcare Australia Limited, State and Federal Governments.
Awareness to general public of how much is getting done on a small budget (especially the community benefits) ⇒ political pressure.	
Offer alternative solutions to management.	
Facts and statistics on priority actions for biodiversity conservation available for politicians and everyone.	Local Government and groups.
GOVERNMENT EDUCATION	
Invite Local Councillors and State representatives onto Landcare/ICM groups.	Groups.
Establish Local Government Environment Consultancy Committees.	Groups, Local Government.
Lobbying on environmental issues, e.g. use form letters.	Groups.
LEGISLATION	
Changes.	
Enforcement.	

Other actions:

- Focus on solutions - not complaints.
- Show how biodiversity links to other priorities.
- Highlight biodiversity by using Vegetation Management guidelines.
- Summary of problems and actions needed to be publicized from the bottom up.
- State legislation - the Mining Act overrules all others currently - CHANGE!!!

Barrier 4: Awareness and/or education of community, government and media

Priority actions to address awareness and/or education of community, government and media		
Action	Who	When
DIRECT APPROACH TO MEDIA - PRINT, RADIO, TELEVISION & WEBSITES		
<ul style="list-style-type: none"> • Identify avenues with high exposure e.g. Landline, Totally Wild, Creek to Coast. • Be assertive with good news stories. • Varied and topical themes. 	Key personnel who cooperate.	Short term.
THROUGH SCHOOLS		
Educate on local biodiversity issues.	Local Landcare groups and identities.	Short term.
Introduce into the curriculum from Year 1.	Department of Education.	Short term.
DEVELOP AND USE PRACTICAL PROCESSES		
<ul style="list-style-type: none"> • Processes such as the Bushland Assessment Kit. • Extension services. 	Local, State and Federal Governments.	Medium term.
ENGAGE CITY PEOPLE TO ADOPT AN ISSUE		
Encourage them to visit and participate.	Organisations such as Greening Australia & ATCV.	Medium term

Other actions:

- Through the media explain the \$\$ value.
- Extension services via service newsletters/utilities.
- Government Policy - Best Practice in the Workplace e.g. site and priorities.
- Environmental Education site at Local Government Expos and local shows.
- Cooperation between community groups and university research.
- Local demonstration sites and signage.

- Sending good news stories to politicians and request their exposure in their newsletters.
- Extension services for remote and rural communities.
- Using artists to highlight issues e.g. special exhibitions such as River Arts Festival.
- Using high profile champions such as Ian Thorpe.
- Coordinated approach to biodiversity extension material e.g. webpage linked to local information.
- Biodiversity Expo.
- Current database of biodiversity facts and priorities.

Appendix 1

Conference Participants

Conference Participants

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Appendix 2

Map of Biodiversity Planning Assessment of the South-East Queensland Region

MAP OF BIODIVERSITY PLANNING ASSESSMENT
NO LONGER AVAILABLE
IN THESE CONFERENCE PROCEEDINGS