Rainforest Recovery
for the
New Millennium

WWF

Proceedings of the
World Wide Fund For Nature
1998 South-East Queensland
Rainforest Recovery Conference

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Proceedings of the WWF (World Wide Fund For Nature) Australia
1998 South-East Queensland Rainforest Recovery Conference,
held at the Tanyalla Conference Centre,
Tannum Sands via Gladstone, Queensland,
from August 31 to September 4, 1998.

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WWF South-East Queensland Rainforest Recovery Project.

Published by WWF (World Wide Fund For Nature) Australia,
GPO Box 528, Sydney, NSW, 2001.

ISBN 1-875941-12-6

Preferred way to cite this publication:

Boyes, B.R. (Editor) (1999). *Rainforest Recovery for the New Millennium.* Proceedings of the World Wide Fund For Nature 1998 South-East Queensland Rainforest Recovery Conference. WWF, Sydney.

Front Cover: Conference participants study the Dan Dan Scrub, located west of Gladstone, during a conference field trip. (Photograph by Benita Darrow).

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1. Introduction

Rainforest Recovery for the New Millennium

Bruce Boyes, Conference Chairperson, and Project Coordinator,
WWF South-East Queensland Rainforest Recovery Project.

In the past the rainforests of South-East Queensland have been extensively cleared for farming, housing and timber plantations. They are now threatened by weed and feral animal invasions, fire, and further clearance for farming and development. South-East Queensland's rainforests now have a very high concentration of threatened plants, animals and ecosystem types, a clear indication of their dire circumstance. Indeed, more than one-third of all of Queensland's endangered plants now teeter on the brink of extinction in South-East Queensland's rainforests.

The 1998 South-East Queensland Rainforest Recovery Conference brought landholders, government bodies, scientists, and Landcare and conservation groups together with the common objective of saving South-East Queensland's deteriorating rainforests. Organised by WWF (World Wide Fund For Nature) Australia, it was a unique event, whose purpose was to advance recovery plans for whole ecosystems, rather than just plant and animal species. The conference recognised that success will only result from cooperative action between people at all levels.

The conference brought landholders, government bodies, scientists, and Landcare and conservation groups together with the common objective of saving South-East Queensland's deteriorating rainforests. (Photograph by Jamie Pittock).

Rainforest Recovery for the New Millennium provided an opportunity for those at the leading edge of rainforest restoration and rehabilitation to share their experiences, voice their concerns, debate issues and problems, and find solutions. Key speakers at the week-long conference included Carl Binning from CSIRO Wildlife and Ecology, who has developed a

Commonwealth Government program for supporting landholders to conserve bushland, and Alex Rankin, Director, Threatened Species and Communities Section, Environment Australia, whose Endangered Species program has been extended to target threatened ecosystems as well as endangered species.

Conference location and venue

Rainforest Recovery for the New Millennium was held at the Tanyalla Conference Centre at Tannum Sands near Gladstone, Queensland from Monday August 31, 1998 to Thursday September 3, 1998 with optional field trips on Friday September 4 and an optional extended field trip on the weekend of September 5 and 6.

The Gladstone area provided the ideal location for the conference, and Tanyalla Conference Centre the ideal venue. Gladstone is a major and developing industrial port city with a rural hinterland, and the Gladstone area features a great diversity of rainforest types. The area clearly illustrates many rainforest conservation issues, and also showcases some of South-East Queensland's best rainforest conservation work, including Gladstone's world-class Tondoon Botanic Gardens with its rainforest ecosystem plantings, and the Canoe Point beach scrub at Tannum Sands.

Dr. Bill McDonald from the Queensland Herbarium (centre) explains South-East Queensland Rainforest Regional Ecosystems during a conference field trip to the Tondoon Botanic Gardens. The tour was conducted by acting gardens manager Brent Braddick (left). (Photograph by Bruce Boyes).

The Canoe Point beach scrub is located directly adjacent to the Tanyalla Conference Centre, and is one reason why this venue was ideal for the South-East Queensland Rainforest Recovery Conference. Another reason was the desire to hold the conference in a regional area, rather than the Brisbane area which is the usual choice for this sort of event. The third reason was the low-cost nature of the Tanyalla Conference Centre. 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 Tanyalla, a low-cost church-run recreation camp and conference centre, meant that conference fees could be kept very low, and as a result the conference attracted a large number of landholders and community group members.

Conference program

The conference program was:

Monday 31/8/98	• Welcomes. • Introduction to conference - scene setting, themes, aims. • Overview of South-East Queensland rainforest ecosystems. • Field trip to Tondoon Botanic Gardens to view rainforest ecosystem plantings.
Tuesday 1/9/98	• Keynote speaker. • Conference papers.
Wednesday 2/9/98	• Keynote speaker. • Conference papers. • Canoe Point beach scrub walk. • Conference dinner.
Thursday 3/9/98	• Conference papers. • Workshop sessions.
Friday 4/9/98	• Optional field trips to Boyne Valley or Mt. Larcom.
Weekend 5-6/9/98	• Optional field trip to Kroombit Tops.

Walking into the open pasture from Frank Bowman's scrub, one of the sites visited on the Boyne Valley field trip. (Photograph by Bruce Boyes).

The conference was officially opened by Liz Cunningham MLA, Member for Gladstone, following welcomes from the traditional owners for the area, Maureen Eggmolesse of the Bailai people, and Jacky Johnson of the Gladstone Gurang. During the conference Mr. Peter Corones, Mayor of Gladstone City, and Mr. George Creed, Mayor of Calliope Shire welcomed conference participants and provided overviews of the rainforest conservation work being carried out by each Council. Dr. David Butcher, Chief Executive Officer, WWF Australia was special guest speaker at the Conference Dinner.

The Conference Proceedings

In the following pages are:

- Mayors welcomes.
- Conference summary.
- Papers as submitted by conference speakers.
- Workshop summary.
- Field trip notes.

The conference proceedings provide a wealth of information that will be invaluable to anyone involved in the conservation of remnant vegetation.

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 with accepted standards for scientific papers. However, no attempt has been made to sanitise the papers, and nor should it be, because success will only result from a plan of action that embraces the diverse experiences of landholders, government bodies, scientists, and Landcare and conservation groups.

Mt. Larcom field trip participants take in the view from the top. (Photograph by Benita Darrow).

Acknowledgements

The efforts of many people contributed to the success of the 1998 South-East Queensland Rainforest Recovery Conference. I would like to thank:

- **Mike Gregory** for his herculian efforts in carrying out many hard yards of conference organisation leg-work before, during and after the conference.
- **Siobhan Bland** for her very considerable efforts in assisting to organise and run the conference.
- Keynote speakers **Alex Rankin** and **Carl Binning** for their excellent presentations.
- **Dr. David Butcher** for his inspiring presentation at the conference dinner.
- The **Lockyer Catchment Centre** for the use of their display board and computer facilities.
- Staff at the **Queensland Department of Environment and Heritage**: **John Clarke** for supply of Kroombit fauna list; **Joy Brushe** for supply of various species lists and advice for Mt. Larcom field trip; **lan Gynther** and **Barney Hines** for advice on fauna issues and contact with various fauna researchers in South-East Queensland rainforests; **Peter Young** for supply of lists for rare and threatened flora species for the South-East Queensland bioregion; **Jeremy Thompson** for providing office facilities for Mike Gregory; **Will Buch** for helping with the spotlighting activity; and **Rhonda Melzer** for assistance and advice.
- Gladstone Tondoon Botanic Gardens Acting Manager **Brent Braddick** for assisting with the guided tour and supplying flora species lists for Dennis Martin's property in the Boyne Valley, and **Margaret Worthington** and **Sue Aspland** for their assistance and advice.
- Calliope Shire Council Parks Manager **Jason Jacobi** for assistance with the Kroombit Tops field trip and offering to act as guide, supply of Canoe Point species lists for all conference participants, and for guiding conference participants on the Canoe Point Botanic Walk.
- Landholders **Dennis Martin** and **Frank Bowman** for allowing us to visit their properties and gain an insight into their perspectives on nature conservation.
- **Calliope Landcare** for introducing us to Dennis and Frank.
- The staff at the **WWF Sydney office** for processing registrations and providing assistance and advice.
- **Larry and Joy Brushe**, and **Alistair Melzer** for their involvement in the Mt. Larcom field trip.
- **Greg Smyrell** for his entertaining slide show.
- **John and Peg Hyland**, managers of the **Tanyalla Conference Centre** for their great hospitality and assistance throughout the conference.
- **Rose Betzien Catering** for keeping us very well fed during the conference.
- **Julie Urquhart**, **Sally Stelfox** and **Max Roberts** for proof-reading the conference proceedings.

- The **many willing volunteers** who performed the duties of timekeeper, projectionist and workshop facilitator, and gave a hand when it was needed.
- All of the **conference presenters** for an outstanding range of perspectives on rainforest conservation.
- **Everyone who attended** the conference for their enthusiasm, participation, and commitment to the conservation of South-East Queensland's rainforests.

Welcome from Cr. George Creed
Mayor of Calliope Shire

Cr. George Creed, Mayor of Calliope Shire Council, welcomed conference participants at the commencement of the Canoe Point Environmental Park walk. The conference venue, Tanyalla Conference Centre, is located within Calliope Shire.

It is with great pleasure that I welcome you all to Calliope Shire, and more particularly to Canoe Point Environmental Park. Council feels very privileged that you have chosen to hold your conference here in Tannum Sands and it is pleasing to see a good registration from interested members throughout the State.

Conference participants commence the Canoe Point Botanic Walk, located adjacent to the Tanyalla Conference Centre. (Photograph by Bruce Boyes).

The Calliope Shire Council is very proud of its record, as it has been able to accommodate a wide spectrum of activities from heavy industrial/chemical complexes to exotic resort islands, while still maintaining a high quality of amenity for the local residents. We are very aware that industrial activity must be kept in balance with the environment and provision of

social infrastructure so that we can all enjoy living and working here. The history of Canoe Point is quite unique and is a good example of how industry and local government can co-operatively contribute to the protection of our environment.

Canoe Point was originally purchased by Queensland Alumina Limited in 1984 as a bequest to the community and to preserve the precious diversity of flora. Since then, it has been protected as an environmental park under Council's trusteeship.

I trust you will all have a most pleasant time during the next couple of days. I have noticed in your itinerary that you will be visiting a few different places in our Shire and you will see some of the reasons why we have chosen to make our homes in the Calliope Shire.

Jason Jacobi and Sue Aspland will be able to provide more detail on the particular management of the park and the variety of species types found in the reserve.

Thank you!

Welcome from Cr. Peter Corones Mayor of Gladstone City

Cr. Peter Corones, Mayor of Gladstone City Council, welcomed conference participants during the field trip to the Tondoon Botanic Gardens, which are located in Gladstone City.

It's my very great pleasure to perform the welcome to our City.

Gladstone is a City which has earned a reputation as a modern successful industrial community. During the past three decades, the population increased more than five fold to almost 45,000 including the City and region. Gladstone and its region today is renowned as:

- *One of the leading ports of Australia and the world* - around 8.6% of the Nation's and 34.6% of the State's exports by volume and worth some 3.5 billion.
- *A significant player in the National and State economy* - referred to as the 'Engine Room of Industry' in Queensland and in the near future - for Australia. $12 billion here, huge, with a highly skilled workforce.
- *An example of successful industry and community interaction* - the City and citizens as one with a strong 'can-do' attitude. For example:
    - Good corporate citizens - University, National Centre of Excellence - industry, university, community as one - Engineers for the Engine Room.
    - Marina - Gladstone Port Authority.
    - QAL Greenbelt and infrastructure.
    - Gladstone Area Water Board - Lake Awoonga.
- *Industry and environment in harmony* - Our Open Space strategy to our award winning Tree Seeding programs and of course our Tidy Towns record:
    - State winner.
    - National finalist.
    - Tidiest industrial city in Australia.
- *A Centre preparing itself for the future* - $10 billion plus of proposed industry and new development under investigation:
    - Port infrastructure - wharf/centres.
    - Energy - new power station - Chevron Gas.
    - Land and water needs.
    - Yieh-Loong Steel, Comalco, light metals, shale oil.
    - 50 Year Port Plan & 30 Year Regional Strategy confirming a region poised for further industrial growth.
- *A Centre of visitor interest* - highlighted by its hinterland, subtropical coastline and reef islands and one of the seven natural wonders of the world. Heron Island and the Bunker Group are on our doorstep, and yes, industry tourism:
    - Largest powerhouse in Queensland.
    - Largest cement plant in Australia.
    - Largest alumina refinery in the world.
    - Largest multi-cargo port in Queensland.
    - One of the largest aluminium smelters in the southern hemisphere.

Gladstone - a great place to visit, a great place to live, a great place in which to invest and do business.

Welcome participants in the Rainforest Recovery Conference to the:

- Engine Room of Industry.
- Port City of the World.
- Capital of the Southern Reef.
- Tidiest Industrial City in Australia.
- National Centre of Excellence in Engineering Maintenance.

A profile of Gladstone's environmental achievements

"Gladstone City Council's leadership and support of projects associated with the Tidy Towns program is a leading example of commerce, industry, local government and community working together with a common vision. The Council plays a pivotal role in raising environmental performance within the general community."

Winner of more than eight Tidy Towns awards and a leader in environmental initiatives, the industrial city of Gladstone has proved itself to have a heart of green. With a backdrop of a natural deepwater harbour, Gladstone's extensive network of green-belt areas provides an enviable lifestyle for residents and visitors alike. In Gladstone, development is a cooperative approach between local government, the community, commerce and industry. A host of reclaimed developments within Gladstone are great examples of the Port Authority's commitment to providing world class community facilities.

Due to the very industrial nature of the town, Gladstone's corporate slogan is 'infrastructure and the environment working together in harmony'. Environmental considerations in city developments are the bottom line for major industrial organisations in Gladstone.

An extensive *Open Space Development Plan* has been developed which provides a sustainable supply of open space for the benefit of future Gladstone residents. Many diverse natural characteristics of the area such as creek systems, remnant bushland, hills, ridges and the harbour islands are to be preserved by the plan. The plan also seeks to extend the green image along main transport routes and entries into the city and maximise public access to the waterfront. Over 32 km of walkways link Gladstone's bikeways and boardwalks. Urban forests are intermittently dispersed to provide native wildlife corridors and an extensive mangrove forest has recently been rehabilitated to provide habitat to a large flying fox colony.

A range of environmental initiatives currently being undertaken within Gladstone includes a unique plant propagation method known as *The Direct Tree Seeding Program*. Based on the 4F's - Fire, Flood, Famine, and the Fundamental orifice (seeds dispersed through bird droppings). This program is leading the way in developing revegetation strategies for areas with adverse growing conditions and is set to revolutionise tree planting in Australia. Mr. Mark Burns of *Global Soil Systems* developed the idea of specially treating native seeds by the four F's before they are spread across the target site. The Gladstone Port Authority sponsored and conducted early trials and the Gladstone City Council developed the concept

even further. Both the Port Authority and the Council are currently using the method to revegetate the remaining barren land areas around the city.

The Gladstone City Council provides the full time equivalent of one staff member to ensure that Gladstone is litter free, and in doing so demonstrates Gladstone's commitment to positive litter control. Gladstone's commitment to recycling is also very high, with the majority of its residents participating in a weekly kerbside collection scheme. Split bins are provided to residents to enable point of source separation. A successful REVOLVE recycling centre enables residents to further separate reusable materials. Various other recycling schemes are underway in Gladstone such as the re-use of stormwater in residential developments as well as a true commitment to recycling by industry. Fly-ash from the powerhouse is mixed together with treated sewerage effluent to provide useable landfill. Whereas in the past this residue was an environmental problem, it is now being re-used to turn land into productive areas.

Great effort has been made to ensure Aboriginal cultural elements are part of Gladstone's link to the past. The Murri Liaison Committee works hand-in-hand with the Council in providing cooperative developments around Gladstone.

Media support of the Tidy Towns projects within Gladstone is extremely strong. *The Observer* newspaper is a major vehicle for raising community awareness of programs within the city. *WIN Television* is also a provider of extensive support to help spread the word. The powerful word-of-mouth method also provides an effective means of extending awareness of a broad range of environmental issues within Gladstone.

Of special note:

- The Gladstone Regional Environmental Forum, which is made up of community environment groups, commerce and industry, together with Council representatives, meets regularly to discuss a range of environmental issues that affect Gladstone.
- The Civic Beautification Committee, formed in 1971, is a unique community group responsible for a broad range of beautification projects.
- The Gladstone Port Authority's commitment to providing world class community facilities has resulted in $8 million being spent over the past five years on waterfront beautification and development projects.

2. Conference Summary

Conference Summary: ‘Rainforest Recovery for the New Millennium’

3 September 1998.
Jamie Pittock, Program Leader - Nature Conservation, WWF Australia,
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I will summarise the conference proceedings by outlining my thoughts on the range of participants and work presented, and conclude with the major issues raised and the solutions suggested during the course of the conference.

Participants

The range of participants in this conference has been one of its great strengths. Participants have included people from: all manner of Commonwealth, State and local government agencies; landholders and industry representatives; non-government conservation organisations, and Aboriginal groups. We range from those with local expertise to organisations with a National field of operations. I thank you all for attending, many travelling long distances, and your considerable contributions and good humour. I particularly thank the people who made very personal contributions based on their life experiences and businesses.

Range of work underway

One of the pleasant surprises to me, as an outsider to the region, and to many participants, is the great range of work underway to conserve the rainforest biome in Queensland. At this conference we have heard of work which may serve as models for conservation work, not only for vineforests but for all ecosystems. Some of these methods include:

- use of flagship species to promote habitat conservation, such as with the Mary River Cod, Richmond Birdwing Butterfly, the Childers Alectryon and other plant species, Kroombit frogs, Coxen’s Fig Parrot, and Black Breasted Button Quail;
- alliances with major landholders, including local government, industry and the army;
- multi-species and ecosystem recovery plans;
- strategic planning for open space, particularly through local government;
- regional and catchment level coordination and expert planning, as demonstrated by the NQ Joint Board;
- working with committed landholders through voluntary conservation agreements, land for wildlife, vegetation trusts, and other voluntary incentives;
- formation of voluntary, local rainforest regeneration and restoration groups to ‘adopt’ and maintain key bushland areas, such as LWMA - Lockyer Landcare and the Noosa and the Bundaberg & District Landcare Groups; and
- development of alternative income sources to promote conservation with landholders, as with the Helidon Hills project.

Importantly, we heard from Carl Binning, CSIRO, that local government and community groups in SE Queensland lead the nation in developing innovative new approaches for conservation.

Carl also made the point that a most important force for success in conservation is the skill and dedication of the people concerned. Clearly, with the participants here, conservation of rainforests is in good hands for the new millennium, and you are establishing techniques which can be used to conserve other ecosystems, such as tropical wetlands.

Major issues and solutions

A number of threads have run through the conference discussions. The identification and resolution of these problems would substantially advance our work for conservation of threatened ecosystems:

Threatening processes:

1. Clearance

Many conference participants expressed great concern at the continuing clearing of rainforests in their districts, such as that associated with sugar industry expansion. While preferring cooperation, education and financial incentives as the primary means of curbing clearing, some participants felt that a regulatory safety net is also urgently required.

2. Weeds

The growing number of pest species and severity of invasions endanger the rainforests, and other ecosystems. Clearly, Australia's weed prevention and control strategies are inadequate. At a State and National level there is a great need for systematic programs to identify, prioritise, control, and even eradicate 'sleeper' and newly invasive weeds and feral animals. This would require governments to deal with pest species in a proactive manner, rather than the current focus on species which have got away, epitomised by the draft list of 'Weeds of National Significance'. It also requires governments to prioritise environmental weeds, not just agricultural weeds, for research on biocontrol and other methods.

3. Fire

Several presenters highlighted the threat posed by fire. Rainforests, in particular the dry rainforests, are being invaded by exotic species such as pink lantana *Lantana camara* and the pasture grass green panic *Panicum maximum* which is causing fires to burn right into the rainforest, causing significant damage. Additionally, rainforest regrowth is often destroyed by burning to promote pasture growth. Fire management planning that accounts for nature conservation is urgently required, including mitigation of the negative impacts of pasture improvement on rainforests.

Conservation methods and coordination:

4. Working with local people and organisations

In presentation after presentation we heard that the most successful on ground conservation management occurred with the participation and ownership of local people, local government and other organisations. These are the people who must want to undertake management in perpetuity if the limited State and Federal funding is to achieve the scale of threatened ecosystem recovery we desire. Conference presenters reiterated the need for us and government agencies to involve local communities from the beginning in planning and decision making for successful projects and programs.

The need to establish genuine collaborative approaches with local Aboriginal groups, such as the representatives of the Bailai people and Gladstone Gurang who have been involved in this conference, was brought to the fore.

5. Developing and applying more voluntary incentive measures

Participants heard of the frustration of many private landholders and community initiatives that are being stifled by the lack of access to appropriate incentive measures. The excellent examples of the work of the Brisbane City Council's voluntary conservation agreement program, and of the new SEQ Land for Wildlife Program were discussed.

Landholders at the conference demanded the opportunity to place a conservation agreement on their land title in Queensland in order that their bushland can be conserved in perpetuity. In addition, landholders sought financial assistance in order to defray the costs of management, rates and lease fees that they are forced to pay despite dedicating their land for conservation. The conference noted that the Brisbane City Council's management grants cost under $9,000 per annum, to conserve 113 ha of environmentally significant land valued at about $4.5 million.

Participants supported widespread adoption of the incentive tools outlined in the CSIRO report "Motivating People", but also highlighted impediments to the successful achievement of this, in particular the inability of small rural Councils to be able to fund incentives.

6. Coordination

The conference was briefed on the dangers of establishing the multitude of overlapping and uncoordinated natural resource management processes seen in NSW, and advised of the opportunities to improve coordination and management in Queensland. Carl Binning, CSIRO, advised us of the desirability of separating organisations providing technical expertise and stakeholder input, from those with statutory responsibility for service delivery for best ecosystem and other natural resource management.

The conference appreciated the model demonstrated by the NQ Joint Board for determining environmental priorities at a regional scale, including through mapping, and providing technical expertise and on ground implementation for ten local governments. We believe

similar sorts of coordinating bodies would be useful to conserve rainforests, river corridors, and other environmental values throughout Queensland.

7. Multi-species and ecosystem recovery plans

A number of speakers identified concerns at the limited resources available to prepare and implement recovery plans and programs for all 1,429 listed nationally threatened species, and opportunities missed to recover multiple species and ecosystems in one process rather than a number of separate plans.

Alex Rankin from Environment Australia outlined the Commonwealth Government's commitment to improving these processes. The conference noted the Commonwealth Government's agreement with the states to halt clearing of endangered ecosystems; to extend Commonwealth legislation to reinforce its role in the protection of endangered ecosystems; to list threatened ecosystems and plan for their recovery. Importantly, Alex said that the Endangered Species Program will be placing priority in future on multi-species and ecosystem recovery plans, and on more direct funding to community initiatives, measures welcomed by the conference.

We believe the Commonwealth and State governments need to increase the resources available for critical overviews to assess the conservation requirements of groups of taxa and threatened ecosystems, and to implement recovery programs. Action by the groups here and governments is needed to assess and list threatened rainforest ecosystems under Commonwealth legislation, which will help afford priority for funding to conserve these ecosystems.

8. Natural Heritage Trust

Almost universally, participants expressed great disappointment in the Commonwealth Government's Natural Heritage Trust. Concerns include:

- the enormous resources required to make applications, often for little return;
- capricious prioritisation and decision making at all levels, including RAPs with little interest or expertise in biodiversity conservation;
- lack of rigour by the Commonwealth and State governments in prescribing regional priorities for NHT funding, such as affording priority to conservation of habitat of threatened ecosystems and species;
- too many applications for conservation of habitat of threatened ecosystems and species being excluded from 'Bushcare' and shunted into the limited funds available through the 'Endangered Species Program'.

Solutions include:

- adding to or replacing the 'one stop shop' with projects commissioned through competitive processes for key biodiversity conservation works;
- greater allocation of NHT funds for conservation of habitat of threatened ecosystems and species;
- Commonwealth and State governments prescribing conservation of habitat of threatened ecosystems and species as regional priorities for NHT, and as essential elements of regional plans.

In summary

We have succeeded in coming together as a diverse group to compare our successful techniques, and we have identified key problems and their solutions.

Carl Binning outlined a number of models for better conservation of native vegetation which crystallised and captured the spirit of the conference.

He argued that effective conservation is best served by access to a diverse set of tools:

- starting firstly with engagement of people with programs like Land for Wildlife that involve participation, respect, and learning;
- then financial support through incentives, such as fencing grants and rate rebates; and
- finally providing security for conservation through voluntary conservation agreements.

Carl argued that we need to include and welcome a broader range of land managers by promoting the concept and establishment of a 'Protected Areas Network'; recognising and supporting 'champion' conservationists in our communities; recognising the role of multiple land use for conservation in a landscape; and being ruthlessly pragmatic in pursuing our conservation mission.

I have found these success stories and these ideas from the last four days challenging and inspiring - the basis for a critical mass of a community movement to conserve Queensland's rainforests and other ecosystems. It is the people here who love rainforests and the people here who must take the initiative to recover rainforests in the new millennium. Let us take the models and concepts from here, maintain our communication networks, recruit new supporters, and conserve the rainforest ecosystems we cherish.

I want to finish by thanking a number of key people and organisations:

Most importantly, I ask you to thank Project staff and conference organisers: Bruce Boyes assisted by Mike Gregory and Siobhan Bland. They have done a remarkable job in organising the conference with the miserable resources provided by WWF. I also thank our hosts for their support and hospitality, the Bailai and the Gladstone Gurang peoples, and the Calliope and the Gladstone Councils.

WWF also thanks the Queensland Department of Environment & Heritage, who have generously contributed funding to our work. I also thank the Queensland Department of Natural Resources staff who have contributed so much to the WWF Rainforest Recovery Project.

A number of people have asked during the conference how they can make a donation for WWF's rainforest work in Queensland. Donations to WWF are tax deductible. I am more than happy to receive donations with your mailing address, alternatively they may be sent to our Sydney office, from where we can send you a tax deductible receipt. Your ongoing support is welcome, and WWF membership forms are available from me.

WWF is proud of and committed to its Rainforest Recovery Project, however its funding capacity is limited. Regardless of WWF's contribution, we believe the people and

organisations represented here and the links made at this conference will continue to build a momentum and demand for rainforest conservation in Queensland.

I hope we can all meet again in two years time to swap notes on how much lantana we have each killed, and celebrate and build on our successes.

Thank you.

3. Setting the Scene

Community Involvement in Recovery Planning

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Community participation and part ownership of recovery processes for threatened species and ecosystems is essential for ensuring on-going government support for biodiversity conservation, for contributing necessary resources, and for ensuring the long term sustainability of the recovery work.

WWF's experience, particularly with the Threatened Species Network (a joint program with the Natural Heritage Trust) is that community participation can make a substantial difference on the ground, especially where there is a partnership between community groups, governments and technical experts. Small grants for such activities are a powerful incentive for community groups to refocus their normal activities on biodiversity conservation priorities.

Community involvement in conservation of threatened ecological communities can be increased by developing and providing a broader range of voluntary incentives to conserve remnants. Governments must maintain and enhance a leadership role in providing good data and setting minimum standards, especially by requiring all relevant National Heritage Trust funded projects to include conservation of threatened species and ecosystems. However a regulatory safety net is also required to protect the public interest in conserving key bushland remnants where land managers are unwilling or financially unviable.

Introduction

This conference is a vital opportunity to discuss and assess how we can best conserve rainforests, and by conserving rainforests, establish models for the conservation of other ecosystems in Australia.

In this talk I want to briefly ask what community involvement in recovery planning really means, discuss some examples from WWF's work, and ask what lessons can we derive from this for our future efforts to conserve threatened ecological communities.

What does community involvement in recovery planning really mean?

Recovery planning at one level is development of any activity to conserve threatened species or ecosystems. In Australia it has come to mean the processes regulated by the Commonwealth Endangered Species Protection Act.

The Act currently lists 1,429 threatened species and also key threatening processes. It has provision to list threatened ecological communities. Once listed, the Commonwealth Government is required to prepare a recovery plan or threat abatement plan, usually in cooperation with the relevant states. Typically, a Recovery Team is assembled of scientific and government representatives, and the odd community representative. The Recovery Team

is charged with developing a plan that will achieve some measurable improvement in conservation status for the species concerned, or mitigation of a key threatening process.

This more formal Commonwealth approach will increasingly predominate as:

- more states enact similar legislative provisions to conserve threatened species and ecosystems;
- State governments face up to the relevant Natural Heritage Trust Partnership Agreement performance indicators;
- the Commonwealth moves to rapidly implement the 1997 regulations that enable threatened ecological communities to be listed and conserved under its legislation; and
- State and local governments respond to the Commonwealth's proposal in the Environment Protection & Biodiversity Conservation Bill 1998 for National regulation of development proposals that may impact on threatened species and endangered ecological communities.

However, the Commonwealth and States are yet to identify any formal proforma for recovery plans for threatened ecological communities. The Commonwealth urgently needs a consistent National approach as its Bushcare, National Reserve System and Endangered Species Programs converge or overlap in their treatment of threatened ecological communities. In my view this is a challenge that this conference can address by using rainforest communities as an example and asking what should a threatened ecological community recovery plan involve?

So what does community involvement mean? At a practical level there are usually many tasks in a Recovery Plan that can be undertaken by the public. There are three fundamental reasons for community participation:

- Resources. There are too many threatened species and ecosystems and too little allocation of funds by governments to conserve them. Public assistance is essential if enough resources are to be provided if this biodiversity is to be conserved. Of the 1,429 species listed on the Commonwealth Act, the average cost of a recovery program is $50,000 per plant and $100,000 per animal species. I suggest from WWF's experience of temperate grasslands, woodlands, and rainforests that the minimum cost to effectively conserve an average threatened ecosystem, fragmented in an agricultural landscape, is about $200,000. The Commonwealth Endangered Species Program has never been allocated more than $7 million per year since its inception in 1990, far short of the $25 million per annum successive Commonwealth governments have admitted is required.

- Long term sustainability. The recovery process at some point needs to succeed then require minimum annual public funding in perpetuity. This can only be achieved if local communities, especially land managers, can integrate conservation of threatened species and ecosystems into their day to day businesses. 'Main streaming' conservation of this biodiversity required community participation in the recovery process at an early stage in order to ensure relevance and develop ownership.

- Government support. Governments will only establish and invest in biodiversity conservation programs if there is demonstrable public support. The Commonwealth Endangered Species Program (established in 1990) and the current government's historically high funding allocation to it are in large part products of WWF advocacy over

the past decade. Community participation in recovery programs is essential to maintain government support for conservation programs and funding.

Having said that community participation is vital, I fear that the two main Commonwealth government funding programs may be missing the mark. In the case of Recovery Teams under the auspices of the Endangered Species Program, I believe some are too focussed on scientific research rather than engaging the community and trying some adaptive management. In the case of the Natural Heritage Trust 'one-stop-shop' and regional arrangements, there is too little expertise and systematic integration of conservation of ecological communities and the habitat of threatened species in the 'big ticket' programs like Bushcare.

Clearly community participation and part ownership of recovery processes is essential for ensuring on-going government support for biodiversity conservation, for contributing necessary resources, and for ensuring the long term sustainability of the recovery work.

Introduction to WWF's work and the Threatened Species Network

WWF is an international non-government organisation that is notable for spanning the local, State, National and international environmental agendas. Our work ranges from field projects involving individual farmers through to major policy and advocacy in the National and international sphere. WWF had its origins in the '60s as a European dominated organisation focussed on conservation of charismatic mega-vertebrates, but now focuses on working with local and indigenous people to conserve whole ecosystems.

Our work on rainforests in Queensland reflects this trend. WWF funded the development of the original 1991 SEQ Vineforest Atlas due to the large number of threatened plant species in the region, however, we saw little evidence that this sound technical knowledge was being accessed and systematically used for conservation by governments and some other groups. For this reason we established the SEQ Rainforest Recovery Project to promote practical application of this technical knowledge for conservation, and work with landholders to conserve significant remnants.

Most recently, WWF has established a three year, multi-million dollar tropical wetlands conservation program to further develop this ecosystem conservation approach. We hope this conference will contribute to this program by identifying models for conservation of rainforest ecosystems which we can apply to tropical wetlands and other ecological communities.

In 1990 WWF and the Commonwealth Government's Endangered Species Program established the Threatened Species Network, a community based program to involve the community in conservation of threatened species and biota. The Network has been allocated about 5% of the Endangered Species Program's funding, so a critical question is: does the Network represent value for money? Generally it has, and there are a number of indicators of success which measure the inputs and outputs of the Network, and the occasional environmental outcome.

In 1997/98, the Network promoted community involvement in conservation of 86 threatened species and ecological communities, of which 72 species are listed under the Commonwealth

Act. The Commonwealth grant of $386,000 has generated work valued at many times this figure, and I suggest, in a more cost effective manner than governments can undertake.

There are individual activities which have been particularly successful. In South Australia, the Network facilitated volunteer involvement in 115 activities over the year to conserve species ranging from endangered orchids to the Kangaroo Island Glossy Black Cockatoo. In Western Australia, the Network initiated partnerships between a State Government Department, community groups, and farmers which have resulted in protective fencing of the habitat of the last populations of four threatened plant species, habitat restoration, monitoring, and plant propagation programs. These examples illustrate the on ground, conservation outcomes that skilled community groups can achieve.

Success has occurred when we have harnessed and focussed the interests of existing community groups, where experts have volunteered their technical skills, where we have had cooperation from State agencies, and where WWF has been able to offer some limited additional funding through small grants.

There are also indications that we are achieving 'mainstream' legitimacy for threatened species conservation work, as indicated by the threatened species booklets published in the News Limited papers in Adelaide, Hobart and Melbourne in recent months, papers with a combined circulation of about 850,000 copies.

However, some other activities have been less successful. Despite a concerted effort to sell to community groups, regional natural resource management and funding committees the value in using existing recovery plans for their programs, few have shown interest in using them. This is of great concern with the increasing decentralisation of environmental programs to community based committees associated with the Natural Heritage Trust, catchment management, Landcare, and regional government. There is a danger of State governments abandoning technical and standard setting roles represented by the recovery programs in favour of regional community committees with limited resources and expertise to deliver good conservation outcomes.

WWF's experience, particularly with the Threatened Species Network is that community participation can make a substantial difference on the ground, especially where there is a partnership between community groups, governments and technical experts. Small grants for such activities are a powerful incentive for community groups to refocus their normal activities on biodiversity conservation priorities.

What lessons can we derive for our future efforts to conserve threatened ecological communities?

Recovery planning will become more widespread and may be applied to dozens of threatened ecological communities in Queensland alone. Recovery planning could be usefully refocused on working with people and communities and being more innovative with the tools applied by adding voluntary and market based incentives.

Many remnants of threatened ecological communities occur on farming properties that are suffering hard economic times. While remnants have been conserved in the past by tradition, economic pressures and changes in land ownership are placing them at risk. We need to

consider a more diverse range of financial incentives to support willing landholders to conserve these remnants. Purchasing conservation easements over privately owned remnants is one example of a tool used in North America that may usefully be applied in Australia.

However, it is also true that some landholders remain unwilling to conserve key bushland and that some farm businesses will never be viable. An appropriate regulatory safety net is required to ensure that the public interest in bushland remnants is protected. Development and application of such regulations in Queensland needs to learn from the failures and successes of other states. NSW remains a case study of how not to introduce clearing controls. Key problems include a failure to explain the controls or link them to financial assistance. By contrast, the South Australian controls have effectively controlled the loss of remnants due to clearing with general public acceptance. Payments of $70 million over ten years to landowners of 600,000 ha of remnants to compensate for the adjustment in property rights played an important role.

A good technical data base is essential and we need a renewed commitment from governments to whole of government collecting, assessing and distributing the essential environment data required to make informed decisions and to prioritise conservation activities.

Our governments need to develop a National program to identify, and eliminate or control new and potential invasive species.

We need to develop and demonstrate successful models for threatened ecosystem conservation. Limited resources for threatened species conservation require us to consider whether a regional threatened species and threatened ecological community recovery plan approach can more successfully and inexpensively conserve threatened biota.

As Commonwealth and State governments decentralise their natural resource management programs to regional committees we must insist that minimum standards for biodiversity planning and conservation be established so that limited funds are directed at real priorities. This should include identifying, mapping, and providing for conservation of threatened ecosystems.

Community involvement in conservation of threatened ecological communities can be increased by developing and providing a broader range of voluntary incentives to conserve remnants. Governments must maintain and enhance a leadership role in providing good data and setting minimum standards, especially by requiring all relevant National Heritage Trust funded projects to include conservation of threatened species and ecosystems. However a regulatory safety net is also required to protect the public interest in conserving key bushland remnants where land managers are unwilling or financially unviable.

Conclusion

Community participation and part ownership of recovery processes for threatened species and ecosystems is essential for ensuring on-going government support for biodiversity conservation, for contributing necessary resources, and for ensuring the long term sustainability of the recovery work. The importance of community participation will only increase as a globalised economy may increase the role of industry at the expense of

government and see regulatory approaches decline in favour of market based and voluntary approaches.

WWF's experience, particularly with the Threatened Species Network, is that community participation can make a substantial difference on the ground, especially where there is a partnership between community groups, governments and technical experts. Small grants for such activities are a powerful incentive for community groups to refocus their normal activities on biodiversity conservation priorities.

Community involvement in conservation of threatened ecological communities can be increased by developing and providing a broader range of voluntary incentives to conserve remnants. Governments must maintain and enhance a leadership role in providing good data and setting minimum standards, especially by requiring all relevant National Heritage Trust funded projects to include conservation of threatened species and ecosystems. However a regulatory safety net is also required to protect the public interest in conserving key bushland remnants where land managers are unwilling or financially unviable.

Distribution and Status of the Rainforest Communities of South-East Queensland

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This paper provides an overview of the distribution and status of South-East Queensland rainforests. Details of location, extent of clearance, regional ecosystems, and threats to survival are given.

Introduction

It is now fifteen years since our first review of the distribution and status of rainforest in southern Queensland (Young and McDonald 1987). We identified and described eight structural formations (as defined by Webb 1978), ranging from the microphyll fern forests and thickets and complex notophyll vine forests of the Border Ranges through the araucarian notophyll and microphyll vine forests to the inland semi-evergreen vine thickets. Notes were provided on their known distributions and remnant status, based mainly on our field experience.

The accompanying maps showing major rainforest areas within the region were based on 1:1 million scale maps derived mainly from the Queensland Forestry Department 1:50000 map series and maps of individual reserves. At that time maps of individual rainforest communities were available only for the eastern McPherson Range (McDonald and Whiteman 1979) and Fraser Island (Stanton 1979).

Since 1990, there has been an accelerated program of vegetation mapping by the Queensland Herbarium to meet the needs of conservation planning within the region, with support from both the State and Commonwealth governments under the National Forest Inventory (NFI). Mapping of existing and pre-clearing vegetation were required for a Comprehensive Regional Assessment process prior to a Regional Forest Agreement between the State and Commonwealth governments. (The terms “pre-European” and “pre-1750” have been used in other studies, but are considered inappropriate here, given that no consistent aerial photography exists earlier than 1950 and few land survey maps date back further than 1880).

The completion of the mapping program for the region in late 1997 (Bean, Sparshott, McDonald and Neldner 1998) has enabled us for the first time to make an objective assessment of the distribution and status of rainforest communities in South-east Queensland.

Mapping methodology

Forest communities and other areas of native vegetation were surveyed and mapped at 1:100000 scale, with a minimum area for individual polygons of 20 hectares. Forty-four map sheets were involved in the coverage of the South-East Queensland bioregion. Individual vegetation units were based on interpretation of patterns on black and white aerial photography at scales of 1:25000 or 1:80000. Where possible, older (e.g. 1960's/1970's) photography was used to assist in determining to the greatest possible extent pre-clearing patterns.

In areas which had been cleared prior to the earliest available aerial photography, several approaches were taken. Extensive use was made of early survey maps held as microfiche by Department of Natural Resources (see Fensham and Fairfax 1997 for discussion of the technique). These maps often provided accurate records of rainforest and vine thicket boundaries, and also recorded distinctive emergents such as hoop, bunya and kauri pine or sclerophyll emergents such as brush box (*Lophostemon confertus*) and eucalypts (e.g. *Eucalyptus grandis*).

Land system and soil maps were also used to extrapolate rainforest patterns. During field traverses through cleared areas, the former vegetation communities can often be deduced from remnants along roadsides and in paddocks. On suitable soils, an absence of eucalypts (either as remnant or regrowth) and/or the presence of characteristic secondary species such as *Acacia melanoxylon* or *A. aulacocarpa* would suggest rainforest as the pre-clearing vegetation.

Vegetation boundaries from the aerial photographs were transferred into a GIS (ARCINFO) database, using rectified 1995 LANDSAT images at 1:100000 scale as the map bases (rather than topographic bases as used previously).

Maps of remnant vegetation cover were delineated from the 1995 imagery supplied by Department of Natural Resources Statewide Land-cover and Trees Study Group (SLATS 1997). The remnant cover and pre-clearing vegetation mapping were then intersected to derive maps of current extent of native plant communities.

Results of mapping of pre-clearing and remnant vegetation are being applied in the current CRA/RFA process. Descriptions of structure and floristic composition of each community and statistics concerning its pre-clearing and remnant extent and representation in nature conservation reserves are given in Bean *et al* (1998).

The total pre-clearing extent of rainforest in South-East Queensland is estimated to have been approximately 665000 ha. The remnant area (1995) is 276000 ha, of which almost 44000 ha occur within conservation reserves.

Regional ecosystems (REs)

Regional ecosystem maps have been derived by intersecting the vegetation maps with land zone maps which have been developed from regional-scale geological maps (see footnote to Table 1). Some vegetation units have been combined and others have been split on the basis

of land zone to produce the regional ecosystem maps. For example, the semi-evergreen vine thicket communities are relatively uniform in terms of structure and canopy dominants across a range of parent material, but on the basis of land zone comprise several distinct regional ecosystems. Some regional ecosystems have been distinguished on geographical distribution, e.g. northern or southern parts of the bioregion, but these divisions do reflect floristic differences.

The rainforests of South-East Queensland comprise 30 regional ecosystems, occurring across six land zones (see Tables 1 and 2) and in all of the ten provinces (climatic/geomorphological subregions) (see Map 1). Descriptions of each province, land zone and ecosystem can be found in Young and Dillewaard (1999 in press). Notes are included on dominant/characteristic canopy species and the occurrence of rare or threatened plant and animal species within each ecosystem.

The following account of rainforest regional ecosystems is concerned mainly with the distribution and conservation status of each community, with particular emphasis on those ecosystems which are considered endangered (less than 10% of their pre-clearing extent remains) or of concern (less than 30% remains). Thirteen rainforest regional ecosystems are threatened, with 5 endangered and 8 of concern (see Table 3).

On the basis of structural and floristic similarity and habitat relationships, five broad groups of rainforest communities can be recognised within South-East Queensland:

(a) upland (cool) complex notophyll vine forest and microphyll fern forest to thicket.

(b) lowland (warm) complex notophyll vine forest and araucarian notophyll vine forest on basic and intermediate volcanics and alluvia.

(c) notophyll and notophyll feather palm vine forest (often with sclerophyll and /or araucarian emergents) on coastal sandmasses and in moist situations on metasediments and intermediate / acid volcanics.

(d) araucarian notophyll / microphyll and microphyll vine forests, occasionally with eucalypt emergents, on fine - grained sediments, metasediments and basic to intermediate (to acid) volcanics.

(e) semi-evergreen microphyll vine thicket ± *Acacia harpophylla* on sediments, metasediments and volcanics.

The regional ecosystems have been grouped according to this arrangement, rather than according to land zone, in order to simplify presentation and comparisons.

Table 1 - South-East Queensland bioregion - land zones and rainforest regional ecosystems

Land zone	Geological unit[1]	Lithology[2]	Typical landform	Rainforest regional ecosystems
1	Quaternary estuarine deposits	Muds.	Plains.	
2	Quaternary coastal dunes and beaches		Beach ridges and swales.	12.2.1, 12.2.2, 12.2.3, 12.2.4
3	Quaternary alluvium	Recently transported material.	Plains.	12.3.1
5	Laterite	Material transported and/or subject to soil forming process during the Cainozoic.	Tablelands and plateaus; deep sandy or loamy soils generally red coloured.	.
7	Cainozoic lateritic duricrusts	Chemically altered sediments, silcrete, stripped of soil.	Crests and low rises with outcropping rock and skeletal soils.	
8	Cainozoic igneous rocks	Basalt, trachyte rhyolite.	Low hills and uplands.	12.8.3, 12.8.4, 12.8.5, 12.8.6, 12.8.7, 12.8.13, 12.8.18, 12.8.18, 12.8.21, 12.8.22, 12.8.23
9/10	Consolidated fine, medium and coarse textured sediments mostly of Cretaceous, Jurassic, Triassic age but including Tertiary sedimentary rocks.	Siltstones, mudstones, shales, calcareous sediments and lithic sandstones, siliceous sandstones and conglomerates.	Plains, low hills, plateaus, scarps.	12.9/10.6, 12.9/10.15, 12.9/10.16
11	Permian to Devonian-Carboniferous sedimentary rocks with varying degrees of metamorphism and folding and often with interbedded volcanics. Includes minor areas of serpentinite	Mudstone, siltstone, shale phyllite, serpentinite.	Ranges, hills, low hills.	12.11.1, 12.11.4, 12.11.10, 12.11.11, 12.11.12, 12.11.13
12	Mesozoic to Proterozoic igneous rocks predominantly granitoids and intermediate to acid volcanics often with interbedded sediments.	Granites, granodiorites, andesites and rhyolites, with minor areas of basic rock types.	Ranges, hills, lowlands.	12.12.1, 12.12.13, 12.12.16, 12.12.17, 12.12.18, 12.12.26

[1] Geological units derived from 1:250 000 Geological Series (AGSO, 1994) and 1:500 000 Moreton Geology.

[2] Lithology descriptions derived from 1:250 000 and 1:500 000 Geological Series. Only the common lithologies are listed.

Table 2 - South-East Queensland rainforest regional ecosystems

Rain forest group	Regional ecosystems	Landform, vegetation, soils	Province	Status	Proportion remaining
1a	12.8.5	Complex notophyll rainforest on Cainozoic igneous rocks. Altitude >600m.	1, 3	No concern at present.	0.97
1a	12.8.6	Simple microphyll fern forest with *Nothofagus moorei* on Cainozoic igneous rocks.	1	No concern at present.	1.00
1a	12.8.7	Simple microphyll fern thicket with *Acmena smithii* on Cainozoic igneous rocks.	1, 6	No concern at present.	1.00
1a	12.8.18	Simple notophyll rainforest with *Ceratopetalum apetalum* on Cainozoic igneous rocks.	1	No concern at present.	n.a.
1b	12.3.1	Gallery rainforest (notophyll rainforest) on alluvial plains.	1–4, 7, 8, 10	Of concern.	0.23
1b	12.8.3	Complex notophyll rainforest on Cainozoic igneous rocks. Altitude <600m.	1, 3	No concern at present.	0.40
1b	12.8.4	Complex notophyll rainforest with *Araucaria* spp. on Cainozoic igneous rocks.	1, 3, 6	No concern at present.	0.66
1b	12.11.10	Notophyll rainforest ± *Araucaria cunninghamii* on metamorphics ± interbedded volcanics.	3, 7, 10	No concern at present.	0.47
1b	12.12.16	Notophyll rainforest on Mesozoic to Proterozoic igneous rocks.	3, 4, 7, 10	No concern at present.	0.66
1c	12.2.1	Notophyll rainforest on parabolic high dunes.	8–10	No concern at present.	0.94
1c	12.2.2	Mixed microphyll/notophyll rainforest on beach ridges.	4, 8–10	Endangered.	0.20
1c	12.2.3	Araucarian rainforest on parabolic high dunes.	8–10	No concern at present.	1.00
1c	12.2.4	*Syncarpia hillii*, *Lophostemon confertus* tall open to closed forest on parabolic high dunes.	9	No concern at present.	1.00
1c	12.11.1	Simple notophyll rainforest often with abundant *Archontophoenix cunninghamiana* ("gully rainforest") on metamorphics ± interbedded volcanics.	1, 3, 7	No concern at present.	0.61
1c	12.12.1	Simple notophyll rainforest usually with abundant Archontophoenix cunninghamiana ("gully rainforest") on Mesozoic to Proterozoic igneous rocks.	5, 7, 10	No concern at present.	0.71

Table 2 (continued)

Rain forest group	Regional ecosystems	Landform, vegetation, soils	Province	Status	Proportion remaining
1d	12.8.13	Araucarian complex microphyll rainforest on Cainozoic igneous rocks.	1, 3, 6, 8, 10	Of concern.	0.20
1d	12.9/10.16	Araucarian microphyll to notophyll rainforest on sedimentary rocks.	2, 7, 8	No concern at present.	0.39
1d	12.11.11	Araucarian microphyll rainforest on metamorphics ± interbedded volcanics; southern half of bioregion.	3, 6, 7	Of concern.	0.30
1d	12.11.12	Araucarian complex microphyll rainforest on metamorphics ± interbedded volcanics; northern half of bioregion.	7, 10	No concern at present.	0.48
1d	12.12.13	Araucarian complex microphyll to notophyll rainforest on Mesozoic to Proterozoic igneous rocks.	5, 7, 10	No concern at present.	0.62
1e	12.8.21	Semi–evergreen vine thicket with *Brachychiton rupestris* on Cainozoic igneous rocks; southern half of bioregion.	2, 6	Of concern.	0.11
1e	12.8.22	Semi–evergreen vine thicket with *Brachychiton australis* on Cainozoic igneous rocks; northern half of bioregion.	5, 10	Endangered.	0.01
1e	12.8.23	*Acacia harpophylla* open forest on Cainozoic igneous rocks.	5	Endangered.	0.06
1e	12.9/10.6	*Acacia harpophylla* open forest on sedimentary rocks.	2	Endangered.	0.04
1e	12.9/10.15	Semi–evergreen vine thicket with *Brachychiton rupestris* on sedimentary rocks.	2	Of concern.	0.19
1e	12.11.4	Semi–evergreen vine thicket on metamorphics ± interbedded volcanics.	10	No concern at present.	0.96
1e	12.11.13	Semi–evergreen vine thicket on metamorphics ± interbedded volcanics; northern half of bioregion.	7	Of concern.	0.81
1e	12.12.17	Semi–evergreen vine thicket on Mesozoic to Proterozoic igneous rocks; south of bioregion.	5	Of concern.	0.32
1e	12.12.18	Semi–evergreen vine thicket on Mesozoic to Proterozoic igneous rocks; north of bioregion.	5, 10	Of concern.	0.80
1e	12.12.26	*Acacia harpophylla* open forest on Mesozoic to Proterozoic igneous rocks.	5	Endangered.	0.11

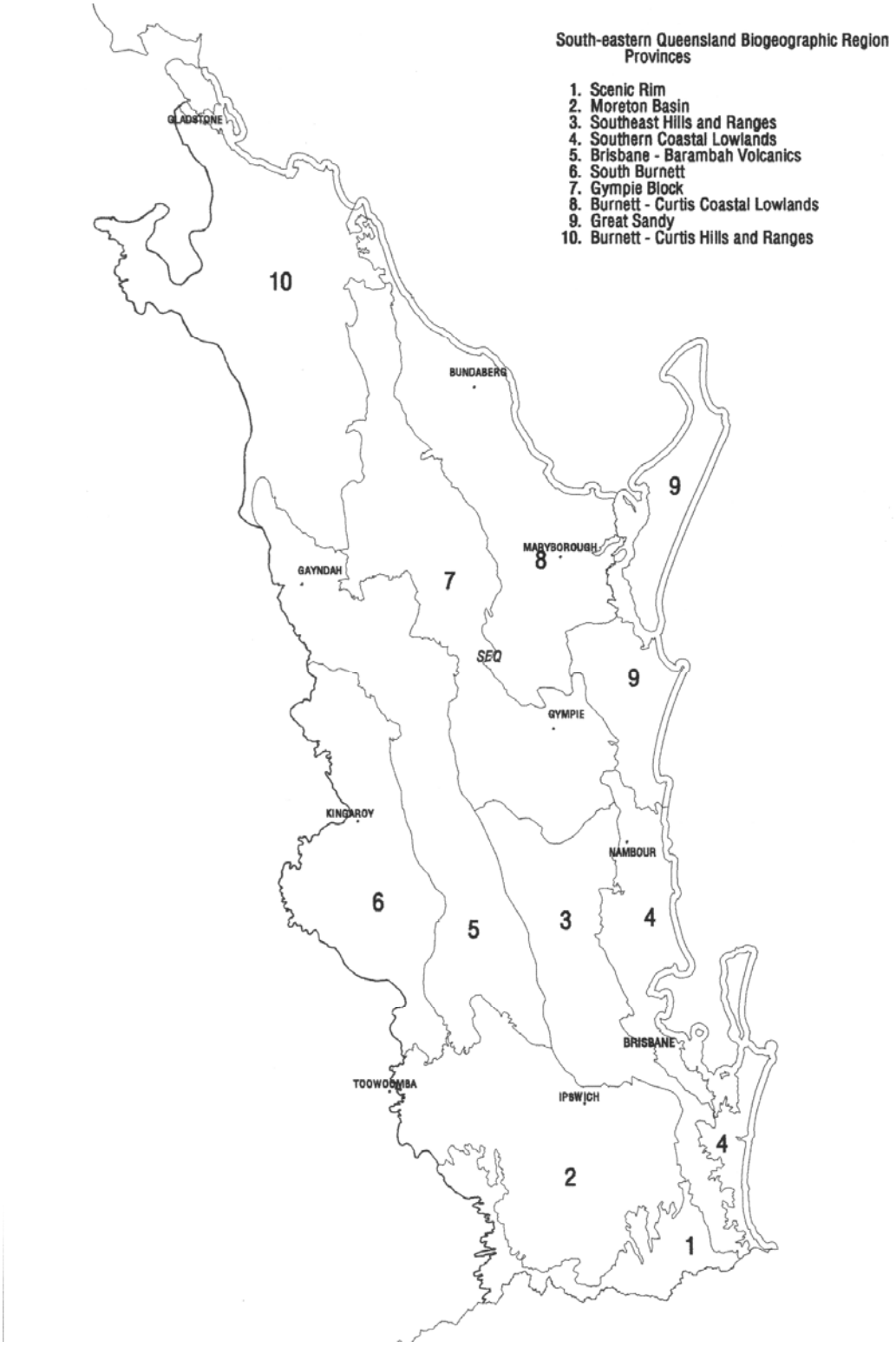
Table 3 - Threatened (endangered and of concern) rainforest regional ecosystems in South-East Queensland

Land zone	Regional ecosystems	Landform, vegetation, soils	Province	Status	Total pre-clearing area (ha)	Total remnant area (ha)	Proportion remaining
2	12.2.2	Mixed microphyll/notophyll rainforest on beach ridges.	4, 8–10	Endangered	2500	500	0.20
3	12.3.1	Gallery rainforest (notophyll rainforest) on alluvial plains.	1–4, 7, 8, 10	Of concern	23100	5313	0.23
8	12.8.13	Araucarian complex microphyll rainforest on Cainozoic igneous rocks.	1, 3, 6, 8, 10	Of concern	98000	19600	0.20
8	12.8.21	Semi–evergreen vine thicket with *Brachychiton rupestris* on Cainozoic igneous rocks; southern half of bioregion.	2, 6	Of concern	36500	4015	0.11
8	12.8.22	Semi–evergreen vine thicket with *Brachychiton australis* on Cainozoic igneous rocks; northern half of bioregion.	5, 10	Endangered	2400	24	0.01
8	12.8.23	*Acacia harpophylla* open forest on Cainozoic igneous rocks.	5	Endangered	6400	384	0.06
9	12.9/10.6	*Acacia harpophylla* open forest on sedimentary rocks.	2	Endangered	28600	1144	0.04
9	12.9/10.15	Semi–evergreen vine thicket with *Brachychiton rupestris* on sedimentary rocks.	2	Of concern	25000	4750	0.19
11	12.11.11	Araucarian hoop pine scrub microphyll rainforest on metamorphics ± interbedded volcanics; southern half of bioregion.	3, 6, 7	Of concern	44700	13410	0.30
11	12.11.13	Semi–evergreen vine thicket on metamorphics ± interbedded volcanics; northern half of bioregion.	7	Of concern	6100	4941	0.81

Table 3 (continued)

Land zone	Regional ecosystems	Landform, vegetation, soils	Province	Status	Total pre-clearing area (ha)	Total remnant area (ha)	Proportion remaining
12	12.12.17	Semi–evergreen vine thicket on Mesozoic to Proterozoic igneous rocks; south of bioregion.	5	Of concern	6500	2080	0.32
12	12.12.18	Semi–evergreen vine thicket on Mesozoic to Proterozoic igneous rocks; north of bioregion.	5, 10	Of concern	4000	3200	0.80
12	12.12.26	*Acacia harpophylla* open forest on Mesozoic to Proterozoic igneous rocks.	5	Endangered	8200	902	0.11

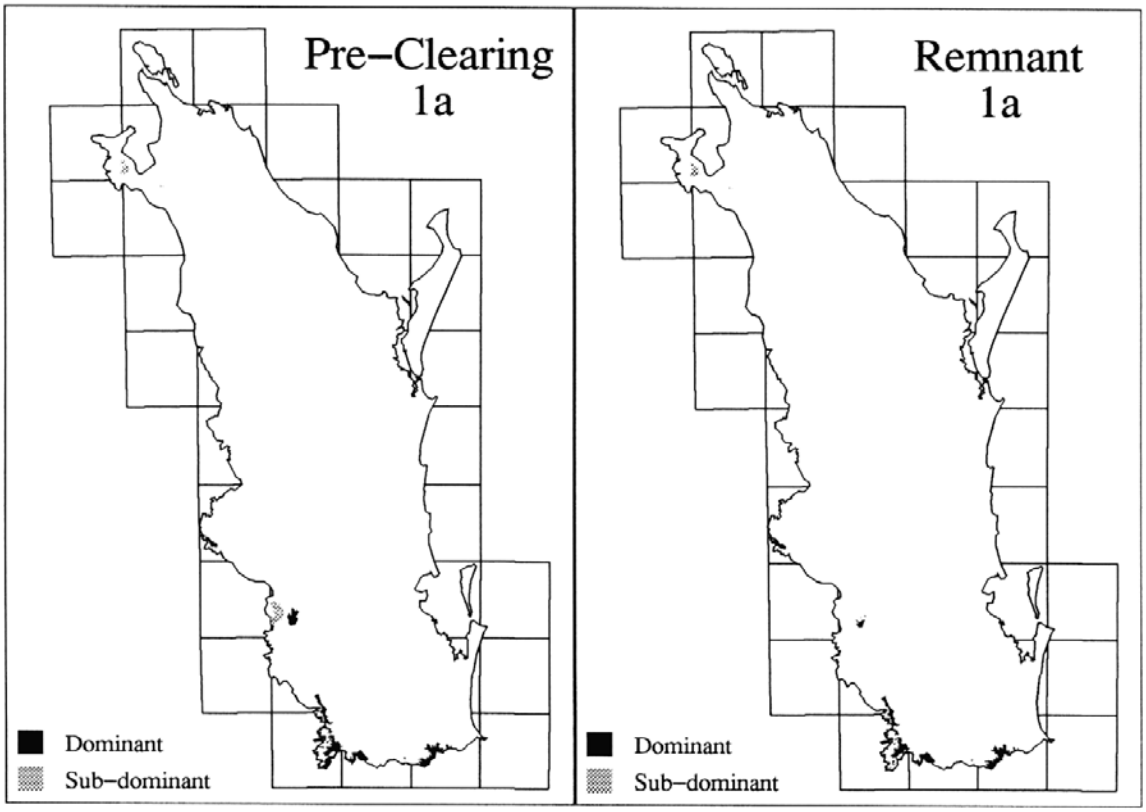
Map 1 - South-East Queensland biogeographic region provinces



Broad rainforest group 1a. Upland (cool) complex notophyll vine forest and microphyll fern forest to thicket (REs 12.8.5, 12.8.6, 12.8.7 and 12.8.18) (pre-clearing extent 33112 ha, 26636 ha remaining, 15638 ha in conservation reserves) (see Map 2)

This group comprises the higher altitude rainforests (> 600 m altitude) on the McPherson and Main Ranges north to the Bunya Mountains. Parent materials are Cainozoic volcanics, chiefly basalt and rhyolite.

Map 2 - Broad rainforest group 1a, pre-clearing extent 33112 ha, 26636 ha remaining, 15638 ha in conservation reserves



Less than 10% of these communities have been cleared, the main areas being the Springbrook plateau and the Acacia Plateau and the Head east of Killarney and the Ravensbourne district north of Toowoomba. There are now significant areas of regrowth on Springbrook, much of which is characterised by dense emergent *Acacia melanoxylon*. Areas of the Main Range rainforests have been selectively logged in the past 40 years for a range of species, including *Sloanea woollsii*, *Cryptocarya erythroxylon* and *Argyrodendron actinophyllum*. These areas are regenerating satisfactorily and there are no serious weed problems, although *Ligustrum* spp. are locally invasive in the Ravensbourne area.

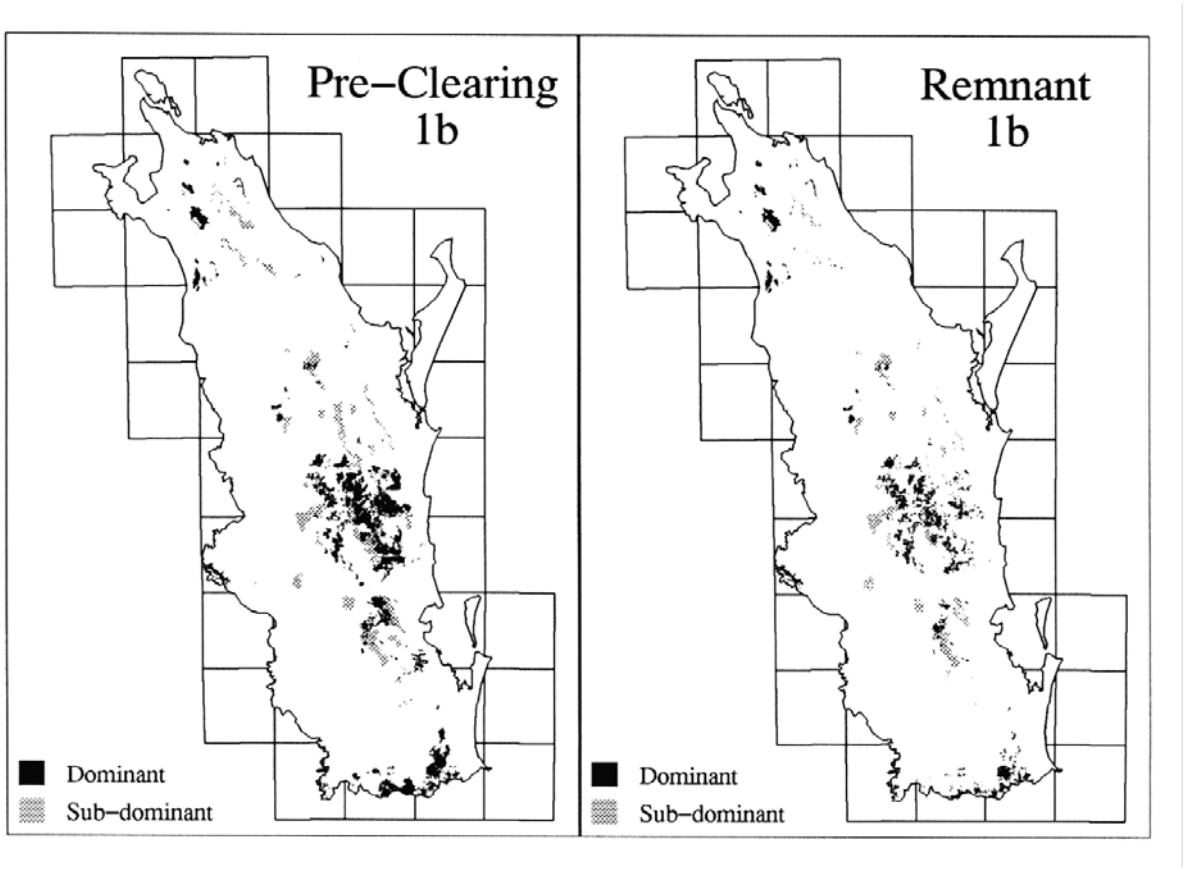
The most extensive regional ecosystem within this group is 12.8.5, which is cool (complex) notophyll rainforest tending to araucarian notophyll rainforest in areas of lower rainfall such as the Bunya Mountains, where *Araucaria bidwillii* is a prominent emergent. In higher parts of the McPherson Range there are small areas of microphyll fern forest dominated by *Nothofagus moorei* (12.8.6), with a drier form of microphyll fern forest in which *Acmena*

smithii is prominent (12.8.7) on the crests of the Main Range and the Bunya Mountains. In parts of the McPherson Range, *Ceratopetalum apetalum* is associated with *Nothofagus moorei* on basaltic soils, but this species also forms dense stands on infertile soils derived from rhyolite, frequently as an understorey to *Lophostemon confertus* (12.8.18).

Broad rainforest group 1b. Lowland (warm) complex notophyll vine forest and araucarian notophyll vine forest on basic and intermediate volcanics and alluvia (REs 12.3.1, 12.8.3, 12.8.4, 12.11.10 and 12.12.16) (pre-clearing extent 196590 ha, 97857 ha remaining, 12417 ha in conservation reserves) (see Map 3)

This group comprises rainforests on relatively fertile soils on the lowlands and subcoastal hills and ranges up to ca. 500 m altitude, with moderate to high rainfall (>1250-1500 mm per annum). The predominant structure is complex notophyll vine forest, often with emergent *Araucaria cunninghamii* ± *A. bidwillii*. The rainforest canopy is characteristically dominated by *Argyrodendron trifoliolatum* and/or *A.* sp. (Kin Kin).

Map 3 - Broad rainforest group 1b, pre-clearing extent 196590 ha, 97857 ha remaining, 12417 ha in conservation reserves



Regional ecosystem 12.3.1 includes the gallery rainforests on floodplains associated with major streams in South-East Queensland, including the Brisbane River, the Mary River (plus Tinana Creek), and the Burnett and Kolan River and Baffle Creek. On the more fertile alluvia, the community is complex notophyll vine forest in which *Argyrodendron trifoliolatum* is prominent, but in many situations it is a simple notophyll vine forest dominated by *Waterhousia floribunda* and/or *Castanospermum australe*.

This ecosystem is of concern, having been reduced to less than 25% of its original extent of more than 25000 ha. It was logged for its valuable timber species, e.g. *Toona ciliata* and *Grevillea robusta*, and then cleared for agriculture and dairying. Very few areas remain in the southern bioregion apart from small remnants such as Bells Scrub at Lawnton.

The few significant areas of gallery rainforest remaining along the Kolan River and Baffle Creek are threatened by weed invasion, particularly the climber *Macfadyena unguis-cati*.

REs 12.8.3 and 12.3.4 represent the moister warm subtropical rainforests (complex notophyll vine forest and araucarian (complex) notophyll vine forest) on Cainozoic basalts at low to moderate altitudes. These occur predominantly in the southern half of the bioregion. Complex notophyll vine forest (12.8.3) was the dominant community on the plateaus and moister slopes of the Blackall Range, the D'Aguilar Range (Mt Mee and Mt Glorious), Mt Tamborine, Beechmont and the eastern McPherson Range. Very similar communities with abundant emergent *Araucaria cunninghamii* (araucarian notophyll vine forests) occurred on the margins and slopes of these plateaus and were particularly well-developed on the Main Range and McPherson Range, especially the northern slopes of the Lamington and Beechmont plateaus.

Neither regional ecosystem is regarded as threatened, although both have been extensively logged since settlement, and most areas of CNVF on the plateaus have been cleared for dairying or cropping. Many areas of logged rainforest have been heavily infested with *Lantana camara*.

There are also considerable areas of CNVF and ANVF in subcoastal ranges in central and northern parts of the bioregion on soils derived from metasediments (± interbedded volcanics) (12.11.10) and also from older igneous rocks (12.12.16). Regional ecosystem 12.11.10 originally covered an area of almost 100000 ha, with the major occurrence in the headwaters of the Brisbane and Mary Rivers (Jimna/Kenilworth/Imbil/Kandanga). Apart from *Argyrodendron trifoliolatum* and *A.* sp. (Kin Kin), these communities may be dominated by *Dissiliaria baloghioides* or *Choricarpia subargentea*. Both *Araucaria cunninghamii* and *A. bidwillii* emergents were abundant in these rainforests, the majority of which have been cleared for the establishment of *A. cunninghamii* plantations. Other areas of this RE occur in the Monto district (e.g. Bania State Forest) on the D'Aguilar Range (Mt Mee and Mt Nebo) and around Beenleigh (Bahrs Scrub).

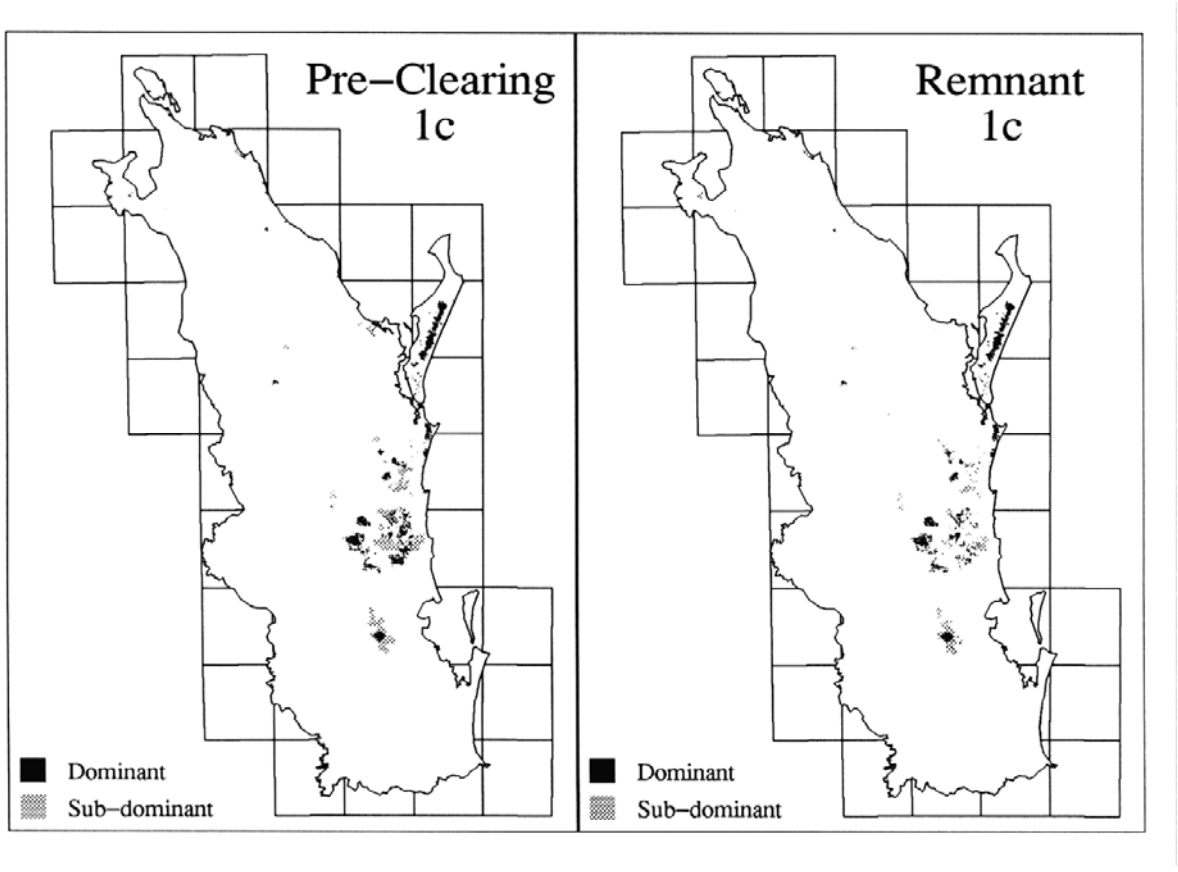
RE 12.12.16 was less extensive (ca 40000 ha) and occurs mainly on the Dawes Range (Granite Creek State Forest), the Coast Range and Mt Bauple area between Gympie and Maryborough and west of Gympie (e.g. Upper Kandanga and Mt Glastonbury). Most of the southern extent of this RE has been cleared for dairying or hoop pine plantations, and the largest remaining area, Granite Creek, has been heavily logged for *Araucaria cunninghamii*, with subsequent heavy infestation by *Lantana camara*.

Moist gullies within REs 12.11.13 and 12.12.16 carry elements of notophyll feather palm vine forest (REs 12.11.1 and 12.12.1, see below).

Broad rainforest group 1c: Notophyll and notophyll feather palm vine forests (often with sclerophyll and/or araucarian emergents) on coastal sandmasses and in moist situation on metasediments and intermediate/acid volcanics (REs 12.2.1, 12.2.2, 12.2.3, 12.2.4, 12.11.1 and 12.12.1) (pre-clearing extent 71163 ha, 41531 ha remaining, 10541 ha in conservation reserves) (see Map 4)

The rainforests in this group are generally moist communities and typically have well-developed understoreys dominated by *Archontophoenix cunninghamiana*. They occur on soils of medium to low nutrient status and can be divided into two subgroups, those on the coastal sandmasses (land zone 2) and those on subcoastal ranges on metasediments or acid to intermediate volcanics (land zones 11 and 12).

Map 4 - Broad rainforest group 1c, pre-clearing extent 71163 ha, 41531 ha remaining, 10541 ha in conservation reserves



The first subgroup is found mainly on the parabolic dunes forming the Fraser Island and Cooloola sandmasses. There are three regional ecosystems on these sandmasses, the moist notophyll feather palm vine forests (12.2.1), a drier notophyll/microphyll type with numerous emergent *Araucaria cunninghamii* and/or *Agathis robusta* (12.2.3) and a transitional type with characteristic emergent *Lophostemon confertus* and/or *Syncarpia hillii*. Permanent streams within the first RE carry almost pure stands of *Archontophoenix cunninghamiana*, while in the latter two REs, the rainforest canopy may be dominated locally by *Backhousia myrtifolia*.

The relatively shallow sands of the coastal beach ridges carry a lower, somewhat drier microphyll/notophyll community (regional ecosystem 12.2.2). This community occurred along much of the coast north of the Mary River and to a relatively restricted extent on the Sunshine and Gold Coasts. The older beach ridges at Eurimbula carry a more complex community with large emergent *Araucaria cunninghamii* on the ridges and *Acmena hemilampra* and *Archontophoenix alexandrae* in the shallow swales. This community has been combined with the moist feather palm community on the high sandmasses (RE 12.2.1).

The low rainforests (littoral rainforest) on the beach ridges (i.e. 12.2.2) have been extensively cleared for residential (holiday) development, and are considered endangered with only 20% remaining of their original estimated extent of 2500 ha. Most of this is found in Eurimbula and Deepwater National Parks and at Boyne Island-Tannum Sands (e.g. Canoe Point reserve). A few small areas remain near Coolum, while an area at Surfers Paradise documented by Webb and Tracey in the late 1950's has long since disappeared.

The rainforests of the major sandmasses have been virtually unaffected by clearing, with more than 95% of their estimated original extent remaining and protected within Great Sandy National Park. They have however been heavily logged for *Agathis robusta* and other valuable species such as *Gmelina leichhardtii*. Few large specimens of *A. robusta* remain in these rainforests, but this species is regenerating freely and is quite common in many areas. *Syncarpia hillii* has also been heavily logged and many areas of this forest type (12.2.4) have been silviculturally treated.

Two regional ecosystems have been recognised within the notophyll feather palm vine forests ("gully rainforests") of the subcoastal ranges. RE 12.11.1 occurs on metasediments, often with interbedded volcanics, and is most extensive on the Conondale and Blackall Ranges and between Kenilworth and Imbil. It is also found east and north-east of Gympie and there are minor areas along the D'Aguilar Range and on the eastern slopes of Mt Tamborine, Beechmont and Springbrook and around Mt Barney.

RE 12.12.1 comprises gully rainforests on older acid and intermediate volcanics and occurs on Kroombit Tops and the Table and Dawes Ranges north and north-east of Monto, as well as the Blackall Range north of Mapleton and the D'Aguilar Range near Mt Mee. The structure and major species are very similar to those for RE 12.11.1, e.g. *Sloanea woollsii, Cryptocarya macdonaldii, Caldcluvia paniculosa, Canarium australasicum, Mischarytera lautereriana*, etc. Two notable exceptions appear to be *Ceratopetalum apetalum* and *Callicoma serratifolia* which occur only in RE 12.12.1 and on Cainozoic volcanics on the eastern McPherson Range (land zone 8). *C. apetalum* occurs on Kroombit Tops and near Byron Creek in Mt Mee State Forest, while *C. serratifolia* also occurs at Kroombit and in Mapleton State Forest.

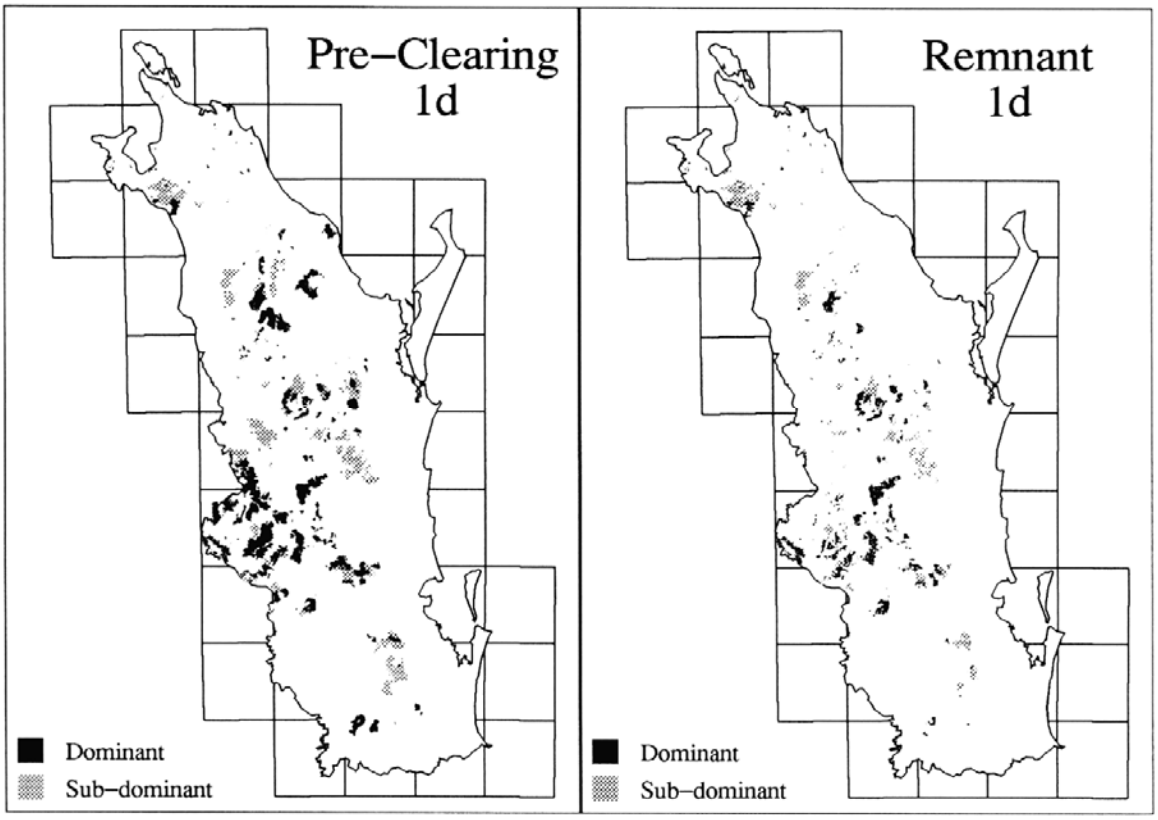
Because many areas of gully rainforest are narrow and frequently contain sclerophyll emergents such as *Lophostemon confertus* and *Eucalyptus* spp., the mapped extent of these regional ecosystems has probably been considerably underestimated. Total pre-clearing extents have been determined as 18600 ha (12.11.1) and 10000 ha (12.12.1) respectively. Neither ecosystem is considered threatened, with 61% and 71% respectively remaining. Both have however been heavily impacted by logging of emergent and adjacent hardwood species and also through selective removal of valuable rainforest species such as *Gmelina leichhardtii, Toona ciliata*, etc. Many areas are heavily infested by *Lantana camara* which,

together with the fuel generated by the sclerophyll emergents, makes these areas highly vulnerable to wildfire.

Broad rainforest group 1d: Araucarian microphyll/notophyll and microphyll vine forests, occasionally with eucalypt emergents, on fine-grained sediments, metasediments and basic to intermediate (to acid) volcanics (REs 12.8.13, 12.9/10.16, 12.11.11, 12.11.12 and 12.12.13) (pre-clearing extent 248291 ha, 89391 ha remaining, 3985 ha in conservation reserves) (see Map 5)

This group comprises the drier *Araucaria cunninghamii* communities occurring on a range of substrates (land zones 8, 9/10, 11 and 12) under intermediate rainfall regimes (1000-1100 mm per annum) in inland parts of the bioregion. In these areas they grade into semi-evergreen vine thicket communities (group 1e) in drier situations, whereas in moister situations they often grade into araucarian notophyll vine forest (group 1b).

Map 5 - Broad rainforest group 1d, pre-clearing extent 248291 ha, 89391 ha remaining, 3985 ha in conservation reserves



Characteristic canopy species in these communities include *Cupaniopsis parvifolia, Premna lignum-vitae, Olea paniculata, Elattostachys xylocarpa, Dendrocnide* spp. and the deciduous species *Flindersia australis* and *Brachychiton discolor. Argyrodendron trifoliolatum* which is characteristic of the moister araucarian notophyll vine forests is generally absent or relatively uncommon, e.g. around Yarraman. Some of the more northerly AMVF communities may contain *Argyrodendron* sp. (Kin Kin) and/or *Choricarpia subargentea* (e.g. the Boyne Valley) and *Archidendropsis thozetiana* occurs in many drier stands.

There are five regional ecosystems within this broad group. Two (12.8.3 and 12.11.11) are of concern, having been reduced by clearing to 20% and 30% respectively of their original extents. Many remnants have been disturbed by logging (e.g. for *Araucaria cunninghamii* and *Flindersia australis*) and are infested with weeds, especially *Lantana camara* . This, combined with the lower rainfall and seasonal leaf fall in these communities, has made them very susceptible to fire.

RE 12.8.13 occurs on Cainozoic basalts on the western McPherson and Main Ranges and originally covered large areas of lateritised basalt in the South Burnett region between Yarraman and Wondai, where both *Araucaria cunninghamii* and *A. bidwillii* were common. It also occurred in the Isis and Woongarra Scrubs around Childers and Bundaberg and at Kalpowar north of Bundaberg. This RE is of concern, with only 20% remaining of its original estimated extent of 98000 ha. Most of the South Burnett rainforests have been cleared for dairying, agriculture or hoop pine plantations and the Isis and Woongarra Scrubs have been almost completely cleared for farming.

Two REs are found on metasediments and interbedded volcanics. RE 12.11.11 occurs in southern areas of the bioregion, on the south-western D'Aguilar Range, between Cooyar and Nanango, including Benarkin State Forest and between Imbil and Kilkivan. It is also of concern, with only 30% remaining of an original estimated 45000 ha. It has been cleared for pasture and plantation establishment.

RE 12.11.12 replaces 12.11.11 in central areas of the bioregion, occurring mainly around Woolooga, on the Woowonga Range and in the Goodnight Scrub district. *Vitex acuminata, Archidendropsis thozetiana* and *Pleiogynium timorense* are characteristic species in this community, but absent from 12.11.11. Approximately 50% of the original extent of 25000 ha remains uncleared, but much of this has been logged and is infested with lantana.

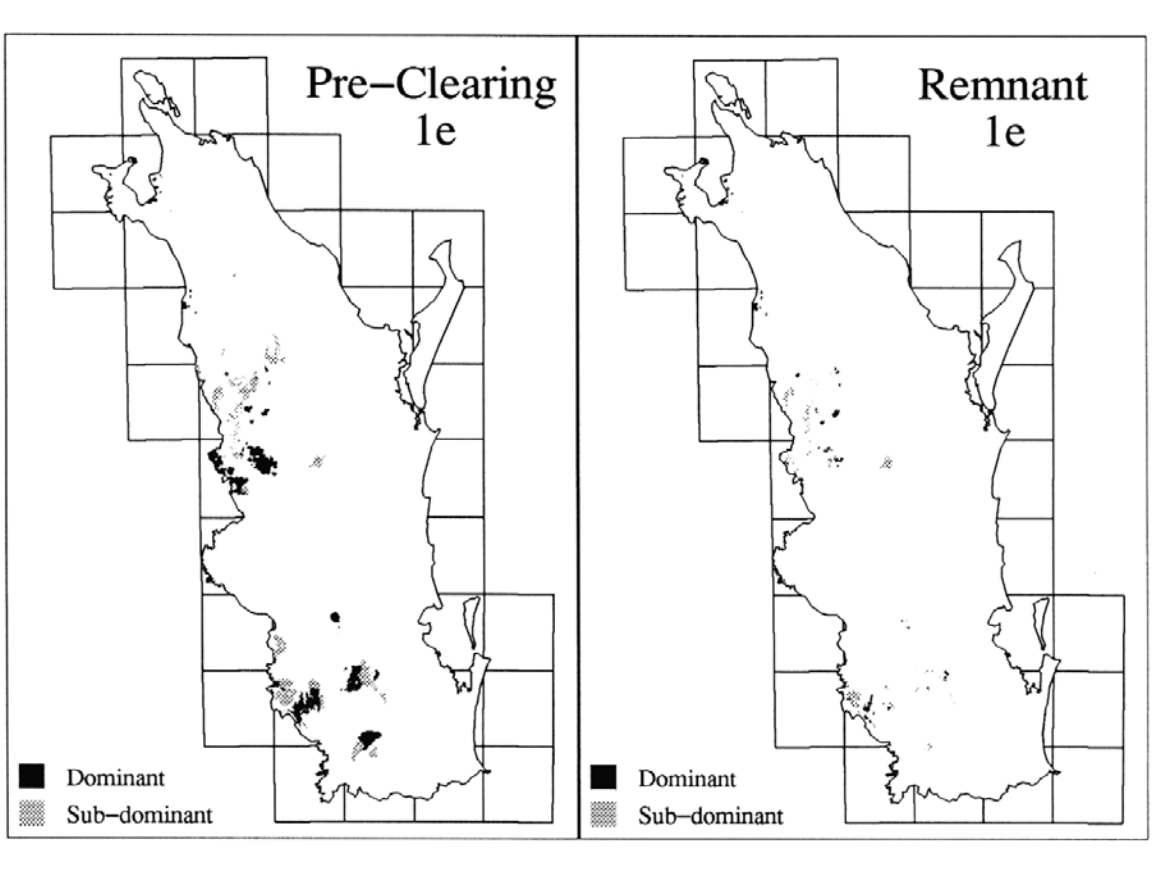
RE 12.12.13 occurs on Mesozoic to Proterozoic igneous rocks which are widespread throughout the bioregion. The most extensive areas of this ecosystem are in the upper Brisbane and southern Burnett River catchments, including Cressbrook and Kipper Creeks, Mt Brisbane, Elginvale, Gallangowan and Oakview State Forests and the Burnett Range between Kilkivan and Biggenden (e.g. Planted Creek). In the north, it occurs at Kalpowar and on the Many Peaks Range (Colosseum and Norton Creeks) and Mt Coulston. Almost 40% of the original estimated extent of 65 000 ha has been cleared for plantation and pasture development and most of the remaining areas have been heavily disturbed by logging of *Araucaria cunninghamii.*

Broad rainforest group 1e: Semi-evergreen microphyll vine thickets and *Acacia harpophylla* open forests on sediments, metasediments and volcanics (REs 12.8.21, 12.8.22, 12.8.23, 12.9/10.6, 12.9/10.15, 12.11.4, 12.11.13, 12.12.17, 12.12.18 and 12.12.26) (pre-clearing extent 115105 ha, 21031 ha remaining, 1242 ha in conservation reserves) (see Map 6)

This group comprises 10 regional ecosystems with semi-evergreen vine thicket (softwood scrub) or brigalow (*Acacia harpophylla*) vegetation which occur on clay loam and clay soils in the drier inland areas of the bioregion. Most of these ecosystems occur more widely in the adjacent Brigalow Belt bioregion.

In South-East Queensland (and in the Brigalow Belt) these ecosystems have been cleared extensively for pasture development and cropping and less than 20% of their total extent remains. Nine of the ten ecosystems are either endangered or of concern (see Table 3). Most remnants require intensive management because of weed invasion (e.g. *Lantana camara, Anredera cordifolia, Panicum maximum, Cenchrus ciliaris*) and fire damage on their margins.

Map 6 - Broad rainforest group 1e, pre-clearing extent 115105 ha, 21031 ha remaining, 1242 ha in conservation reserves



Semi-evergreen vine thicket communities are typically low and relatively open with large bottle tree emergents (*Brachychiton rupestris* and *B. australis*). There are seven vine thicket regional ecosystems in South-East Queensland, with two (12.8.21 and 12.9/10.15) making up 75% of the total original extent of these communities.

RE's 12.8.21 and 12.8.23 occur on Cainozoic basalts and lateritised basalt. RE 12.8.21 is confined to the southern half of the bioregion, e.g. the Lockyer Valley and the Bunya Mountains, and may grade into araucarian microphyll vine forest. It is of concern, with only 11% (4015 ha) remaining of a pre-clearing extent of about 36500 ha.

RE 12.8.22 occurs in the northern half of the bioregion and is restricted to a few localities such as Coalstoun Lakes near Gayndah and the Stony Range near Gin Gin. It is endangered, with only an estimated 24 ha (1%) remaining of the original extent of 2400 ha.

RE 12.9/10.15 occurs on sediments, mainly in southern parts of the bioregion (province 2), e.g. the Lockyer and Fassifern Valleys. It is of concern, with 19% remaining of an original 25000 ha.

RE 12.11.4, on metasediments, is restricted to the extreme north of the bioregion, in the Boyne Valley. This RE occurs more extensively to the north, in the Brigalow Belt bioregion, and is not considered of concern.

The other two vine thicket REs occur on older (Mesozoic to Proterozoic) igneous rocks. 12.12.17 occurs to a relatively limited extent in southern parts of the bioregion, e.g. near Murgon and in the Brisbane valley (Mt Beppo). It is of concern, with only 32% (2080 ha) remaining of the estimated pre-clearing extent of 6500 ha. RE 12.12.18 is restricted to small areas in central and northern parts of the bioregion, e.g. near Gayndah and Kroombit Tops. It incorporates some araucarian microphyll vine forest as well as semi-evergreen vine thicket and is of concern, with 3200 ha remaining of the estimated 4000 ha prior to clearing.

There are three regional ecosystems in which brigalow (*Acacia harpophylla*) is the dominant vegetation. These communities frequently have a well-developed vine thicket understorey, and belah (*Casuarina cristata*) is often a prominent emergent. All three ecosystems are considered endangered, with only 6% remaining of an estimated total area of 43200 ha prior to clearing.

RE 12.8.23 occurs on Cainozoic basalt and has been reduced to less than 400 ha from an estimated pre-clearing extent of 6400 ha, mainly in the Murgon-Proston district.

RE 12.9/10.6 occurs on sediments in the Lockyer Valley and was the most extensive of the three brigalow RE's. Only 4% now remains of the original estimated extent of 28600 ha.

RE 12.12.26 occurs on older igneous rocks between Murgon and Proston and in scattered locations near Gayndah. Its total pre-clearing extent was 8200 ha, of which ca. 900 ha remains.

Conclusions

Apart from the higher altitude rainforests along the McPherson Range (rainforest group 1a), the rainforests of South-East Queensland have been extensively affected by logging and/or clearing for agricultural, pastoral and plantation development.

This impact has been particularly severe in the drier rainforest types, the araucarian microphyll vine forests (rainforest group 1d) and the semi-evergreen vine thickets and *Acacia harpophylla* communities (rainforest group 1e). These types are estimated to have covered more than 355000 ha, more than half the pre-clearing extent of rainforest within the region. Most of the remnants are threatened by weed invasion and fire damage on their margins.

The araucarian microphyll vine forests now cover less than 40% of their original extent, with two of the five regional ecosystems considered of concern. The semi-evergreen vine thickets and *Acacia harpophylla* communities however have been reduced by more than 80%, with four regional ecosystems endangered and five of concern.

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4. Community Rainforest Conservation

The Bremer Institute of TAFE

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The Horticulture and Environmental Studies Department of the Bremer Institute of TAFE, based in Ipswich and Brisbane's south-west suburbs, is recognised regionally for its innovative and constructive approaches to the conservation and environmental management through its training schemes, Certificate and Diploma courses and active participation in community projects.

Bremer TAFE is currently involved in several "hands on" recovery and revegetation projects including the Opossum Creek Project, WWF Ipswich Rainforest Recovery Project, and the Westfalen Revegetation and Forest Farming Projects. The TAFE plays a major role in involving students and the community in the propagation of rare and threatened plant species for these projects, along with the widest possible diversity of local species through its Native Plant Nursery at Bundamba. In addition, Bremer TAFE is working in conjunction with local land developers to relocate native plant species to parks, gardens and green corridors for conservation purposes and the provision of propagation material.

The Bremer TAFE is committed to maintaining its leading edge in addressing significant local conservation issues while providing rewarding quality training through its active involvement within the community.

The Bremer Institute of TAFE

The Horticulture and Environmental Studies Department of The Bremer Institute of TAFE, based in Ipswich and Brisbane's south-west suburbs, has for a number of years endeavoured to actively participate in local conservation and environmental community projects. The Bremer TAFE is part of the Recovery Team for the WWF Ipswich Rainforest Recovery Project and will play a major part in the propagation or rare, vulnerable and endangered plant species along with the propagation of the widest possible diversity of local species for the project from its Native Plant Nursery at Bundamba. This is in line with the ecosystem approach to threatened species recovery which has been adopted, shifting away from a species approach.

Species that will be propagated for the project include:

- *Pouteria eerwah* (a native plum), endangered.
- *Plectranthus habrophyllus* (native coleus), endangered.
- *Notelaea lloydii* (Lloyd's native olive), vulnerable.
- *Cupaniopsis tomentella*, vulnerable.
- *Sophora fraseri*, vulnerable.
- *Choricarpia subargentia* (giant ironwood), rare.
- *Callitris baileyi* (Bailey's cypress pine), rare.
- *Hernandia bivalvis* (grease nut tree), rare.

The Bremer Native Plant Nursery specialises in local native plant species and is currently implementing propagation trials particularly on species not commercially available, difficult to propagate and/or threatened. The Nursery currently has a propagators authority to propagate threatened species. The Bremer TAFE is also involved in establishing plantings of local rainforest species at the TAFE and Ipswich SGAP Rare and Threatened Species Garden at Bundamba Hill and at the Bremer TAFE Westfalen Campus at Redbank (Figure 1). Westfalen is a disused open cut coal mining site. Ipswich YUPI Inc. is the current owner of the site and the Bremer Institute has a partnership with YUPI to provide training to Work-for-the-Dole participants. These participants, along with the TAFE's horticulture and conservation students, are currently controlling environmental weeds, planting and direct seeding a diversity of endemic species along Six Mile Creek and drainage systems from the coal mining site leading into it. The plants used for revegetation are propagated at the Bremer TAFE Nursery from local plant material.

As an educational institution the Bremer TAFE is also developing programs to inform the community of species biodiversity, the importance of preserving remnant vegetation and sustainable land management issues. These are currently being implemented through courses such as the Certificate III in Environmental Practices, Certificate II, III and the Diploma of Horticulture and a New Forest Farming Course.

The Forest Farming Course involves developing commercial rainforest timber and Eucalyptus species plantations that will replace the exploitation of rapidly diminishing natural resources. It therefore aims to combine conservation practices along with a sustainable land use which will provide a future income for landowners. This will connect conservation with an industry and make it less reliant in the future on Government funding. The course was developed from the long proven Jack Mitchell system which is currently experiencing tremendous interest. The system is based on mixed timber species plantations which offers environmental benefits over monoculture approaches. These benefits include the maintenance of an ecological balance, the conservation of biodiversity and the creation of varied and productive habitats for native fauna due to no clear felling and the preservation and revegetation of nearby natural areas. Other advantages of the system include cost-effective establishment, low maintenance, no need to install irrigation and minimal use of fertilisers and pesticides. The system also enables a commercial sawn log to be obtained in as little as 15 years. The Bremer TAFE is currently establishing demonstration plantations at its campuses at Bundamba and Westfalen.

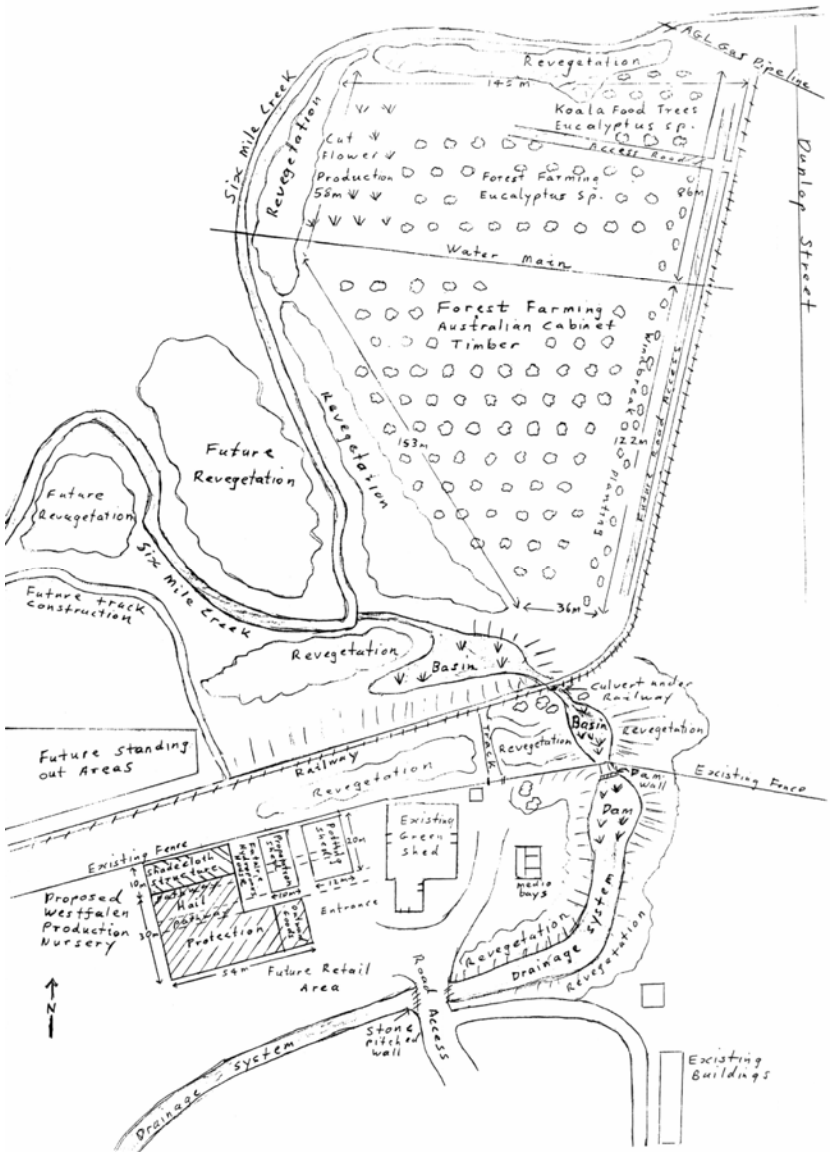
The Bremer TAFE is also involved in local plant rescue at several sites in the Ipswich area. Currently it is working with a local land developer who aims to preserve and save as many plants as possible on the land that he is developing on his housing estate. Some plants are transplanted and others are taken back to the TAFE Nursery so that they can be later planted back into developed areas near to where they were taken. Other plant rescues involve a *Melaleuca irbyana* wetland community, the site for a multi-million dollar development and a unique heathland ecosystem scheduled to be cleared for industrial development. The rescued species are also used as motherstock plants for plant propagation and planted in gardens and revegetation sites at the TAFE Campuses at Bundamba, Richlands and Westfalen. This will reduce the need in the future to obtain propagation material from wild populations.

The Bremer TAFE is also at present involved in preserving plants found on remnant roadside vegetation. One of the rarest plants in Queensland, a new species of native olive (*Notelaea*

sp.) can be found in remnant bushland at Dinmore near Ipswich. Conservation and horticulture students have studied the gully where the olive grows and contributed to the Greening Australia and the Main Roads' management plan for its survival on the site. The TAFE Nursery is also currently propagating the species to assist its preservation. Other threatened species also occur on the site. These include *Notelaea lloydii* (named after Lloyd Bird, OAM), and *Marsdenia coronata* which was thought previously to be extinct.

The Bremer TAFE is committed to addressing significant local conservation issues while providing rewarding quality training by its active involvement within the community. The Forest Farming Course and Project at Westfalen has recently appeared on the Channel 2 television program “Landline”. The Bremer TAFE Native Plant Nursery and the preservation of the *Notelaea sp.* roadside remnant at Dinmore near Ipswich have also been filmed by the Channel 10 program “Totally Wild”. Channel 10 will also be filming the Bremer TAFE's Native Plant Rescue for “Totally Wild”.

Figure 1 - Proposed Westfalen Development and Revegetation Project



Woogaroo Scrub Project - Preserving Flora and Fauna for Future Generations

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for the Woogaroo Scrub project coordinator, Lloyd Bird O.A.M.

Coordinated by active conservationist and community member, Lloyd Bird O.A.M., the Opossum Creek Project is one of the success stories that the Bremer TAFE has been involved with. Spanning nearly six years, this Natural Heritage Trust funded project aims to restore an area of fragmented riparian rainforest and remnant dry vine scrub along Opossum Creek near Ipswich, South East Queensland. This vegetation was originally part of the Woogaroo or Goodna Scrub which once fringed the banks of the Brisbane River and surrounds.

The remnant vegetation lies within Springfield, a new housing development between Ipswich and Brisbane. Consequently extensive greenbelts and wildlife corridors have been incorporated into the design of Springfield throughout Opossum, Woogaroo and Mountain Creeks, the major drainage systems in the area. This has assisted in the conservation of significant flora and fauna habitats and links bushland areas at the base of White Rock, Spring Mountain and Mount Flinders to the Brisbane River. In addition a major weed control initiative has been carried out throughout the life of the project with assistance from valuable volunteer organisations like Australian Trust for Conservation Volunteers (ATCV), members of Society for Growing Australian Plants (SGAP Ipswich Branch) and local volunteers.

The restoration of the remnant rainforest at Opossum Creek is important in helping to preserve the diversity of local plant species, some of which have medicinal and culinary potential. With the involvement of various community groups, local organisations and land developers it is hoped that the area will be enjoyed by people and become a refuge for wildlife.

Woogaroo Scrub project

The Woogaroo Scrub Project aims to restore an area of fragmented riverine rainforest and a surrounding flat along Opossum Creek. The area, near Ipswich in South-East Queensland, was originally part of the Woogaroo or Goodna Scrub. The area now lies within Springfield, a new city development between Ipswich and Brisbane.

South-East Queensland is experiencing rapid urbanisation and increasing population pressures. While extensive tracts of relative intact bushland remain in close proximity to Brisbane and Ipswich, urban expansion will eventually result in the loss of much of this green space.

Opossum, Woogaroo and Mountain Creeks serve as major drainage lines within the Springfield development. Both streams and their tributaries are of major importance as

wildlife corridors providing a link between the Brisbane River and extensive tracts of bushland to the south in the vicinity of White Rock, Spring Mountain and Mt. Flinders. A fringing rainforest known as the Woogaroo or Goodna Scrub once extended from the Brisbane River to Goodna upstream for five kilometers. The lower reaches of Opossum Creek also contain small fragmented patches of disturbed rainforest.

Historical value of Woogaroo Scrub

The Woogaroo Scrub was a popular destination for early botanists and naturalists. Many took the train to Goodna, where they alighted and spent time exploring the rainforest. Many of the plant species recorded can still be found along Woogaroo and Opossum Creeks.

The fragmentation problem

Timber getting, agricultural pursuits and fires have resulted in fragmentation of the closed forest. Valuable timbers, including hoop pine *(Araucaria cunninghamii),* red cedar *(Toona australis),* black bean *(Castanospermum australe)* and bumpy ash *(Flindersia schottiana)* were logged to the point of virtual extinction. Invasive tree species such as camphor laurel *(Cinnamomum camphora)* and Chinese elm *(Celtis sinesis)* rapidly colonised disturbed areas.

During the planning process, Springfield Land Corporation Pty. Ltd. decided to encourage involvement by residents, schools and the scouting association in a number of environmental projects aimed at retaining important habitats to conserve local flora and fauna. A scheme was formulated to regenerate riparian vegetation fringing Opossum Creek, including both disturbed dry rainforest and tall open forest.

The vegetation

A vegetation survey carried out prior to the start of the project recorded 130 closed forest species present within a small area. Located at the base of a steep ridge facing south, the creek flat had the advantages of being a fire-proof environment, was sheltered from desiccating winds and was easily accessible.

More recent flora and fauna surveys have discovered 35 species of butterfly and the powerful owl. Eighteen species of frog, including the rare green thighed frog, have been identified in Woogaroo Creek. Threatened flora discovered include:

- *Indigofera baileyi* (QDPI),
- *Marsdenia coronata* (ANZECC),
- *Sarcochilus dilatatus* (ANZECC), and
- a new species *Plectranthus habrophyllus.*

Unfortunately *Sarcochilus dilatatus* has not been observed since the devastating bushfires in 1994.

When the project started in late 1992, areas up from Opossum Creek were heavily infested with lantana *(Lantana camara*) and along the creek bank itself the exotic "weed" trees camphor laurel *(Cinnamomum camphora)* and Chinese elm *(Celtis sinensis)* dominated. A large number of the camphor laurel and Chinese elm have now been poisoned with herbicide.

Lantana clearing

Tackling the 'walls' of Lantana at first appeared to be a major undertaking. However within a year the majority of it has been cleared. A large amount of work was initially and progressively carried out by the Australian Trust for Conservation Volunteers (ATCV), members of the Society for Growing Australian Plants (SGAP Ipswich Branch) and the rest by local volunteers.

All the Lantana has been cleared using hand tools such as brush hooks, machetes and secateurs. The reason for this was the numerous native seedlings such as white cedar *(Melia azedarach)*, silky oak *(Grevillea robusta)* and blackwood *(Acacia melanoxylon)* under the Lantana which would have been destroyed using machinery. The Lantana was cut back near the base which was either dug out or left for follow up poisoning with herbicide. Many rainforest seeds germinated once the Lantana was removed. These species include Maiden's Wattle *(Acacia maidenii)*, Native Pomegranate *(Capparis arborea)*, Red Olive Berry *(Cassine australis* var. *australis)*, Ivory Tree *(Siphonodon australis).*

The right plant in the right place…

Use of the right plant in the right place, combined with copious amounts of mulch, has resulted in minimal losses up to the present time. After Lantana is removed the soil is left in good condition with a thick layer of mulch. Planting into this humus-rich soil contributes towards optimum survival rates. Slopes are also left with this rich soil as the Lantana has prevented it from being washed away. During the recent drought this mulch has helped keep alive the hundreds of trees, shrubs and vines planted in cleared areas. These plants were given only small amounts of water when planted, as Opossum Creek has been dry for over a year. All the water that was used for planting has been brought into the area in containers. Hardier species were planted on the slopes and those requiring more water were planted nearer the creek in moisture pockets.

Propagation

A number of rainforest plant species endemic to Opossum Creek are either not available through commercial nurseries or only in limited quantities. In order to restore the area with enrichment planting, many species are being propagated by SGAP (Ipswich), Redbank Plains High School, and the Bremer Institute of TAFE. Seeds and cuttings from local sources are used when possible, however some original species have disappeared and in these cases propagating material from other locations is being used. Species planted at Opossum Creek are endemic to similar riverine rainforest within a 40 km radius, the exception being some rare species such as Native Jute *(Corchorus cunninghamii).*

Other species that are currently being propagated include: pavetta *(Pavetta australiensis)*, corkwood *(Duboisia myoporoides)*, whalebone tree *(Streblus brunonianus)*, round lime *(Microcitrus australis)*, hairy psychotria *(Psychotria loniceroides*) and kangaroo apple *(Solanum aviculare)*, plunkett mallee *(Eucalyptus curtisii*), native indigo *(Indigofera baileyi)*, milk vine *(Marsdenia coronata)*, and native coleus *(Plectranthus habrophyllus).*

Preserving plant diversity

The restoration of the remnant rainforest at Opossum Creek is important in helping to preserve the diversity of local plant species which have medical potential. Some species could also have potential in the food industry.

On a recent expedition to a patch of Woogaroo Scrub, Dr David Lin, from Queensland University of Technology, found plant material of the rainforest Yellow Wood tree *(Sarcomelicope simplicifolia)*. Dr Lin is presently researching the medicinal potential of a number of species found in closed forests in south east Queensland.

A number of other plant species from the Woogaroo Scrub have been collected for similar purposes during the preceding years.

Among these are Chain Fruit *(Alyxia ruscifolia)*, Tape Vine *(Stephania japonica)*, Black Bean *(Castanospermum australe*), and Black Teak *(Pentaceras australis)*. Scaly Myrtle *(Austromyrtus hillii)*, Mallet Wood *(Rhodamnia argentia)*, and Native Guava *(Rhodomyrtus psidioides)* were also collected for evaluation of essential oils. Yellow Persimmon *(Diospyros australis)*, Iron Tree *(D. geminata)*, Long Tom *(D. fasciculosa)*, and Wild Lime (*Microcitrus australis*) have been collected for research into commercial fruit production.

Koala habitat

A surrounding flat next to Opossum Creek is also being restored. Various *Eucalyptus* species, particularly koala food trees such as the Queensland blue gum *(Eucalyptus tereticornis*) and the gumtopped box *(E. moluccana)* are now being planted. On a recent visit a koala was spotted climbing up a camphor laurel tree. Hopefully the planting of these *Eucalyptus* trees will not only encourage koalas to the area but also aid in their survival.

Communities working together for the future

The restoration of sections of the Woogaroo Scrub is a genuine attempt by a cross section of the community to involve itself in conserving our dwindling natural resources.

The involvement in the project by local schools, the Society for Growing Australian Plants (SGAP), the scouting association, the Bremer Institute of TAFE, and various other community groups is being encouraged.

Hopefully the enthusiasm generated by this project will result in the formation of a Woogaroo Creek Catchment Association involved in a number of nature-based activities including tree planting, bird watching and bush walking.

Rapid urbanisation must not allow us to lose sight of the fact that, along with larger tracts of bushland, many small specialised habitats - such as Opossum Creek - are a vital link in preserving diversity of flora and fauna for the enjoyment of future generations.

The Rainforest Conservation Work of LWMA - Lockyer Landcare

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"FROM VISION TO REALITY"

This paper discusses the formation, history, background, structure and current activities of Queensland's first Landcare - Catchment Management group, the Lockyer Watershed Management Association Inc. (LWMA) - Lockyer Landcare.

LWMA - Lockyer Landcare has played a leading role in the conservation of South-East Queensland's rainforests. Achievements include:

- *The Dwyers Scrub Conservation Park.*
- *The Berlin Scrub Nature Refuge, which was Queensland's first Nature Refuge Agreement.*
- *Three demonstration sites for "hand-on" rainforest conservation work.*
- *Vegetation mapping of Laidley Shire.*

In 1980 Fred had a vision

In 1980 Fred From, a farmer from the Helidon Hills in the Lockyer Valley west of Brisbane, had a vision. A vision to bring people together to care for their catchment. His vision became reality in 1981 with the formation of Queensland's very first Catchment Care/Landcare Group and one of the first of its kind in the whole of Australia. Not long after Fred's vision, LWMA - Lockyer Landcare emerged as an action-orientated group. From humble beginnings in the early days, it was expanded into a "valley wide" association a few short years later. "People helping people and learning from others" has always been the basic idea behind the success of this self help group.

The Lockyer Watershed Management Association (LWMA) - Lockyer Landcare Group now features three subcommittees: Education, Vegetation Projects, and "BIG" (Brassica Improvement Group).

The Education Sub-committee promotes the Lockyer Valley as an important food producing and water supply catchment in which Landcare and catchment care principles are widely recognised and able to be uniquely demonstrated through a community education program. This sub-committee currently runs a successful program of community education through Lockyer Valley Rural Tourism Packages aimed at "*Learning Through Enjoyment*".

The LWMA Vegetation Projects Sub-Committee (VPSC) focuses on achievable bush regeneration and other conservation projects which demonstrate sound Landcare practices and which have community education benefits.

The Brassica Improvement Group ("BIG") is leading the way with Integrated Pest Management (IPM) and other strategies that are achieving significant reductions in the use of chemicals for crop growing in the Lockyer.

LWMA - Lockyer Landcare rainforest conservation work

The considerable efforts of LWMA members, in particular Mt. Whitestone farmer Peter Sutton, led to the Queensland Government's purchase of a property at nearby "Egypt" which features a 40 hectare dry rainforest remnant. The property is now the Dwyer's Scrub Conservation Park.

Queensland's very first Nature Refuge, the Berlin Scrub Nature Refuge, was established in 1994 over a 70 acre dry rainforest remnant on the property of LWMA members Dick and Doris Scanlan at Mt Berryman.

The Vegetation Projects Sub-Committee (VPSC) is currently carrying out three Natural Heritage Trust (NHT) funded conservation projects at three dry rainforest remnants: "Nelson's Remnant" at Blenheim, "A Touch of Paradise" at Mt Sylvia, and "Welk's Remnant" at Mt. Berryman. The VPSC also has regular visits to other bushland remnants throughout the Lockyer Valley area, as well as visits to the conservation projects of other groups outside the area. "A Touch of Paradise" and "Welk's Remnant" both have interpretive trails with guide books. The VPSC recently carried out a major project to fence "Welk's Remnant", and the landholder who owns "A Touch of Paradise" is extending the existing fence around his remnant with part of the NHT project funding.

Through its work the VPSC is successfully conserving rainforest areas and is successfully promoting to the community the benefits of rainforest retention and management.

LWMA has also carried out vegetation mapping for Laidley Shire, and has just commenced a second mapping project for Gatton Shire. The Gatton Shire Vegetation Assessment and Conservation Project is going further by seeking to integrate vegetation conservation and management, including the provision of incentives, into Gatton Council's new Integrated Planning Act (IPA) Planning Scheme.

LWMA's efforts are indeed taking rainforest conservation from "Vision to Reality".

Conservation of Isis and Woongarra Scrubs Remnants

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This paper aims to describe the Woongarra and Isis Scrubs in an historical setting. It provides insights into the fate of these two Scrubs and how the Native Vegetation and Propagation Project is working to ensure that there is some sort of future for them. The past and present extent of the Woongarra and Isis Scrubs and their botanical composition and characteristics are discussed including their current status and situation. The actions previously undertaken to protect these remnants as well as a rationale and objectives for the current Native Vegetation and Propagation Project are also presented. Bundaberg and District Landcare aims to facilitate the continuation of community participation and involvement in ensuring the continued success of the project into the future and the conservation and management of the Scrubs themselves.

Introduction

The Native Vegetation Propagation Project received funding for 1997 under the National Landcare Program and in 1998 under the Bushcare component of the Natural Heritage Trust. The aim of the project is to locate and record the plants found in the remaining Woongarra and Isis Scrubs remnants, collect seed and propagate Scrub species then make these plants available to community groups, schools, Councils or landowners wishing to replant areas of Woongarra or Isis Scrub. The project also aims to raise the profile of the two Scrubs by bus trips, media releases, seed collecting and propagating workshops etc. and giving advice and assistance to landowners and other members of the community about how to protect or replant areas of Scrub. The initial funding application was for three years and we are confident that funding will be forthcoming for the last and final year of the project. If this is so, the project will continue until the end of 1999.

Brief history of the Isis And Woongarra Scrubs

The Isis and Woongarra Scrubs were dry vine scrubs that grew on the red volcanic soils around Childers and Bundaberg respectively. The Isis Scrub around Childers is reported to have covered an area of some 13,000 ha, whilst the Woongarra Scrub around Bundaberg apparently covered some 4,000 ha. Both of these Scrubs were almost totally cleared by the turn of last century and today less than 1% of both of them remain. The areas were both initially cleared for timber then once it was realised that the soil on which these Scrubs grew was very fertile they were further cleared for maize then sugar cane. Today sugarcane and small crops remain the dominant industries in these red soil areas although I believe there is tremendous scope for farm forestry to become a very viable proposal on areas once used for sugarcane growing around Childers.

Characteristics of Isis and Woongarra Scrubs

Both of these Scrubs have been classified as softwood Scrubs and despite the many similarities in the species composition of the two Scrubs, there are obvious differences that set them apart. For example, the Hoop Pine (*Araucaria cunninghamii*) would have been the tallest of the trees in the Isis Scrub but it would appear that the Hoop Pine was not found in the Woongarra Scrub. Also, the rare and threatened Childers Alectryon (*Alectryon ramiflorus*) is found in the Isis Scrub but not in the Woongarra Scrub. Similarly, one of the main pioneer species around Bundaberg is the Macaranga (*Macaranga tanarius*) whilst in Childers it is Bleeding Heart (*Omalanthus populifolius*).

Plant lists of Scrub remnants show that even today both Scrubs still support over 100 different Scrub species. Unfortunately we will never know what species may have grown in these Scrubs before white settlement.

Current situation

The size of both Scrubs has been reduced to less than 1% of their original range. In Bundaberg we would be looking at a figure of say around 20 hectares in total surviving and around Childers the situation would be similar. In Childers very few Scrub remnants remain on private property with the bulk of those I found being located along road reserves. In Bundaberg the situation is very different; with really no Scrub vegetation remaining along road reserves at all and what little does remain is either on private property in small fragments consisting of a couple of acres at best or owned by the Councils. In both these areas, most road reserves were cleared of their vegetation so that tractors and harvesters could turn round around outside the paddock. This of course allowed greater farm area to be put under cane.

In my opinion, the current situation for both these Scrubs is probably similar to that which exists in many areas that contain small remnants of dry vine Scrub. There appears to be an acceptance that these areas need to be kept because of their ecological and historical value but little money and effort is going into their protection and rehabilitation. It seems that when budget time comes around there is just not enough money to go round and by the time roads, sewerage, drainage, city parks and gardens and sporting fields get attended to, there is just not enough left to do anything with the Scrub remnants.

What action has already been taken to protect them

Burnett Shire Council is actively taking steps to protect its remaining Scrub remnants. Burnett Shire Council has erected a very good boardwalk through one of their remnants so that people can view it close hand and last year the Council set aside a 3.6 ha block for replanting with Scrub species. This project has effectively taken on the running of this revegetation project with a group of local volunteers meeting once a month for tree planting, weeding, watering etc. Replanting has been going for almost a year now with over a 1,000 Scrub trees having been planted. So far we have achieved something like a 97% survival rate and this can largely be attributed to the commitment of members of the group.

Focus of project to date

The first twelve months of the project focused on locating and checklisting remnants in the three Shires, collecting seed and propagating plants. At this stage I would like to thank Paul Forster from the Queensland Herbarium for his assistance in these field surveys. Remnants were located with the aid of aerial photos, ground truthing, feedback from media releases and talking to landowners, shire councillors and other people who may have knowledge of the location of remnants. This was very successful and I feel that just about all of the remnants of any significance were located. At the same time seeds were collected and Scrub trees propagated from as many species as possible. Propagation is being done at the Department of Primary Industries Research Station in Bundaberg where I am allowed to use their propagating facilities as well as shade houses.

In June 1998, the first report entitled "Conservation of Isis Scrub Remnants" was launched by the previous Minister for the Environment, Brian Littleproud. This document is a starting point for conservation of these remnants and I believe is the first document that has actually listed significant remnants, assessed their condition and then made recommendations for their protection. Similar reports are being done for Bundaberg City and Burnett Shire remnants.

As well as drawing attention to the issue of the Scrub conservation, I have also been able to draw attention to the ongoing problem of environmental weeds and their impacts and threats on remaining native bushland. In this area the biggest problems are Cat's Claw Creeper (*Macfadyena unguis-cati*), Broad-leaf pepper Tree (*Schinus terebinthifolia*), and Ochna (*Ochna serrulata*). Looming problems are Madeira Vine (*Anredera cordifolia*), Pigeon Berry (*Duranta repens*) and Black-eyed Susie Vine (*Thunbergia alata*). I recently undertook a local campaign to draw attention to the potential impact of Madeira Vine as I have located plants at several sites around Bundaberg and it has also been reported along the Burnett River at a couple of places.

The future

In some shires I believe there is more awareness than in others as to the community benefit of retaining native vegetation. Unfortunately when you are dealing with such a small number of remnants of such small size, I believe we haven't got the time to wait for these slower councils to change their attitude toward remnant vegetation.

In the case of the Woongarra and Isis Scrubs, I believe that both Councils and landowners need incentives to help convince them of the benefits of retaining their remnants. I also believe that it would be advantageous to implement schemes, with the co-operation of the councils to actively manage these remnants. I believe that something like a working group of people could circulate amongst the remnants and remove weeds, replace or erect fences to keep out stock if need be and to slowly introduce the council to the idea of looking after these remnants like the accepted idea they have of looking after roads, bridges etc. Once Council was comfortable with this idea and after a period of maybe 18 months or 2 years, I believe such maintenance and restoration works could be then built into Council budgets. In the mean time, appropriate management plans would have been devised for these remnants so that when council does begin to take on-board this work there is a plan in place for them to follow. Of course only a certain number of remnants of a certain size could be looked after by this method and the priority sites would have had to have been located, plant listed and clear recommendations made on how to manage them.

Rosewood Scrub Arboretum

Arnold Rieck, Coordinator, Rosewood Scrub Arboretum Project,
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The Arboretum was established four years ago with NLP funding by the Ipswich Branch of SGAP. The Arboretum is located at Peace Park, Rosewood, and is to be the site where species indigenous to the Rosewood dry vine scrub can be established as a safe refuge and a source for propagation material in future years.

To date, one hundred of the two hundred plus species identified in the scrub have been planted in the park - all the plants raised from local seed!

Peace Park is an ex-situ location where rare and threatened rainforest species in the Ipswich area are being planted.

Location of Scrub

What we have left are small remnants of dry vine/brigalow/hoop pine scrub that once stretched from Rosewood north to Lowood, and from Haigslea west to Plainland-Laidley area. The area of the scrub is associated with tertiary volcanic soils which cover the Jurassic Walloon sandstones and coal measures. Much of the scrub was found on the undulating ridge country associated with the Bluff at Rosewood, Marburg Range and Minden Range, and the drainage lines emanating from this ridge country.

Most of the scrub was cleared from 1870's to 1900's, mainly by German settlers, to grow agricultural crops. Settlements were established at Kirkheim (now Haigslea), Marburg, Minden and Prenzlau. Today, grazing and hobby farming are the main activities on these cleared scopes.

Significance of the Scrub

Aerial photographs reveal there were approximately 1600 ha of vine scrub - 200 ha remain, and 7400 ha of brigalow scrub - 170 ha remain. There is no area of pristine original scrub left. Most are small fragments degraded by weed species - asparagus, cat's claw and green pansi.

Species listings

Post-war emphasis was on tropical rainforests. In 1982 Lloyd Bird listed species on Mt. Stradbroke. Some QUT students listed 80 species near Tallegalla School. Publication of *Trees and Shrubs in Rainforests* - the red book has been of tremendous help to amateur botanists. Over recent years Ipswich SGAP members, Greening Australia staff and Ipswich City Council officers have all helped to list species on properties and roadside verges. I have 15 at present - most through SGAP excursions. Roadside verges are important as a source of seed of common, uncommon, and rare species. We have nearly 200 species listed, ranging from trees to grasses. Two rare and threatened - *Callitris baileyi* and *Sophora fraseri*, a new

Glycine not yet described and several not common the scrub - *Diplospora cameroni* and *Rhodamnia dumiola.* I have planted more *Celtis parmiculata* and *Sterculoia quadrifida* than we know exist in the scrub!

SLP Saving Local Provenances

I started propagating local species in the early 80's when I was in charge of Horticulture at Rosewood State High School. Moreton Shire Council's nursery used to give away *Callitris baileyi* and *Acacia fasciculifera* from local seed - on the free tree give aways! Calls came for specimens of local plants - leaves, etc. to be sent overseas and used in Australia in testing their medicinal and insecticidal properties. There was a need for an easy source of seed and other propagation material.

The Arboretum

Ipswich SGAP approached the Ipswich City Council to establish an arboretum of Rosewood scrub species in Peace Park, Rosewood, the park being given to the Council when the original farm was sub-divided. The Park has an area about 2 ha and there were left in the park seven scrub species following early clearing in the 1900's. Four years ago, Ipswich SGAP received funding through the National Landcare Program. To date, 80 local species have been planted out. That's about half the species found in the scrub.

Propagation and planting

Three local SGAP members and Oakleigh Colliery's nursery have helped me with propagation. The Colliery is revegetating mine dumps with dry vine scrub species. Plantings have involved SGAP members, Rosewood Scouts and Venturers, and ATCV groups. We are filling a gully and its slopes with multiple plantings.

Maintenance

Ipswich City Council supply wood chip for mulch and have located a tap for watering nearby. We are using the wood chip between plants to retard weeds. SGAP has a monthly working bee - numbers vary from one to ten. A Council Parks and Gardens squad have positioned copper logs around the edges of the plantings - mid August. Council is to rip two areas for future plantings.

Over the four years, we have been plagued by vandals who have pulled out plants or smashed them to the ground with stakes. Quite a lot bear such damage. The water laid on to the site was most beneficial during our first three years when Rosewood had very low rainfall - three drought years. This year, plantings are responding to rain since Easter. I have employed ATCV groups for weed eradication, and try to use little weedicide. Chipping and whipper snipping are used to control weeds.

Future plantings

We will continue to add new species to the gully plantings as they become available, especially the under-storey shrubs on the sides of the gully.

There will be 10 feature gardens in the new area of: Aboriginal food plants, Aboriginal medicine plants, rare and threatened species - an ex-situ location for Ipswich's Rainforest Recovery program, prickly and spiny plants, butterfly host plants, plants with medicinal and insecticidal properties, plants used by early settlers, plants not common in the scrub, wood turning plants, and local plants with horticultural potential.

Publications and publicity

We have had a few good articles in the local press - Queensland Times, Moreton Border News, Gatton Star - on the project.

We hope to print a booklet illustrated with drawings or photographs of the more important species. We are busy collating material. When schools use the Arboretum for educational purposes, pupils and students will have a two-page handout on some of the species.

The Arboretum could become a tourist attraction in Rosewood in the future. It is adjacent to the railway line which will be used by the Australian Railways Historical Society (ARHS) for local steam train journeys.

Hints on propagation

Some species of dry vine scrub plants set seed irregularly after flowering following good rain. The *Vineforest Atlas* is useful for fruiting times.

Use a well drained mixture of 50% perlite with 50% peat/sand or 50% potting on mix.

Large 25 cm plastic pots are ideal. Place large seed on surface and cover with scrub leaf litter.

Seed with a hard woody testa can be rubbed on coarser sand paper to weaken the testa, or the testa can be cut off with secateurs to expose the seed. Cut through the pistle end, not stalk end. Seed protected with a woody layer. Remove most of the outer layer. Try boiling water and soak overnight.

Collect decomposing fruit under parent trees, place under shady trees, cover with litter. Cross fingers.

Scavenge seedlings germinating after good rains under parent trees. We found lots of *Owenia venosa* germinating this way. You will need permission from DNA to scavenge along roadside verges.

Keep results - including your failures!

The Noosa & District Landcare Group

Barrie Craig, Chairman, Noosa & District Landcare, PO Box 278, Pomona, Q, 4568.

Noosa and District Landcare is actively involved in many aspects of native revegetation in the Noosa Shire. Seed collection walks are conducted monthly and we have a seed propagation nursery just outside of Pomona. We have a retail Native Nursery at our Resource Centre supplying trees under the Council's Free-tree scheme and also to the general public. We have established an Arboretum at Kin Kin which is planned as a 'living museum' of what the Kin Kin Scrub (a former area of dense rainforest) used to be like. The Group is much involved in revegetation projects for Wildlife Corridors and Riparian Zones. Bush regeneration projects are also undertaken and regular Workshops are held on rainforest species identification and regeneration techniques.

Background of the Noosa & District Landcare Group

Many Australians when thinking of Noosa imagine white sands, blue oceans and cafes. Noosa Shire is predominantly a rural area, with a unique landscape, housing rare and threatened species often not found elsewhere. Farming is now in decline, and the threat of unprecedented population growth, with sub division of rural lands and ongoing remnant vegetation clearing an outcome, the most pressing issue facing the region.

The Noosa & District Landcare Group Incorporated formed in 1989/1990 after concerns from rural landholders in regards to agricultural chemical use and indiscriminate land clearing. The Group is a community-based organisation encouraging ecologically sustainable use of our natural resources, within the Noosa Shire.

Feedback from the local community on landcare related issues via public meetings, field days and the Resource Centre gives directions to the Group as to the type of projects needed.

Issues affecting the area are:

- Water Quality: degradation of the local waterways from urban development causing loss of vegetation, increased nutrients from wastewater and septics, and destruction of habitat.
- Loss of remnant vegetation which is home to many rare and threatened plants.
- Loss of viable agricultural lands.
- Loss of rural aesthetic values through urban development in a rural area.
- Social problems involved with increased population, lack of employment and changes in land use (ie issues with agricultural chemical usage).
- Lack of recognition of new forms of agricultural pursuits on a Local, State and Federal Government level (for example farm forestry plots).
- Education for new landholders.
- Zoning of land use: There are large tracts of viable agricultural lands presently being subdivided. Under the present Local laws, DPI zoning, which identifies viable agricultural land, often fails to protect many viable areas.

Projects created to address these issues include:

- Demonstration Sites: Pinbarren and Eastern Branch Rd Wildlife Corridor.
- Camphor Laurel Eradication Kin Kin Creek.
- Landslip Rehabilitation , Black Mountain.
- Farm Forestry trial plots.
- Creekbank Rehabilitation, Cooroy & Skyring Creek.
- Ecological Studies Project, Cooran and Pomona Schools.

Other major projects within the Shire include:

- Farm Forestry Program aimed at establishing a large area of freehold cleared land under timber trees.
- Vegetation Surveys, registering information about forest types, and remnants of the Kin Kin scrub.
- Water quality monitoring in the Six Mile and Noosa River Catchments.
- Nursery specialising in propagation of native trees from locally collected seed.

The success of the Group has been measured by volunteer support and community participation and on the ground projects and works. Changes in attitudes and a diverse membership also reflects the success of the Group. Projects that link properties and encourage landholders to look beyond their own boundaries to the bigger picture such as the Noosa Landcare Wildlife Corridor Scheme have also been a great measure of success in getting neighbours together for a project for the common good. To date, the Farm Forestry program has established large areas of farm forestry on private lands and raised awareness of the benefits, both ecologically and economically, to the grower. Also Government agencies are beginning to recognise farm forestry as a land use in the rural landscape.

The Landcare Resource Centre based in Pomona is heavily utilised by the public, with land and water management information available. The Centre also provides a social focus for local landholders and landcarers with common interests who previously felt more socially isolated. Our Resource Centre is always a hive of activity with volunteers assisting with greenhouse and administrative works. It has become difficult for the Group to keep up with the demand from the public for assistance, particularly since many Government extension field officer positions have been rationalised.

A measure of success also has been the involvement of varied Government and non Government groups such as Local Authorities; Industry and other community groups. Funding for projects has been sourced from a wide variety of areas including DPIE Farm Forestry Program; DEETYA; Noosa Council; Coastcare; Waterwatch; Gaming Machine Grant Funds; Office of Labour Market Adjustment and Private enterprise via our own sponsorship arrangements and via Landcare Australia Limited.

Details of how Noosa Landcare is assisting with the recovery of Rainforest in the region are best illustrated in our many and varied projects.

Kin Kin Arboretum Project

The Kin Kin Arboretum is a project based on establishing a "Living Museum" of the historic Kin Kin Scrub for educational and environmental purposes. The location of the Arboretum is on 5 acres of Crown Land (Council is Trustee) on the corner of Kin Kin Rd and Eastern Branch Rd, Kin Kin. The site also has historic value being the grounds of the old Kin Kin School. This project is in memorial to W.D. Francis, the Government Botanist who published the historical book on the rainforest trees of the region.

The site has been established from local seed collected and propagated by volunteers of the Noosa Landcare Group. A special section for Rare and Threatened Species is currently being established with the assistance of our Green Corps team. The Group has an Educational Permit from the Dept of Environment to collect rare and threatened seeds for this project.

The grand opening of this project is scheduled for November 1998. The site will have labelled trees for educational purposes; a rare and threatened plant section and walkways, picnic facilities and interpretative signs established. There will also be pamphlets, booklets and species lists available. Noosa Landcare Group has secured a Green Corps Team to commence work for 6 months, with the Kin Kin Arboretum being the major project of the team. Noosa Landcare Group envisages the site to be a major tourism attraction for the hinterland, and will provide an historical and environmental educational facility for locals and visitors.

To date the Noosa Landcare Group, with some assistance from Noosa Council, and via funds secured from the Australian Nature Conservation Agency has:

- Removed large camphor laurels, lantana, groundsel and other invasive weeds.
- Established approx. 5,000 trees.
- Constructed walkways.
- Constructed a Picnic Shelter.
- Established a driveway and parking facility.
- Mulched established sites.
- Maintained the site for weeds and grass.
- Held weekly morning working bees (Thursdays) to maintain the site.
- Monthly working bees planting new species.
- Developed and printed a brochure.
- Commissioned a Botanist and Historian to write information for a Booklet.
- Seed collected in Kin Kin area and propagated trees for the site.
- Purchased a brushcutter and tools, glyphosate; lime; and fertiliser for the site.

Noosa landcare funds many of the above items, and the project is run on predominantly voluntary contribution and use of private tools such as slashers, mowers, brushcutters etc. This will be unsustainable in the long term.

Botanical surveys

As a great deal of the region has had little if any botanical survey works conducted, particularly on private lands where most rainforest remnants occur, we have successfully secured funds for Botanical Surveys of Rainforest remnants in the hinterland conducted by

renowned Botanist, Gary Thomas. These surveys have provided species lists for landholders for regeneration projects, rare and threatened species and indicates the status and viability of remnants in the hinterland. The survey works are also recorded in the GIS. The Survey results are available from our Reference Library, where landholders access the information to identify a remnant in their area as a guide to regeneration works.

We have also conducted a survey comparing the Vegetation Loss between 1979 and 1993 using aerial photographs and groundtruthing. The results of this survey indicated an increase in young vegetation such as wattle, and environmental weeds such as camphor laurel, and a decrease in older vegetation indicating a loss in biodiversity. Further studies are needed to conduct ground truthing of vegetation types that have increased and decreased.

At present we are conducting Botanical Survey works of the State Forests in the area to compile information to submit to the Regional Forest Agreement process for South East Queensland. We feel that our State Forests have a high conservation value and should be included in the National Reserve system

Seed collection walks

Seed collection walks are held at least once a month and volunteers (under the guidance of the Project Coordinator) collect seed and hone their identification skills whilst visiting State Forests and private properties. The seed collection walks are mainly targeting rainforest species. Seed which is collected is taken back to the Resource Centre for propagation. We are keeping a record of seed source and time of collection for our propagation records.

Propagation of rainforest seedlings

Noosa Landcare has a small nursery attached to the Resource Centre and every Tuesday we have a volunteer ‘potting up bee’. This day has become a great social and educational activity for many of our volunteers and it ensures that we have stock for our landcare projects and for sale to members. We have a standing stock of 6,000 plants and grow approximately 30,000 plants per year.

Herbarium

The Group has an ongoing Herbarium project, which is focused on collecting and storing Herbarium samples for referencing, identification works and training. This project when completed will provide a comprehensive set of samples which include leaves, flowers and fruits of all plant species occurring in the area.

Vegetation Survey in conjunction with Noosa Council

During 1994/95, the Group conducted the aerial photo interpretation, digitising and ground-truthing for the Noosa Shire Council Vegetation Survey. Other activities involved with this Survey included: identification of forest types occurring in the Shire and species identification of remnants. This was done on a predominantly voluntary basis and resulted in a huge workload for our Group, however the final product was comprehensive and included a great deal of local knowledge.

Wildlife Corridor Scheme

The Noosa Landcare group has a Wildlife Corridor Scheme where assistance is provided to landholders who have adjoining properties that can create a linkage to a viable remnant. Assistance provided includes technical advice, trees, guards and stakes. Two projects are currently underway:

- Pinbarren Wildlife Corridor: now involves 13 properties, which links the isolated Mt Pinbarren National Park to the Cooran (Woondum) State Forest.
- Eastern Branch Wildlife Corridor: involving 3 properties planting in riparian areas to assist with linking the remnants occurring on this important creek system.

Fauna Survey works are now underway to determine the fauna present and the use of the corridor.

Riparian Restoration Scheme: Corridors of Green Consortium

We are currently working on mapping, surveying and restoration of the Six Mile Creek Riparian zone, an important habitat of the endangered Mary River Cod. This project has resulted in planting of degraded areas on private lands along the Six Mile. This project is part of a Consortium with Greening Australia, Barung and Gympie Landcare Groups and WWF. This Consortium is working together at a catchment level to restore and rehabilitate riparian zones in the Mary River Catchment.

Noosa River Bufferwidth Assessment and Noosa Wetlands Survey

These surveys commissioned by Noosa Landcare and conducted by Dave Burrows and Gary Thomas provided species information of riparian and wetland sites and condition of these sites as an indication of the need for conservation, management and restoration. These surveys have provided both community and Government a means to prioritise areas needing conservation and landcare works. These surveys have been published and are on sale for $30 each.

Educational activities such as Rainforest Species Identification and Bush Regeneration workshops

Regular educational activities are provided throughout the year for members, non members and Green Corps teams on rainforest species identification and bush regeneration techniques.

Other educational activities include: propagation techniques, computer training (GIS and database), soil surveys and farm forestry property planning.

Monthly planting and restoration working bees

We conduct working bees at project sites and bush regeneration sites on a monthly basis and incorporate local schools, particularly primary schools, in our planting activities. The positive impact of Landcare groups has been the “out there doing it” activities. Most of the sites we work on are rainforest sites and plantings.

Wallaby browsing prevention trials

The greatest problem facing landholders interested in planting trees is the browsing of young plants by wallabies. To try and assist landholders, we have conducted trial methods of detering wallabies from browsing young plants. These have included:

- Scents such as stockholm tar (old farmers method), garlic spray, egg spray, chilli spray and fish emulsion spray.
- Fencing such as electric fencing and hinge joint fencing.
- Guards including plastic, wire and heavy duty plastic guards.
- No deterrents.

This study conducted over two years, has provided information about wallabies preferred rainforest plant diets and the time and money resources needed to protect young plants from wallaby browsing. This information is available from our Reference Library.

Library and information: species list and propagation techniques

The Noosa Landcare Group has a comprehensive Reference Library that consists of:

- Botanical and Zoological Reference Books.
- Survey results.
- Government publications.
- Natural Resource Information.
- Farm Forestry and other alternative rural industry information.
- DPI Agrilink Package.
- Noosa Council Planning Scheme studies.

The Library currently has 897 publications listed in the database for community members to access via Computer or catalogue.

Future activities

- Existing activities with emphasis on larger planting areas.
- Expand riparian restoration scheme into the Noosa River Catchment.
- Direct seeding trials.
- Establishment of riparian demonstration sites along the Noosa River.
- Increase propagation of rainforest species.
- Establishment of a flora bank.
- Expand Consortium of regional ‘green groups’ to include: Noosa, Barung, Gympie, Tiaro, Maroochy and Namba Landcare Groups; Greening Australia Queensland; Corridors of Green; Mary River and Noosa River Catchment Groups and Noosa Parks Association.
- Establishment of a new Regional Landcare Educational Resource Centre at Pomona High School.

5. Perspectives on Rainforest Recovery Planning

Keynote address

Alex Rankin, Director, Threatened Species and Communities Section, Environment Australia

GPO Box 787, Canberra, ACT, 2601.

A lot can happen in a millennium: the changing role of government in threatened species conservation.

Overview

Consideration of issues about the challenges and issues facing rainforest recovery and development of innovative solutions to those challenges is very timely. At the Commonwealth level, the next couple of years will bring significant changes in the way threatened species conservation is managed both legislatively and administratively. Change is happening at all levels, from the broad scale reform of Commonwealth environment legislation, to the way in which funds under the Endangered Species Program are administered. The types of projects the Commonwealth will fund are changing—as are the groups who will be asked to take on responsibility for managing on-ground recovery actions. Importantly, in 1998 we are asking a number of questions about threatened ecological communities, including:

- How to identify those that are endangered?
- How to set priorities for recovery?
- How should the recovery process be managed and what are our objectives for recovery?
- How do we know when we've been successful?

This paper outlines current thinking and directions within the Commonwealth on threatened species management. In particular it examines:

- the problem;
- the current legislative framework;
- changes foreshadowed in the new Commonwealth environment legislation;
- key challenges; and
- future directions.

Australia's extinction record

We know that 110 species have become extinct in Australia over the past 200 years. Of these 110 species, 42 species of animals (including 19 mammals - the worst rate of mammal extinctions in the world) and 68 species of plants have been lost. Obviously, this number represents only the tip of the iceberg. Poor information on the total extent of Australia's

biodiversity at the time of European settlement means that we will never know exactly how many species have become extinct, particularly in relation to the significant invertebrate taxon.

Of the species that remain, 1429 are currently recognised as being nationally endangered or vulnerable. Of these: 106 animals and 373 plants are recognised as endangered, and 140 animals and 700 plants are recognised as vulnerable. On average, an additional 77 species are identified in the endangered and vulnerable categories every year - while the conservation status of only 35 species is improved to the extent that they can be downlisted or removed from listing under the Endangered Species Protection Act 1992.

At the current time, only one ecological community (the Cumberland Plain Woodland) is formally recognised as being nationally threatened - although five nominations for listing of threatened ecological communities are currently being considered by the Commonwealth. Despite this, it is anticipated that over 100 communities could be listed by mid 1999, merely by drawing on current State listings.

How is the Commonwealth Government involved?

The Commonwealth Government is involved in threatened species management in two key areas: through National legislation and through administration of a number of National programs.

Current legislative framework- Endangered Species Protection Act 1992

The objectives of the Endangered Species Protection Act 1992 (ESP Act) are to:

- promote the recovery of species and ecological communities that are endangered and vulnerable;
- prevent other species and ecological communities from becoming endangered;
- reduce conflict in land management through readily understood mechanisms relating to the conservation of species and ecological communities that are endangered or vulnerable;
- provide for public involvement in, and promote public understanding of, the conservation of such species and ecological communities; and
- encourage cooperative management for the conservation of such species and ecological communities.

The ESP Act provides a number of mechanisms for achieving these objectives, including:

- identifying and listing endangered and vulnerable species, endangered ecological communities and key threatening processes;
- preparing and implementing recovery plans (for listed species and ecological communities) and threat abatement plans (for listed key threatening processes);
- entering into voluntary conservation agreements;
- providing an option to apply conservation orders to prohibit, restrict or impose requirements on specified activities on or in Commonwealth areas or where Commonwealth environment assessment procedures are in place; and

- conducting inventories of Commonwealth land to identify the presence and abundance of listed native species and ecological communities on that land.

Current legislative framework-other legislation

A number of other pieces of Commonwealth legislation also provide for the protection of threatened species in relation to Commonwealth acts and decisions. Key legislation includes:

- The Environment Protection (Impact of Proposals) Act.
- The Australian Heritage Commission Act.
- The Telecommunications Act.
- The Wildlife Protection (Imports and Exports) Act.
- The Whale Protection Act.
- The World Heritage (Properties Conservation) Act.
- The National Parks and Wildlife Protection Act.

Endangered Species Program

The Endangered Species Program has been running since 1989. Since that time there have been a number of advances in awareness of threatened species issues, and the Program has acted as a catalyst for the introduction of threatened species legislation and recovery programs in a number of the States, as well as the Commonwealth.

The Program has also provided assistance for work on recovery plans for 485 of the 1429 species listed on Schedule 1 of the Endangered Species Protection Act 1992 and now forms part of the Natural Heritage Trust's 'one-stop shop'. Program's funds are available to anyone who submits an application through the normal NHT process and amount (on average) to some $6m-$8m per annum.

The goal of the Program is "**to protect and conserve Australia's threatened species and ecological communities so that they can survive, flourish and retain their potential for evolutionary development in the wild"**.

The Program provides a core resource for the conservation of nationally threatened species and ecological communities, primarily through its assistance for the preparation and implementation of recovery and threat abatement plans. The Program is also complemented by a number of other Environment Australia programs, including the larger Bushcare, Landcare, Coasts and Clean Seas, and National Reserves System programs. For example, Bushcare supports action for the protection, restoration or creation of habitat for threatened species while the National Feral Animal Control and Weeds programs support work critical to the abatement of key threatening processes associated with weeds and introduced feral animals.

In addition, the Program works cooperatively with other parts of Environment Australia including the Environmental Resources Information Network (which provides spatial database tools and support for the program), and the Environment Forest Taskforce on threatened forest species issues and the Regional Forest Agreements. The Commonwealth's obligations under the ESP Act need to be met before it can sign off on any RFA. This includes ensuring that the comprehensive, adequate and representative reserve system

provides adequate reservation for listed species and communities, and that the RFA itself includes commitments to the development and implementation of recovery plans and threat abatement action, and appropriate management prescriptions.

Limitations with the current framework

While the ESP Act and the Endangered Species Program provide a useful framework for threatened species management, they have a number of limitations and do not provide the flexibility to encourage or support more innovative approaches:

- The Commonwealth's capacity to protect listed species and communities is limited to Commonwealth areas and Commonwealth decisions only and to areas covered by a voluntary conservation agreement.
- Funding focus has tended to be on drafting recovery plans rather than implementing recovery and threat abatement actions.
- The ESP Act constrains the focus and content of recovery plans and does not allow for more strategic management action to be taken - this has been reinforced by a generally rigid approach to developing funding guidelines and priorities under the program.
- The linkages between the ESP Act and the EP(IP) Act are neither clear, nor well understood.
- Finally, through some quirk of legislative drafting, it is not possible for the Commonwealth to adopt recovery plans for species that occur on both Commonwealth and State land (although they can be 'administratively approved'). Legal advice also indicates that the Minister for the Environment is also not free to list new key threatening processes where those threats are known to occur both in and outside Commonwealth areas.

The legislative limitations are common to a number of the Acts administered by the Commonwealth - and have been part of the rationale for the current Governments attempts at broad-sweeping reform of Commonwealth environment legislation.

The need for this reform of environment legislation has been accepted by all States and Territories - who earlier this year signed a Heads of Agreement which set out the broad scope and nature of the proposed changes to Commonwealth law. As a result, in July 1998, the Minister for the Environment introduced the Environment Protection and Biodiversity Conservation Bill (EP&BC Bill) into the Commonwealth Parliament.

The Environment Protection and Biodiversity Conservation Bill

Regardless of the controversy that followed introduction of the Bill, it is difficult to deny that it represents one of the most significant changes to Commonwealth environment legislation in the past 20 years.

In its current form, the EPBC Bill is intended to replace and repeal 5 pieces of Commonwealth legislation:

- The Environment Protection (Impact of Proposals) Act.
- The Endangered Species Protection Act 1992.
- The Whale Protection Act.

- The World Heritage (Properties Conservation) Act.
- The National Parks and Wildlife Protection Act.

It is proposed that within a year of its introduction, the Bill would also be amended to incorporate the AHC Act. Other legislation that is also likely to be drawn within the broad framework of the Bill includes the Wildlife Protection (Regulation of Imports and Exports) Act, Sea Installations Act and Commonwealth Acts governing hazardous waste and ozone protection.

Key features of the Bill

1. The EP&BC Bill allows for listing of new categories of threatened species and ecological communities.

Species can be listed in one of six categories (which are based on the 1994 IUCN Red List categories):
- Extinct.
- Extinct in the wild.
- Critically endangered.
- Endangered.
- Vulnerable.
- Conservation dependent.

The categories in which ecological communities can be listed are more restricted (critically endangered, endangered and vulnerable) than those for species, but this is still a substantial expansion on the provisions in the current ESP Act.

As the IUCN has not yet established definitions and guidelines for assigning a threat status to ecological communities, regulations will need to be drafted to provide guidance on this issue.

2. Nationally threatened species and ecological communities are an issue of 'National environment significance'.

The EP&BC Bill identifies nationally threatened species in the critically endangered, endangered and vulnerable categories & communities in the critically endangered and endangered categories, as one of six issues of National environment significance (NES). Other NES matters include: world heritage properties, wetlands of international importance, listed migratory species, nuclear action and Commonwealth marine areas.

Under the Bill this means that:
- Any proposed activity anywhere in Australia must be assessed to determine whether it could have an impact on one of these matters of NES; and
- Any action that has the potential to have a *significant* impact on any of these NES matters must be referred to the Commonwealth for a decision on whether some form of environmental impact assessment is required, whether the action can proceed and under what conditions the action can be taken.

Large civic penalties are established for the failure of any person to refer such actions to the Commonwealth. The Bill also establishes that a person is guilty of a criminal offence if they

kill, injure, trade, keep or move a member of a listed species or community (other than those in the conservation dependent category) in or on a Commonwealth area. Strict liability applies to this provision and conviction carries a maximum penalty of 2 years imprisonment.

The Bill does not define significant impact and this is a matter of critical importance that will be negotiated with the State and Territory governments and set out either in regulations or administrative guidelines.

The Bill provides for a number of circumstances where the requirement to refer actions to the Commonwealth is effectively 'waived'. These include where a bilateral agreement has been negotiated with a State or Territory Government to accredit their environmental assessment and management processes or where the action is consistent with an approved recovery or threat abatement plan.

3. Strengthened protection within the Commonwealth

Another significant change in the Bill is the move to identify the Environment Minister as the action minister for all decisions involving actions that could have a significant impact on NES matters. In addition, the Bill provides that:

- A person must not take an action on or outside Commonwealth land that has or will have a significant impact on the environment.
- The Commonwealth (including Commonwealth agencies) must not take any action inside or outside the Australian jurisdiction that has, will have or is likely to have a significant impact inside or outside the Australian jurisdiction.
- The Minister can also make conservation orders controlling actions in Commonwealth areas to protect listed threatened species or communities.

4. Recovery Planning

The Bill includes some small but significant changes to the process for preparation of recovery plans that will ensure greater opportunities for public input and comment and which emphasise the need for cooperative action between the Commonwealth and States.

For example, the new Bill offers a broader range of opportunities for the content and form of recovery plans, including covering multiple-species or regional ecosystems in the one plan and adoption of plans that are not drafted as recovery plans but which contain the necessary elements of a recovery plan. Plans are also required to identify critical habitat and important populations.

The deadlines for preparing plans are reduced to 2 years for species and communities in the critically endangered category, 3 years for endangered and 5 years for vulnerable species—and the Minister must review each plan at least every 5 years.

5. Changes to the Advisory Committees

The Bill establishes a new Biological Diversity Advisory Committee, which is to advise the Minister on matters relating to the conservation and ecologically sustainable use of biological diversity. Membership is to include representatives of ANZECC, conservation organisations, the scientific, rural and business communities and the Commonwealth.

A new Threatened Species Scientific Committee is also established to replace the Endangered Species Scientific Subcommittee and, to some extent, the Endangered Species Advisory Committee. Its functions are to advise the Minister on the making of recovery and threat abatement plans, including priorities for plan preparation, and amendment of lists and also includes the provision of advice on listed marine and migratory species and the preparation of wildlife conservation plans.

6. Provision for environmental audits

Finally, the Bill allows the Minister for the Environment to require a directed environmental audit to be undertaken if s/he suspects that a permit holder has contravened, or will contravene a permit.

Key challenges for the Commonwealth

The legislative changes flagged in the new EP&BC Bill represent a significant change in the way threatened species issues are to be regulated by the Commonwealth. There are a number of other challenges facing the Endangered Species Program, and every individual and agency involved in threatened species conservation, management and protection, that cannot be addressed by legislation alone. What are these challenges?

- The number of species recognised nationally as being endangered or vulnerable is growing, on average, by 50 per year. At the same time, taxa such as invertebrates and non-vascular plants are significantly underrepresented on the National list of endangered and vulnerable species.
- While the Endangered Species Program has provided assistance for 485 of the 1429 species listed, only 21 plans for 22 species have been adopted or approved by the Minister. This combined with the reduced deadlines for preparing recovery plans and the need to undertake regular reviews of plans means the Commonwealth needs to find more effective ways of preparing and adopting plans.
- The quality of information available to land holders and owners on threatened species distribution and management requirements is currently very poor. It is desegregated, often unsubstantiated and it is difficult to find out critical information such as important habitat, population distributions and known and suspected threats.
- To date, most of the action on preparation and implementation of recovery plans has been managed by State agencies. It is difficult for community groups and individuals to know how to get involved in on-ground action or to access funds from the Program to assist their efforts—although establishment of the Threatened Species Network and Threatened Bird Network have been of great assistance in this area.

In addition to these broad challenges, the Commonwealth also recognises a number of specific challenges in relation to ecological communities:

- Those ecological communities that are listed first are likely to be given a high priority for funding - regardless of current levels of threat.
- On a related issue, how can listings of ecological communities be handled more strategically, and how should priorities for action and funding be allocated? Options for establishing priorities include assessing the current levels of disturbance and known threats, or relying on the availability of expertise and willingness to take action on particular communities.

- How do we define the boundary of the listed community? While the issue of boundary definition is exceedingly complex, this question assumes particular significance under the Environment Protection and Biodiversity Conservation Bill where the impact of development proposals on endangered ecological communities will need to be assessed by the Commonwealth.

On other boundary issues:
- What do we do in situations where a State and the Commonwealth have different understandings of the boundary of a listed community?
- Are potential restoration areas included in the boundary?
- How do we know when a newly discovered area is sufficiently similar to a listed community that it should be included, or an area becomes sufficiently degraded to be excluded?
- What are the objectives for recovery of endangered ecological communities? In relation to this, are we managing for the evolutionary development of a listed community, or are we managing for the ongoing maintenance of the community in its current form?
- Finally, what sort of significant impact thresholds can be identified which will help when assessing the impacts of development proposals on endangered ecological comminutes?

How is the Commonwealth responding to these challenges?

A number of initiatives are being pursued within Environment Australia to address these challenges:

Multiple-species approaches

- As part of the 1999-2000 round of NHT funding, Environment Australia aims to have the majority of projects focussed on multiple-species. Applicants for funding will be encouraged to look at the broader regional context or at the full ecological unit when designing their projects.
- It is recognised that a single species approach will continue to be appropriate for some species.

Funding conditions

- Funding will be more strictly tied to completion and adoption of recovery plans and to providing data for inclusion in a National threatened species database - key aspects of the database will be made available to community groups, developers and members of SAPs and RAPs.

Cooperative action

- The Endangered Species Program will seek to work cooperatively with the Buschare Program to fund action on threatened ecological communities.
- Options for complementary action on threatened marine species and communities will also be explored with the Coasts and Clean Seas Program.

- Consideration is currently being given to incorporating labour assistance as part of the Endangered Species Program through, for example, greater use of the Australian Trust for Conservation Volunteers.

Threat-based approach

Instead of focusing on a species-based recovery process, the Endangered Species Program will give particular emphasis to developing a new 'threat-based' recovery approach. In general, this will involve systematically examining the listed species and communities in each region, identifying the most common threats to the listed species and communities in that region and developing recovery plans which focus on reducing those threats. It is anticipated that this type of approach will:

- focus on the causes of endangerment rather than the effects;
- provide much greater opportunity for community involvement in and management of the recovery process - although this has not yet been tested;
- reduce the threats to species and communities in a range of categories (rather than simply focusing on those in the critically endangered and endangered categories);
- reduce the likelihood of species and communities progressing up the scale of endangerment;
- have benefits for other non-listed species and communities; and
- provide opportunities for greater interaction between Commonwealth and State programs.

Improving Information

Environment Australia is currently developing a National threatened species database that will:

- consolidate information on the status, habitat requirements, distribution and key threats to listed threatened species and communities;
- be available for interactive use through the internet;
- include an internet-based development application and approval process;
- provide access to all recovery plans, action plans and conservation overviews;
- present relevant information from the 485 recovery plans that have already been developed;
- present data gathered by recovery teams and through other processes such as the RFA process; and
- be on-line from early 1999.

In addition, Environment Australia will be working to produce development and threatened species guides for key industry sectors. These guides will:

- recommend minimal survey requirements;
- indicate threatened species potentially of key concern to particular industry sectors;
- provide examples of best practice industry developments; and
- provide appropriate contact details and references.

Improving Community Involvement

Improved levels of community involvement in recovery planning and on-ground action will be encouraged by:

- increased flexibility in funding arrangements;

- improved assistance and advice to SAPs, RAPs;
- improved assistance and advice to groups or individuals seeking funding through the Endangered Species Program; and
- providing increased support for the Threatened Species Network.

Summary

In summary, many species are currently recognised as threatened in Australia - and there is little doubt that more species and communities will continue to added to the Endangered Species Protection Act 1992. Addressing this problem requires more than reliance on the 'traditional' single-species recovery process - it is imperative that we take the time now to explore new avenues, address challenges and answer key questions.

The Commonwealth is responding to this imperative by exploring opportunities for streamlining and improving current legislative and administrative processes for the protection and recovery of threatened species.

But action by the Commonwealth is not enough. A cooperative, coordinated and innovative effort by all agencies, community groups and individuals represents our best chance for success.

Over the Hill - a New South Wales Perspective on a Shared Heritage

R. John Hunter, New South Wales National Parks & Wildlife Service,
GIO Building, Moonee Street, Coffs Harbour, NSW, 2450.

A human artefact, the Queensland/New South Wales border divides one of the most biologically diverse parts of the Australian continent - coastal and near-coastal southern Queensland and northern New South Wales. This area is also home to perhaps the greatest concentration of threatened rainforest plant species on the continent. To recover these species and the ecosystems where they occur it is advantageous to have an overview of their distributions. The threatened rainforest species and communities in northern New South Wales are discussed, with an emphasis on the links to southern Queensland.

The Tweed Shield Volcano is central to understanding the distribution of such species. One of the two major rainforest refugia on the east coast of Australia, this ancient volcano is now a threatened species hot spot. The threatened species and ecosystems clustered around its eroded flanks are the remnants of past more-extensive distributions, new species establishing a foothold and the tattered survivors, particularly on the lowlands, of human assault. Examples of each type are discussed.

Beyond the Tweed Shield are smaller refugia, often with their own unique (and very often threatened) rainforest plant species. Examples of such refugia and species are noted, with a particular emphasis on those in New South Wales.

The current approach to recovery planning in New South Wales is also discussed.

South-Eastern Queensland and North-Eastern New South Wales make up a region which has probably the highest priority for attention Australia-wide for the recovery of rainforest species and rainforest ecosystems. This region is second only to the Cape York/Wet Tropics area in the number of rare or threatened rainforest plant species occurring (Briggs & Leigh 1995), but, because of the more extensive clearing of the lowlands - particularly the alluviums and basalts - there is a higher proportion of critically endangered rainforest species in this area. This situation is unlikely to improve, given the rapid growth in population in South-Eastern Queensland and North-Eastern New South Wales; Brisbane is expected to exceed Melbourne in population within a decade.

It is a truism that administrative boundaries often limit the ability of people to see beyond them; the neat parcelling of the landscape for one reason often places false boundaries on ones perception of other realities. An unfortunate historical fact has seen the biological unity of the South-Eastern Qld / North-Eastern NSW obscured by the fact that the region is dissected by the Qld/NSW State border. The biological slight offered by this artificial construct is compounded by the fact that the border runs through landforms of fundamental importance to understanding the distribution of rainforest types and species in south-eastern Qld and north-eastern NSW - the Mount Warning and Focal Peak shield volcanoes.

The formation of the volcanic shield, similar in shape to an inverted saucer, of the Focal Peak volcano began about 24 million years ago. Originally stretching as far as Beaudesert and Beechmont in the north-east and Nimbin and the Doon Doon Valley in the Tweed in the south-east, this large volcanic massif with its true volcanic caldera is now represented only by intrusions such as Nimbin Rocks, Mt Clunie and Mt Lindesay and the remnant volcanics of areas such as the Koreelah, Tooloom and, possibly, Richmond Ranges (Rainforest Conservation Society 1992).

The Mount Warning shield volcano was emplanted east of the Focal Peak volcano and on the edge of the continent. Formed between 23 and 18 million years ago, this volcano was originally over 1900 metres in altitude (Floyd 1977). The presence of this mountain composed of large areas of relatively fertile basalt and smaller, but significant, areas of less fertile rhyolite close to the ocean was of major importance to the survival and evolution of rainforest in Australia. Proximity to the ocean resulted in the shield receiving orographic rainfall even during times of drought or periods of drier climate. The generally high rainfall and the fertile soils made this an ideal site for rainforest.

The high rainfall also resulted in the erosion of the shield. The streams on the eastern flanks of the volcano were larger than those on the western side because of the higher rainfall from winds off the ocean, and the initially radial drainage system was altered as the eastern streams ate more quickly back into the shield. Eventually these eastern streams cut back and encircled the central vent of the shield leaving this vent, the mountain we know as Mt Warning, standing isolated in the centre of the resultant erosion caldera (the Tweed Valley).

The history of Australian rainforest is one of a contraction from continent-wide distribution when Australia was connected to Gondwana to a near coastal distribution in a discontinuous band from the Kimberleys to Tasmania. Environmental upheavals associated with cycles of Glacials (‘Ice Ages’) and Interglacials over the past few million years have further moulded the distribution of the Australian rainforests and sifted their species composition. Central to the survival of the rainforests have been areas of reliable moisture and relatively fertile soils which have provided refugia for rainforest. Despite the major changes in climate there have always been refuge areas for rainforest. While generally having fertile soils and adequate moisture, rainforest refugia are areas often (but not always) associated with gullies and steep topography; in particular, rainforest refugia are areas which are protected from fire (Webb & Tracey 1981).

The Mount Warning and Focal Peak shield volcanoes combining relatively large areas of fertile soils, adequate rainfall and topographic relief were crucial refugia for rainforest, particularly as most rainforest refugia were smaller and more fragmented by environmental perturbations. Mount Warning is recognised as the second most important refugia on the east coast, the major refugia being the mountain massifs of the Wet Tropics (Floyd, pers. comm.). Nor is the importance of this refugia confined to its role in ensuring the survival of rainforest. There is good evidence to suggest that the shield volcano was a centre for the evolution of rainforest types and rainforest plant species.

Understanding of Australian rainforest ecosystems was distorted by the belief, first advanced by Hooker (1860), that they were ‘alien’ to the continent, a belief which was fostered by the often stark contrast between the rainforest and the ‘typical’ Australian *Eucalyptus* and *Acacia*

communities. The belief that rainforest in Australia was 'invasive', with a southern, Antarctic rainforest contribution and a northern, Indo-Malesian contribution dominated thinking until quite recently, and was central to the recognition by Burbidge (1960) of an overlap zone between the Antarctic and Indo-Malesian rainforest floras in south-eastern Qld and north-eastern NSW - the Macleay-McPherson Overlap. Unfortunately, this reinforced the mistaken belief that the rainforests of the border area were some type of mediocre half-breeds.

It remained for two of the foremost students of rainforest ecology, Len Webb and Jeff Tracey, to burst the bubble and place Australian rainforests squarely at the centre of the evolution of Australian plants and plant communities. They and a co-worker carried out floristic analyses of rainforest sites across the continent and showed that past environmental sifting of previously more continuous rainforest vegetation of Gondwanic origin had resulted in distinct lines of rainforest evolution within Australia (Webb and Tracey 1980; Webb *et al* 1984). They recognised that there is a primary separation between the northern hotter (megatherm) rainforests and the southern cooler (mesotherm/microtherm) rainforests. The first includes two groups - ecofloristic regions B and C - while the latter incorporates ecofloristic region A.

Ecofloristic region A is therefore distinct from regions B and C, and this represents an evolutionary parting of the ways relatively early in the Australian portion of the Gondwanic rainforest flora. Region A incorporates the south-eastern rainforests and ranges from cool temperate and upper montane through warm temperate and lower montane to cool/warm subtropical thermal regimes (Webb et al 1984). Each of the regions is made up of several ecofloristic provinces and each of these provinces has a fairly compact 'core area'.

The A region has three provinces. The core area of the A1 province represents the optimal humid mesotherm regime on mainland Australia and is centered on subtropical coastal southern Qld and northern NSW - specifically, the lowlands and up to about 900 metres on the Mt Warning shield (Webb *et. al*. 1984). Outliers are scattered from Mackay to Dorrigo.

As well as being the core of the A1 province, the Mt Warning shield is also part of the core area of the A2 province which is subtropical-lower montane (microtherm/mesotherm) and extends along the humid cloudy highlands from the Qld/NSW border southward to the cool humid uplands of the Illawarra in southern NSW. This province includes the *Nothofagus moorei* dominated cool temperate rainforests which reach their northern limit on the Mt Warning shield plus other cooler rainforest types; these types often overlap with the A1 province at higher altitudes.

At its drier northern and western margins in southern Qld and northern NSW the A1 province is overlapped by the subhumid-humid warm subtropical C1 province. The C1 province is characterised by Hoop Pine 'scrubs' and its core area is on basalts or calcareous sediments on the lowlands in coastal and near-coastal areas north of Brisbane (Webb *et al* 1984). There are occurrences of this type on both the Mt Warning and Focal Peak shields.

As the core area for one province, part of the core of a second and with a representation of a third, it is not suprising that the Mt Warning shield is diverse in terms of both rainforest communities and rainforest plants. As has been noted above, the A region represents a distinct line of rainforest evolution and recent work indicates that the A1 province was central to this line, with the A2 province being less important and the A3 (which includes the

southern cool temperate rainforests of Tasmania and Victoria) being derived from the first two (Rainforest Conservation Society 1992). Unfortunately, the lowland portion of the shield has largely been cleared and the lowland subtropical rainforests on soils derived from basalt are now decimated and the remnants threatened with extinction. These were the most species-rich rainforests in northern NSW and southern Qld and were the home to a number of refugial species plus some species which are probably recently evolved. The decline of the lowland rainforests has had a considerable impact on native species.

An example is the Big Scrub, an area of lowland subtropical rainforest on the south-eastern flanks of the shield. Originally 75 000 hectares in extent, less than 100 hectares remains; that is, 99.86% has been destroyed and only 0.14% is left. Five birds are no longer present in the Big Scrub, including Rufous Scrub Bird, Bristle Bird, Albert's Lyrebird and Coxen's Fig Parrot. Most remnants have less than four species of ground mammal and the Freshwater Cod is no longer present in the streams. Only fragments remain and it is impossible to reconstruct the diversity of life which must have existed in this area. However, there are some hints of the biodiversity.

Victoria Park is an eight hectare remnant of the Big Scrub. In this small area, there are 97 species of trees and shrubs, 181 species of birds and 14 species of bats. Twenty-four of the animal species present are considered endangered and twenty-one of the plants are rare or threatened with six considered endangered. There is reason to believe that the former lowland subtropical rainforests on basalt-derived soils and alluviums in the Tweed Valley were even richer.

The NSW section of the Mt Warning shield supports 105 species of rare or threatened plants; eight are considered endangered and twenty-one are considered vulnerable. Recent studies of the coastal catchments from the Bellinger River to the Qld border (Natural Resources Audit Council 1996) concluded that forty-six plant species are endemic to the area and twelve of these are mainly restricted to rainforest. The artificial nature of the State border becomes obvious if adjacent parts of South-Eastern Qld, particularly the Qld section of the shields, are included in these calculation - this gives a further eighty endemic species for the bioregion. About one third of the total of about 126 endemics are associated with the Mt Warning/Focal Peak shield volcanoes.

Knowledge of a species across its range is desirable, if not essential, to recovering the species. However, the fact that a State border runs through such an important locus of distribution of threatened species does more than distort our perception of the species which are shared by the two states. It also hinders efforts to co-ordinate recovery of the species, if indeed co-operation is possible across the administrative boundaries.

Table One shows some of the threatened plant species which occur on the Mt Warning shield. (This list is probably not complete, due to the difficulty in reconciling the different classifications across the State border). These include species with a range of patterns of distribution - some are endemic to part of the shield and confined to one of the states, some extend further and occur on the shield in both states while others extend beyond the shield to other rainforest areas.

Threatened species with narrow ranges and endemic to the shield include *Austromyrtus fragrantissima, Baloghia marmorata, Corokia whiteana, Davidsonia pruriens* var. *jerseyana,*

Davidsonia sp. Mullumbimby', *Desmodium acanthocladum, Diospyros mabacea, Diploglottis campbellii, Elaeocarpus williamsianus, Elaeocarpus* sp. Rocky Creek, *Endiandra floydii, Endiandra hayesii, Eucryphia jinksii, Fontainea australis, Fontainea oraria, Isoglossa eranthemoides, Macadamia tetraphylla, Symplocos baeuerlenii, Syzygium moorei, Uromyrtus australis* and *Zieria adenodonta.* Endemic, but not threatened, rainforest species include species such as *Archidendron muellerianum, Ardisia bakeri, Lepiderema pulchella* and *Rhodamnia maideniana.*

Some threatened species are more widespread, with species such as *Syzygium hodgkinsoniae* and *Choricarpia subargentea* extending north from the shield into Queensland, some such as *Amorphospermum whitei* extending south into New South Wales and others, such as *Cryptocarya foetida* and *Acronychia littoralis,* extending both north and south. By contrast, the distribution of species such as *Diospyros mabacea* and *Fontainea oraria* which have relatively narrow distributions on the shield suggest that they may be recently evolved species.

The distribution of species such as *Amorphospermum whitei* and *Choricarpia subargentea* which occur only on the shield and in another area off the shield suggest that they are disjunctions of formerly more widespread distributions caused by environmental perturbations which have left such species in several refugia. The *Nothofagus moorei* communities might also be regarded as refugial but Floyd (1977) has suggested that those on the Mt Warning shield may have been separated from similar communities elsewhere for a very long period of time because the communities on the shield include endemics such as *Pittosporum o'reillyanum* and *Parsonsia tenuis.* The distribution of species such as *Elaeocarpus williamsianus* and *Davidsonia* sp. 'Mullumbimby' indicate the role of particular substrates (in this case metasediments on the eastern side of the shield) in providing 'refugia within refugia'

In NSW, beyond the Mt Warning shield are a number of other rainforest refugia, generally scattered along the Great Escarpment. These include the Dorrigo area which has endemics such as *Olearia flocktoniae, Denhamia moorei* and *Cryptocarya dorrigoensis,* and shares species including *Hicksbeachia pinnatifolia, Amorphospermum whitei, Castanospora alphandii, Endiandra introrsa* and *Alloxylum pinnatum* with the Mt Warning shield. The New England area nearby has the endemic *Neoastelia spectabilis* and shares *Tasmannia glaucifolia* with the Ben Halls Gap/Barrington Tops area further south. The limestones of the Macleay River valley have the endemic *Cryptocarya williwilliana,* while the gorges of the Wollemi have acted as a refuge for the ancient araucaria *Wollemia nobilis.* Further south the Illawarra area has the endemic *Daphnandra* sp. D and is one of the areas where *Eucryphia moorei* occurs; this latter being a close relative of *Eucryphia jinksii* which is known from only one small area on the Mt Warning shield. Further north in Qld there is another scatter of refugia including areas such as the Bunya Mountains, the Maleny/Kin Kin area, Granite Creek and Kroombit Tops.

These refugia and the patterns of species distributions are clues to past environments and past sifting and development of rainforest communities on the Australian portion of Gondwana. Human activities, particularly over the past two centuries, have much reduced these ancient lineages. Fortunately, we are now increasingly aware of the importance of our rainforests and efforts are being made to reverse the trend toward extinction which we have imposed on many rainforest species. The rainforests of southern Qld and northern NSW are the homes of

probably the most endangered rainforest species on the continent and workers in both states will need to co-operate if we are to ensure the survival of the greatest number of threatened species.

Formal recovery planning, funded by Environment Australia, began in NSW in the early 1990s. Four of the earliest plans were for Mt Warning Shield species - *Diploglottis campbellii, Elaeocarpus williamsianus, Fontainea oraria* and *Acronychia littoralis.* These four have been funded by Environment Australia and recovery works have been carried out. While these works are generally achieving what they set out to do, it is true to say that until recently they tended to concentrate on single species, and paid limited attention to nearby other threatened species and the communities in which they occur. This is not to say that communities were completely ignored in the past; one of the earliest plans written was for a threatened rainforest community - the Black Bean-Silky Oak (*Castanospermum australe-Grevillea robusta*) community.

The passing of the Threatened Species Conservation Act 1995 has given an increased State focus to recovery planning, with a New South Wales list of threatened species and increased State funding of recovery. Under this act provision is made for the listing of threatened species, threatened communities and threatening processes. Rainforest plant species occurring on the Mt Warning shield which have been, or are, the subject of recovery plans include *Angiopteris evecta* (this species is considered endangered in New South Wales), *Davidsonia pruriens* var *jerseyana, Davidsonia* sp. 'Mullumbimby', *Diospyros mabacea, Elaeocarpus* sp. 'Minyon', *Uromyrtus australis, Isoglossa eranthemoides, Randia moorei, Rapanea* sp. 'Richmond River' and *Owenia cepiodora.*

Two rainforest communities - rainforest on floodplains and littoral rainforest on krasnozems - are currently being considered for listing as threatened communities. Bitou Bush (*Chrysanthemoides* spp.) has been listed as a threatening process and Camphor Laurel (*Cinnamomum camphora*) is currently under consideration.

It is predicted that recovery planning and implementation in New South Wales will increasingly focus on recovery of communities. This commonsense approach is reflected by the increased emphasis on multi-species plans. It is to be hoped that the logical progression to community plans, as pioneered in Queensland, will soon follow. For the sake of our threatened rainforest species it is to be hoped that the prevailing boundary-induced myopia will be resisted.

It should always be remembered that governments will only deliver if people push them. If we feel strongly about something, we must make efforts at an individual level to get things done. We, as individuals, are the only people who can ensure that our threatened rainforest plants are recovered. In undertaking this very worthy enterprise it is to hoped that we will all confront the final boundary - the boundary that separates us as humans from the rest of nature. I believe that it will only be by crossing this boundary and recreating our links with nature that we will finally recover our selves and cease driving our fellow organisms into extinction.

Threatened plant species of the Mount Warning shield volcano

Acronychia littoralis
Amorphospermum whitei
Austromyrtus fragrantissima
Baloghia marmorata
Bulbophyllum globuliforme
Bulbophyllum weinthalii
Clematis fawcettii
Corchorus cunninghamii
***Corokia whiteana*
Cryptocarya foetida
Cyperus semifertilus
***Davidsonia pruriens* var. *jerseyana*
Davidsonia sp. 'Mullumbimby'
***Desmodium acanthocladum*
***Diospyros mabacea*
Diploglottis campbellii
***Elaeocarpus williamsianus*
***Elaeocarpus* sp. 'Rocky Creek'
Endiandra floydii
Endiandra hayesii
**Eucryphia jinksii*
Euphrasia bella
Floydia praealta
Fontainea australis
***Fontainea oraria*
**Fontainea venosa*
Hicksbeachia pinnatifolia
***Isoglossa eranthemoides*
**Macadamia integrifolia*
Macadamia tetraphylla
Marsdenia longiloba
Owenia cepiodora
Ochrosia moorei
Plectranthus nitidus
**Plectranthus habrophyllus*
**Pouteria eerwah*
Randia moorei
***Rapanea* sp. 'Richmond River'
Sarcochilus fitzgeraldii
Sarcochilus hartmannii
Sarcochilus weinthalii
Sophora fraseri
Symplocos baeuerlenii
Syzygium hodgkinsoniae
Syzygium moorei
Tinospora tinosporoides
***Uromyrtus australis*
Westringia rupicola
**Zieria collina*
Zieria granulata var. *adenodonta*

* Species which are known only from the Queensland section of the landform
** Species which are known only from the New South Wales section of the landform
Species common to Queensland and New South Wales have no asterisk

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The South-East Queensland Rainforest Recovery Project

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The rainforests of South-East Queensland have a high concentration of threatened rainforest plants and animals, particularly plants. Indeed, more than one-third of all of Queensland's endangered plants are found in South-East Queensland's rainforests. A number of threatened fauna species depend on these threatened rainforest habitats: the Black-Breasted Button Quail, Coxen's Fig Parrot, the Richmond Birdwing Butterfly, the Nangur Skink, and several rainforest frogs.

So far, recovery planning has taken a single species approach, and in many cases this approach will be the best. However, if there are a range of threatened species in the same habitat type then it will often be more practical and efficient to take an ecosystem approach. The rainforests of the Gold Coast and Hinterland, which have over 40 endangered and vulnerable plant species, clearly show the advantages of an ecosystem approach, as do the rainforests of Ipswich, our first rainforest ecosystem recovery region.

As well as taking an ecosystem approach, we are also not trying to recover particular ecosystem types or species right across the extent of their range. If recovery planning is to work effectively, then it needs to be locally owned and driven. Community groups, and in particular local landholders, need to be genuine partners in the recovery or workable actions will not be developed. Achieving both local ownership and a proper scientific basis for recovery actions creates the need for a coordinated approach to recovery planning at a bioregional level.

Background

In 1991, WWF funded a Queensland Herbarium study of South-East Queensland vineforests, culminating in the publication of *The Vineforest Plant Atlas for South-East Queensland.* 232 vineforest sites were studied, 63 of which were found to have high conservation value.

WWF implemented the South-East Queensland Vineforest Project in 1996, as a follow up to the 1991 study. A Federal 'Save the Bush' grant provided the funding for the project, which involved using the finding of the 1991 study and some subsequent surveys to promote the conservation and management of high conservation value vineforest sites. The project was overseen by an Advisory Committee consisting of representatives from WWF, the Queensland Department of Environment, the Queensland Department of Natural Resources, and the conservation movement.

Twelve high-priority sites were determined in consultation with the project Advisory Committee and the authors of *The Vineforest Plant Atlas for South-East Queensland.* Proposals for the conservation and management of the twelve sites were initiated. Other

components of the project included an extensive public awareness and education campaign, activities to increase community involvement in vineforest conservation, and developing and advancing solutions to the impediments landholders face in attempting to conserve remnant vineforest.

The 1996 South-East Queensland Vineforests Project gained considerable government, landholder and community support for the conservation and active management of vineforests and threatened vineforest plant species. This led the Queensland Department of Environment to invite myself to initiate threatened plant and ecosystem recovery for the Department's new Threatened Species and Ecosystems Unit early in 1997. The Department expected that the vineforest project would contribute to the preparation of Queensland's first threatened ecosystem recovery plan. This new phase of the project was made possible by a successful funding application to the Rothwells Trust, and by the granting of $10,000 from the Queensland Department of Environment. In the second half of 1997 the Department of Environment provided further assistance by funding a student placement from the University of Queensland Gatton Campus. The student, Siobhan Bland, prepared a draft rainforest ecosystem recovery plan for Ipswich, which was selected as the pilot area for the project because of its close proximity, progressive community and local government rainforest conservation work, and representation of a wide range of rainforest conservation issues.

Late in 1997 the project was expected to undergo a complete metamorphis into the South-East Queensland Rainforest Recovery Project with the receipt of funding from the Commonwealth Endangered Species Program. However, the funding application was unsuccessful because of uncertainty at a Federal level on how to proceed with threatened ecosystem recovery and a difference of opinion between the Commonwealth and Queensland Governments in regard to determining funding priorities for threatened plant species.

Proper funding for the project has continued to be the major impediment. Substantial funding was anticipated in early 1998 from an overseas grant to WWF Australia. However, it was decided to focus this funding on the conservation of tropical wetlands, leaving only a small amount available for the South-East Queensland Rainforest Recovery Project. This small amount of funding has been sufficient to keep the project alive and bring the Rainforest Recovery Conference to fruition, but not without a massive amount of unpaid work by myself.

A funding application for the South-East Queensland Rainforest Recovery Project has been submitted to the 1998/99 round of the Natural Heritage Trust (NHT). Comments received on the application from the NHT Regional Assessment Panel (RAP) were negative and demonstrated a serious lack of awareness by the RAP in regard to threatened species and ecosystem conservation issues. The project has, however, been given strong support by the State Assessment Panel (SAP), which is the next step in the NHT decision-making process. It is hoped that this support will assist this innovative project to secure long overdue funding.

Species recovery

As other presenters at the conference have shown, a very effective way of bringing threatened species back from the brink of extinction is through the preparation and implementation of 'Recovery Plans', which operate under the Commonwealth *Endangered Species Protection Act 1992*. A Recovery Plan is a detailed plan that sets out the research and management

needed to ensure the long term survival of a species in the wild. The Recovery Plan aims to re-establish viable populations of the species and includes the removal of threats such as invasive weeds or fire. All too often conservation actions fail in the long-term because they are random and ad-hoc. A Recovery Plan overcomes this problem by establishing a scientifically determined framework for conservation actions. Recovery Plans are overseen by Recovery Teams, which bring together all of the relevant stakeholders, including landholders, scientists, government representatives, and community groups.

Moving towards ecosystem recovery

So far, recovery planning has taken a single species approach, and in many cases this approach will be the best. However, if there are a range of threatened species in the same habitat type then it will often be more practical and efficient to take an ecosystem approach. The rainforests of the Gold Coast and Hinterland, which have over 40 endangered and vulnerable plant species, clearly show the advantages of an ecosystem approach.

If single species recovery plans were prepared for every single threatened rainforest plant species in the Gold Coast hinterland it would involve over 40 Recovery Teams preparing over 40 Recovery Plans. Because all of the species occupy the same ecosystem type in the same area, many of the threats to their survival are the same, for example habitat clearance and weed invasion. Similar or identical conservation actions will be therefore be needed for all of the species, making it much more practical and efficient to have one recovery plan with one set of ecosystem conservation actions instead of over 40. Recovery of the habitat also recognises that the species needs to be part of a functioning ecosystem. Individual species may still need other conservation actions, in addition to the conservation of their ecosystem, for example propagation and planting to increase plant numbers in the wild, but these actions are also likely to be able to be carried out much more efficiently through an ecosystem recovery approach. For example, it is more efficient to travel to a site and take cuttings of several species for propagation purposes rather than just one species.

The situation with other South-East Queensland rainforest areas is not as extreme as the Gold Coast example, but the benefits of ecosystem recovery can still be clearly seen. For example, in our pilot ecosystem recovery region of Ipswich, which is described in detail in the next paper, and the Gayndah area rainforests, which contain three endangered, two vulnerable, and two rare plant species.

Another reason for establishing ecosystem recovery is that the ecosystem itself may be threatened and need conservation actions in its own right. The paper “Distribution and Status of the Rainforests in South-East Queensland” provided an overview of the status of all of South-East Queensland’s rainforests, showing how past clearance has led to a number of rainforest ecosystem types to now be considered as “endangered” or “of-concern”. An example is the dry rainforest, or Semi-Evergreen Vine Thicket (SEVT), ecosystems of the Lockyer Valley.

Local ownership

Another problem with the current recovery planning approach is that it attempts to recover a species right across its entire range. For some species this involves thousands of kilometres, several State Governments, and a myriad of Local Governments. The result is Recovery

Team members flying large distances to meetings at considerable expense, serious difficulty in reaching concensus on conservation actions because so many different agencies are involved, and on-ground outcomes that don't work because decision-making leaves out community groups and landholders.

A better approach is a two-tiered process that involves:
1. Conservation assessment and priority setting at the large-scale level, for example at a bioregional level.
2. Conservation action planning at the small-scale local level.

Rainforest ecosystem assessment at the South-East Queensland bioregional level, as described in "Distribution and Status of the Rainforests in South-East Queensland", provides a good scientific basis for decision making in regard to regional and local priorities for conservation. However, the Ipswich pilot rainforest recovery shows that on-ground conservation actions are best determined at a local level so they are sensitive to the local situation and local needs and, importantly, can be owned by the local community. Local ownership is the key to lasting success because the community *wants* to keep carrying out the conservation actions.

Conclusion

Recovery planning for ecosystems is often much more cost efficient and practical than single species recovery, especially where there are several threatened species in the same ecosystem type or the ecosystem type itself is threatened. There are, however, key impediments to the advancement of ecosystem recovery planning. It has been extremely difficult to obtain funding for the South-East Queensland Rainforest Recovery Project, highlighting the need for both the Queensland and Commonwealth Governments to become more proactive in fostering new and innovative approaches to threatened species and ecosystem conservation.

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Ipswich Rainforest Recovery Project

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Ipswich City constitutes a significant subregion within the South-East Queensland Bioregion requiring recovery work on its threatened ecosystems and communities. It is also a rapidly growing urban centre within South-East Queensland. It features productive farming areas, several rural communities, two major rivers, an historic urban centre and natural bushland remnants that are abounding in ecological, scientific, aesthetic and recreational value. These values provide the foundations for a quality of life that is of high value to Ipswich City's residents and visitors, and it is therefore fundamental that these values be maintained and ultimately enhanced.

Ipswich City is currently experiencing rapid rates of population growth. Although there are positive outcomes from this population growth and economic development, it does ultimately have a significant impact upon the natural values that Ipswich City boasts. Of particular significance are the rainforest remnants which support a rich diversity of life, including more than 10 rare and threatened rainforest plant species and several threatened fauna species.

The Ipswich Rainforest Recovery Plan will be a comprehensive, yet concise and easy to use document. Land protection and appropriate habitat management will be the primary goal of the recovery actions. However, for some rare and threatened species, more active conservation management may still be required. A Recovery Team is overseeing the preparation of a plan which is still evolving. Most significantly the project is taking an ecosystem approach to Recovery planning and developing co-operative partnerships with the landholders and land managers of Ipswich's rainforests.

Introduction

Beginning in 1996, the WWF South-East Queensland Vineforest Project has been effective in conserving highly significant vineforests in the South-East Queensland Bioregion. The project has successfully engaged the community and government in this process. Consequently, the Queensland Department of Environment and Heritage (QDEH) invited WWF Project Officer Bruce Boyes to initiate threatened plant and ecosystem recovery for the Department's new Threatened Species and Ecosystems Unit. A major component of this work has been the initiation of ecosystem recovery processes for South-East Queensland rainforests.

Due to their rich soils, the rainforest communities of Ipswich City have been subject to extensive clearing for agriculture, rendering them much less common than they were before

European settlement. In conjunction with the original fragmented nature of the rainforest that occurs in Ipswich City, the remaining stands are known as remnants.

There are three broad types of remnant rainforest in Ipswich City and as they are all currently threatened with extinction at varying levels, they have been classified as Regional Ecosystems - 12.9/10.6, 12.9/10.15 and 12.9/10.15 (Young, 1997). They are characterised by species typical of the drier rainforest communities known as dry rainforest, vineforest or softwood scrub. The five major areas of remnant bushland which support these rainforest communities include the southern portion of the D'Aguilar Range in the north-east of the City (including Brisbane Forest Park), the Flinders Peak area in the south-east, the Rosewood scrub area in the south-west, the Pine Mountain area in the central-north and the Woogaroo/Opossum Creek area in the central east.

Project history

In choosing Ipswich, WWF has been able to take advantage of a high level of community and Ipswich City Council rainforest conservation action. Due to the high conservation values and perceived level of threat to the rainforest Regional ecosystems and threatened species in Ipswich, a Recovery Team was formed bringing together people of relevant expertise and interest with representatives from the key agencies involved in conservation.

To date a Draft Recovery Plan has been prepared. It will serve as a baseline from which to further assess the issues, impacts and outcomes of the proposed Recovery Actions. The information gained through the implementation of the Actions proposed in this document will be used to develop a formal Recovery Plan in 1999.

Why do the Ipswich rainforests require recovery?

The various rainforest ecosystem types in Ipswich all have high conservation value, particularly in the City-wide context. The majority of the rainforest remnants to be conserved by this project are listed as "endangered" in the Qld. Department of Environment and Heritage 'Regional Ecosystems' assessment. The endangered category is given to ecosystems with less than 10% of the original pre-European area remaining. Some remnants that are listed as "of-concern" will also be targeted for conservation. The "of concern" category is given to ecosystems with 10-30% of the original pre-European area remaining.

Rainforest communities have been almost completely cleared from the gentle slopes of lowland areas, meaning that the majority of remnants are on steep hills or mountain tops and sides, or in protected gully and riparian areas. Because of large-scale past clearance, remnants are very isolated, typically separated by distances of 5 to 20 km.

Land use between remnants is typically either grazing, timber plantations, or rural-residential. There is much anecdotal evidence (and in some cases documented reports) of continued decline and degradation of many of these remnants, mainly through the lack of appropriate or on-going management (refer to consultancy studies by Ecograph and Landcare Management Consultants - see References). Many of these areas are threatened with weed infestation and inappropriate fire regimes, while some have a number of competing land tenure interests which maybe incompatible with conservation.

To resolve these management issues the project will operate in conjunction with existing local and State Government incentives schemes, or alternatively facilitate and/or encourage the introduction of schemes where none currently exist. This project represents a significant change in mindset in regard to the community and its role in recovery planning. Firstly, it represents a shift in approach away from a primarily species based approach to recovery planning, towards a more habitat or ecosystem oriented approach. This approach acknowledges the need for effective land management and conservation (both species and habitat conservation) as a priority means of Recovery planning for threatened species and communities. Secondly, it renders Recovery Planning a locally owned and controlled process, by concentrating on species and ecosystem recovery across all land tenures within a region and inherently linking the actions of the Recovery Team to those of a variety of land managers.

The Recovery Team

The Recovery Team was established as of 16th October, 1997 and includes key stakeholders and authorities recommended to implement the various tasks detailed in the Draft Recovery Plan. Membership includes:

- WWF.
- Qld. Department of Environment & Heritage - Threatened Species and Ecosystems Unit.
- Department of Environment & Heritage - Central Moreton District, South-Eastern Region.
- Department of Environment & Heritage - Queensland Herbarium.
- Ipswich City Council.
- Pine Mountain landholder issues representatives.
- Rosewood Scrub landholder issues representatives.
- Envirocare - Ipswich Environment Network.
- Society for Growing Australian Plants – Ipswich.
- Society for Growing Australian Plants - Rainforest Study Group.
- Bremer Institute of TAFE, Department of Horticulture, Conservation and Environment Studies.

Summary of the conservation values of rainforest and related ecosystems within the Ipswich city boundaries

Regional ecosystem identification has been developed by the Queensland Department of Environment and Heritage as part of a nature conservation planning framework. Defining these ecosystems is considered to be a highly adaptive tool for planning and managing the majority of species and habitats. With rapid urban expansion and continued vegetation loss throughout the South East Queensland bioregion, a more detailed picture of what is happening to biodiversity at the regional scale is needed. In the context of assessing the conservation values in the biogeographic regions in Queensland, the regional ecosystems (indicating both current extent and pre-European distribution) becomes a useful baseline for conservation planning. There are two key components to identification of the regional ecosystems. Firstly, there are the physical patterns that define the environment and landscape, such as, geology and landform. Secondly, there are the biotic components of the landscape. Up until present these assessments have been mostly limited to flora, due to the paucity of fauna data across the State (unfortunately, this situation still predominates). However, when the extent of the current knowledge is combined (both physical and biotic characteristics)

these components can be used to identify the regional ecosystem type (Forest Assessment Unit et al 1998).

For the purposes of the Ipswich Rainforest Recovery project the Regional Ecosystems represent a useful baseline indicating the following (Refer to Figures 1 & 2):

- percentage of the ecosystem remaining regionally;
- approximate percentage of extent remaining in Ipswich;
- conservation status (both locally and regionally); and
- notional extent of ecosystems pre clearing.

This information is useful in establishing goals for the recovery of rainforests in Ipswich. Firstly, it establishes priorities in terms of conserving an adequate representation of the regional ecosystem types in Ipswich. Secondly, it also assists with establishing baseline figures for the area needed to be conserved to prevent further decline of the rainforests in Ipswich. Finally, it presents an indication of what needs to be done (in spatial terms) to recover the Ipswich Rainforests.

Regional ecosystem 12.9/10.6 and current regional ecosystem status

Regional Ecosystem 12.9/10.6 (Elsol; Sparshott; and Young and McDonald) is classified by Young (1997) as endangered. This classification reflects the current extent and threatening processes pertaining to this ecological community (Young, 1997). Regional Ecosystem 12.9/10.6 is known to occur in 9 locations within Ipswich City scattered throughout the Rosewood area and is commonly known as the 'Rosewood Scrub'.

This regional ecosystem type has contracted in its range to the extent that less than 10% remains today (Young, 1997). Prior to European settlement this ecological community, was somewhat naturally restricted (geographically) throughout the South East Queensland bioregion. It covered an area extending from Rosewood North through Marburg to Esk Shire (Young, 1997; Landcare Management Consultants, 1996).

Habitat requirements and limiting factors

This regional ecosystem type is characterised by the presence of *Acacia harpophylla* open forest ± *Allocasuarina cristata* and vine thicket species on Cainozoic to Proterozoic sediments especially fine grained rocks (Young, 1997). Little is understood of the ecological/biological requirements of this regional ecosystem type and thus research and monitoring in this area is indicated as a conservation priority.

Regional Ecosystem 12.9/10.6 was extensively cleared for pasture and cropping subsequent to European settlement (Young, 1997). Only limited areas remain of this ecosystem type and they are exposed to invasion from weeds like *Asparagus africans* (Young, 1997).

Regional ecosystem 12.9/10.15 and current regional ecosystem status

Regional Ecosystem 12.9/10.15 (Bostock; Elsol; and Young and McDonald) is classified by Young (1997) as endangered. As with Regional Ecosystem 12.9/10.6, this classification reflects the current extent and threatening processes pertaining to this ecological community

(Young, 1997). Regional Ecosystem 12.9/10.15 is known to occur in 8 locations within Ipswich City in the eastern Rosewood and Grampian Hills areas.

This regional ecosystem type has contracted in its range to the extent that less than 10% remains today (Young, 1997). Prior to European settlement this ecological community covered a more contiguous area in the Rosewood and Grampian Hills areas to west of the Woogaroo Creek area (Young, 1997).

Habitat requirements and limiting factors

The remnants of this ecological community possess special ecological values in that they provide habitat for rare and threatened flora species including *Callitris baileyi.* Regional Ecosystem 12.9/10.15 was extensively cleared for pasture and cropping subsequent to European settlement (Young, 1997). It requires intensive management due to the high risk of invasion from weeds as well as fire damage on its margins (Young, 1997). Little is understood of the ecological/biological requirements of this regional ecosystem type and thus research and monitoring in this area is indicated as a conservation priority.

Regional ecosystem 12.11.11 and current regional ecosystem status

Regional Ecosystem 12.11.11 (Bostock; Elsol; and Young) is classified by Young (1997), as "of-concern". "Of-concern" correlates to the status of vulnerable in the Commonwealth *Endangered Species Protection Act 1992*. As with Regional Ecosystems 12.9/10.6 and 12.9/10.15, this classification reflects the current extent and threatening processes pertaining to this ecological community (Young, 1997). Regional Ecosystem 12.9/10.15 is known to occur in 11 locations within Ipswich City at Pine Mountain (with an additional 2 sites at Sapling Pocket and World's End Pocket), Kholo Creek, Woogaroo and Opossum Creeks and the Flinders Peak area.

This regional ecosystem type has contracted in its range to the extent that only 10-30% remains today (Young, 1997). Prior to European settlement this ecological community covered contiguous stretches in the Pine Mountain area, Woogaroo and Opossum Creeks and west of the Flinders Peak area extending into Beaudesert Shire (Young, 1997).

Habitat requirements and limiting factors

The remnants of this ecological community possess special ecological values in that they provide habitat for rare and threatened flora species including *Alyxia ilicifolia* subsp. *magnifolia, Corchorus cunninghamii, Cupaniopsis tomentella, Hernandia bivalvis* and *Sarchochilus dilatatus* (Young, 1997). Regional Ecosystem 12.11.11 was extensively cleared for pasture and cropping subsequent to European settlement (Young, 1997). Consequently remnants are vulnerable to weed infestation and wildfire damage on margins (Young, 1997). Little is understood of the ecological/biological requirements of this regional ecosystem type and thus research and monitoring in this area is indicated as a conservation priority.

Figure 1 - Preclear Ipswich Rainforest Ecosystems

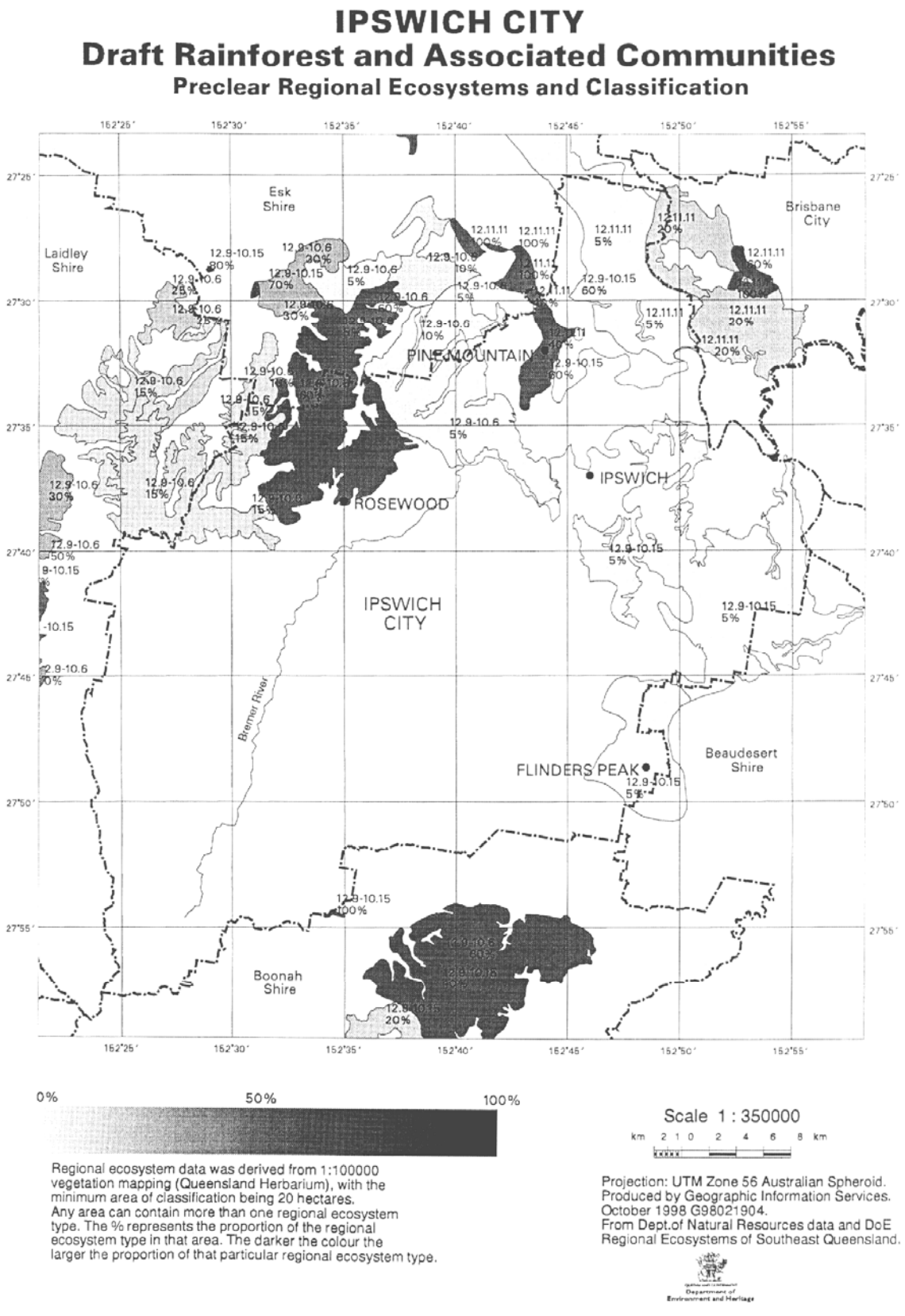
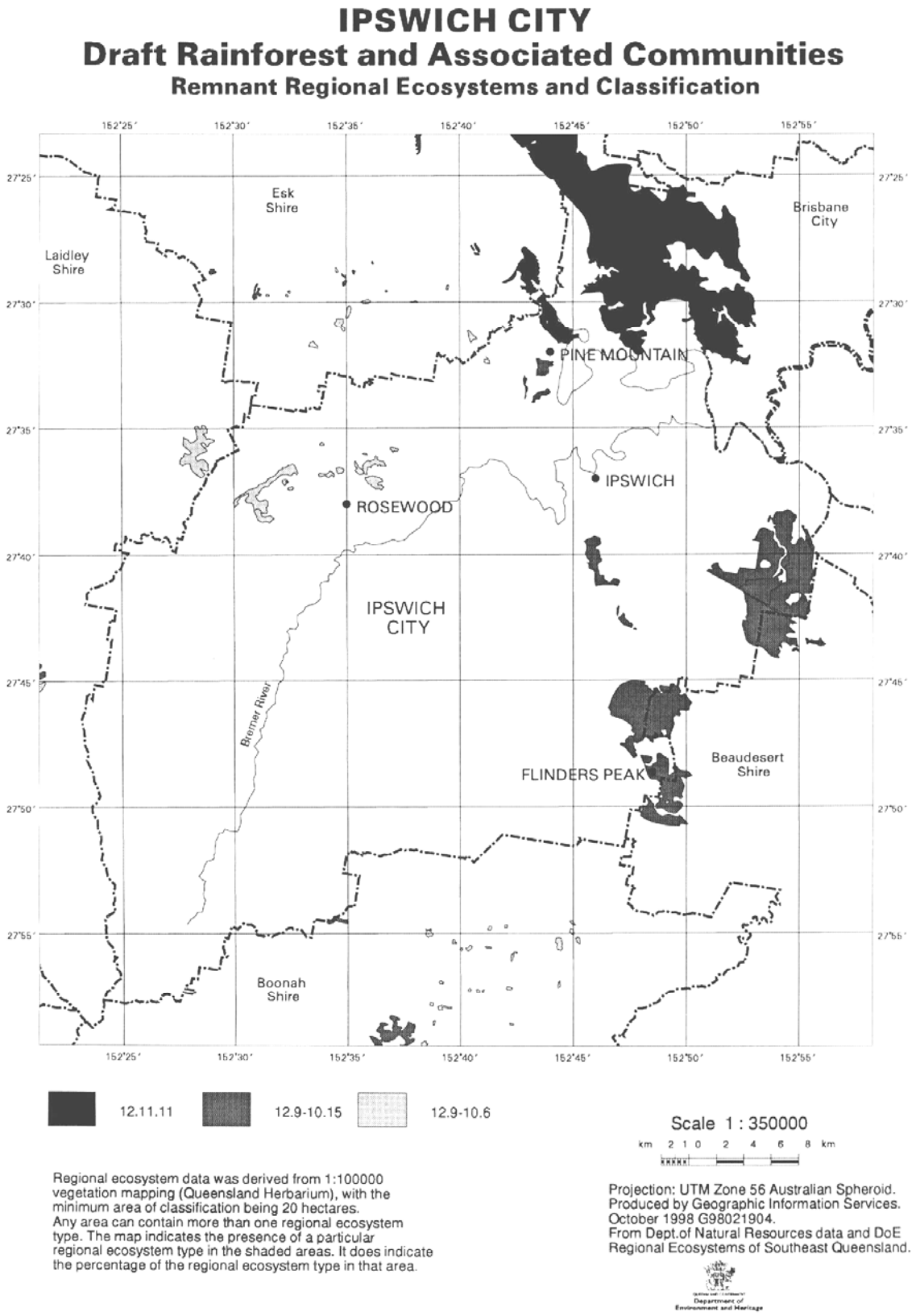


Figure 2 - Remnant Ipswich Rainforest Ecosystems



The recovery process for the Ipswich rainforests

Strategy for Recovery

In order to prevent further decline of these threatened rainforest ecosystem areas (including flora and fauna components) within Ipswich City, and to contribute to the conservation of endangered and vulnerable plant species, this Recovery Plan aims to provide a framework for current and future recovery actions throughout Ipswich City.

The WWF Ipswich Rainforest Recovery Team will be working to involve the local community, landholders and industry in extensive education programs as well as undertake several conservation actions to ensure the conservation of the current extent of the ecosystems and species in question. The Recovery Actions also include a research and monitoring program to improve the knowledge of these communities and flora and fauna species in order to enhance conservation and management priorities over time.

Development of a draft Recovery Plan

The Recovery Team identified what it considers to be the realistic goal of preventing further decline of threatened rainforest ecosystem areas (including flora and fauna components) within Ipswich City, contributing to the conservation of endangered and vulnerable plant species. Recovery Criteria were identified to measure the success or failure of the Recovery plan. Measurable units were identified so that at any stage of the implementation phase of the project, it can be evaluated by anyone on the Recovery Team in a consistent manner.

The first year in the implementation phase, of the project (1998/99) represents the application of the priority actions identified in the Action Plan component of the Draft Recovery Plan. Preparing an Implementation Schedule for these actions involved the identification of the agency or organisation responsible for administering the implementation of each action, as well as costing and sourcing of all funds required. The continued co-ordination of the implementation of the plan will be the responsibility of WWF project staff.

Identification and implementation of draft recovery actions

The Recovery Team identified the need to establish Demonstration Sites on areas with high conservation values, as a useful component of an Draft Recovery Plan. These Demonstration Sites incorporate a number of conservation actions derived from the Recovery process. These actions can be broadly broken down into categories such as:

- “on ground works” in conservation and management (initially focusing on high priority demonstration sites);
- flora and fauna surveying;
- research and monitoring (particularly on demonstration sites);
- community involvement in promotion of the project, including various conservation activities and education; and
- *in-situ* and *ex-situ* species establishment of rare and threatened species.

Actions are further detailed into more specific Tasks to be undertaken in order to achieve that action ie. the Action “to develop a natural regeneration program”, can be broken down into

Tasks such as: exclusion of grazing, fencing to prevent vandalism, monitoring of weed regrowth as compared to seedling recruitment.

The "on ground" work carried out on demonstration sites will represent a baseline from which to further assess the issues, impacts and outcomes of the Draft Recovery Plan. The information ascertained from these actions will be used to review and develop a Recovery Plan in 1999.

Future directions

Research

The intended research and monitoring work on demonstration sites will provide valuable information on ecosystem dynamics and management issues. In general terms, information is lacking on the usefulness of remnants as reserves for the protection of rare and threatened species or as examples of conservation of threatened communities. For example, it is poorly understood how the size of a remnant and the degree of isolation it may have, relates to the sustainability of populations of many species and communities. The Ipswich Rainforest Recovery Plan will undertake monitoring studies to assess these issues. The studies will examine a broad range of issues such as the impact of edge effects, corridor usage, and natural regeneration. The information gained from such study will help develop a better understanding of the viability of remnants and the usefulness of (re)establishing viable corridors. Other important areas of research include:

- establishing appropriate grazing and fire regimes;
- increased understanding of the reproductive ecology of rainforests and associated community types;
- management guidelines for faunal habitat maintenance and (re)establishment;
- establishment of successful techniques for the propagation and cultivation of a broad range of rainforest species; and
- examine the priorities with respect to genetic research and *in-situ* and *ex-situ* (re)establishment and restocking of rare and threatened flora species (a case by case assessment).

Initially, the results of further research and monitoring will aid the Recovery Team in the development of a formal Recovery Plan over the next year. This Recovery Plan will determine what needs to be done over the next five years to achieve the Recovery Teams goals. As a better understanding of the biological and ecological requirements of each ecosystem type is established, the Recovery Team will review its progress and re-evaluate its overarching goals.

Promotion of the project and creating new partnerships

The Recovery Team has drawn on a broad range of community groups and includes representation from non-government and government agencies. For this reason, it has the potentiality of very broad dissemination throughout the community. The project already has strong publicity, essentially through newsletters, in particular *WWF South-East Queensland Rainforest Recovery News.* Edited by Project Coordinator Bruce Boyes, this newsletter has been very successful in actively engaging the community in rainforest conservation.

The on-going development of new partnerships has been identified as an integral component of the Recovery Plan. Such partnerships include:

- establishing partnership agreements with industry groups;
- establishing an education program which demonstrates to the public the benefits of the recovery project; and
- investigate the opportunities to develop a range of incentives for public participation in the recovery project.

Getting "on the ground" results

The project has already achieved much, through forging partnerships at many levels, for example:

- the involvement of landholders in the Recovery Team has led to the sharing of valuable knowledge about land management and conservation;
- it is planned that several sites will become demonstration and monitoring components of the Draft Recovery Plan in its first year of "on ground" funding;
- the demonstration sites will ultimately provide active examples of sustainable land practices and conservation; and
- overall the project is demonstrating the benefits of community-based partnerships, representing genuine value-for-money in the conservation of rare and threatened species and communities.

Conclusion

With the Ipswich Rainforest Recovery Team now into its second year, it is clear that the Recovery Plan will continue to evolve over time. However, the Recovery Team is committed to the long term goal of conserving rainforests in the Ipswich region and is already demonstrating the benefits of community-led recovery work at the regional scale, and importantly it has established multi-stakeholder representation and support. The Recovery Team believes that with continued support it can develop the project into a model for the conservation of other rainforest ecosystems throughout the region, and ultimately for the conservation of other ecosystem types throughout Australia.

Acknowledgments

We would like to thank the Ipswich Rainforest Recovery team for their commitment to the project and the work they have undertaken over many years, which partly inspired the formation of the team. Also: WWF SEQ Rainforest Recovery Project Co-ordinator, Bruce Boyes; Ipswich City Council; those landholders who have shown great interest in the project and allowed us to become involved in their activities; and the Queensland Department of Environment and Heritage Geographic Information Services who assisted with mapping the Regional Ecosystems and preparation of maps for this publication.

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Recovery of an Endangered Fish - the Mary River Cod

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Funded by the National Fishcare Program of the Dept. of Primary Industries and Energy.

Large Mary River cod once lurked in the deep shaded waters of the streams in the Mary River Catchment providing plentiful food for Aborigines and early European settlers. Elderly residents of the Mary Valley talk about cod at least 38 kg being caught in the early 1930's. Today the cod remains only in a few parts of the Mary River system. Within one generation the Mary River Cod has gone from plentiful to rare...we are missing out on what our grandparents once enjoyed ... large cod seen in clear deep water shaded by trees.

Riverine rainforests occurring as narrow bands along parts of the Mary River and its tributaries once played a key role in the Mary River Cod habitat. The roots of the vegetation binded and held the stream banks together and reduced the velocity of water which would otherwise eat away unprotected banks. This stream bank vegetation provided shade, acted as a natural nutrient filter and provided food sources for aquatic plants and animals. Eventually some of this vegetation became snags providing habitat and refuge for fish such as the Mary River Cod. Riverine rainforests too became threatened within one generation.

To recover the endangered Mary River Cod requires increasing the amount of cod habitat by safeguarding existing riverine rainforests and rehabilitating degraded riparian areas.

A twelve month WWF project to map cod habitat in the Mary River Catchment was funded by the National Fishcare Program of the Dept of Primary Industries and Energy and co-ordinated through the Threatened Species Network. Features of this project included:

- *Working with landholders, fishing groups and interested members of the community to map known areas where Mary River Cod are still surviving.*
- *Identifying areas which may be suitable for restocking in the future.*
- *Identifying areas which require remedial works to protect or restore cod habitat.*
- *Providing extension services to landholders interested in remedial works on their property.*

Top predator and bottom line indicator in the Mary River catchment

The Mary River cod is a top predator in the stream system. In the food web in the streams, which starts with leaves falling into streams being eaten by small invertebrates which in turn are eaten by small fish who are eaten by larger fish, the cod is at the end of the line. So the cod depends on the health of stream system in which it lives.

The Mary River and its tributaries drain the Mary River catchment. Everything everyone does in the Mary River catchment can help or hinder the future of the Mary River cod. So the health of the cod population is an ideal indicator of the overall health of the catchment. Now, the Mary River cod is endangered and our riverine rainforests are threatened.

Recovery Plan for the Mary River cod

The Recovery Team for the cod, chaired by DPI Fisheries and attended by representatives of community groups, local councils, and State and Commonwealth departments and agencies, oversees the process of saving the Mary River cod.

In late 1995, this Recovery Team drew up and published a Recovery Plan for the cod. The key actions recommended in the Recovery Plan are:

- *Increase the numbers of cod* by limiting the taking of cod and restocking streams with cod fingerlings [the taking of cod has been prohibited since December 1996, with a fine of up to $75,000 for taking cod. Cod are being bred up in hatcheries for release into the streams of the Mary River catchment potentially starting early 1999].
- *Increase the amount of cod habitat* by safeguarding existing cod habitat and rehabilitating degraded habitat [projects such as the Mary River Cod Habitat Mapping & Extension Project (WWF) and the Volunteer Riverbank Restoration Grants Scheme (MRCCC) are surveying, promoting and supporting cod-sensitive stream management by landholders].
- *Research* the cod's biology and ecology and develop hatchery techniques for breeding cod [DPI Fisheries commenced radio-tagging and tracking cod in late 1997 and are supporting hatchery technique research at the Gerry Cook Fish Hatchery, Lake Macdonald].
- *Monitor* the cod's progress and the effects of these recovery activities.
- *Most importantly*, involve the community [the Mary River Cod Community Network is the focus for community effort and interest in the future of the Mary River cod].

The Recovery Team recognises that the cod has no future without the involvement, commitment and action of the people of the Mary River catchment.

About the Recovery Plan, it is important to remember that just because the Plan has been published, this doesn't mean there are any guarantees that the actions in the Plan will occur. That is still up to community commitment and uncertainties such as government favour and the availability of funding.

Cod need more habitat

There isn't much point in breeding up numbers of small cod for release if they have nowhere to live. For the cod to have a future, stream conditions throughout the catchment need to become cod-friendly again.

Cod habitat is characterised by isolated holes of deep, slow-flowing water, littered by snags and overhung by riparian vegetation. However, cod habitat is much more than this. Whatever anybody does, anywhere in the catchment - in streams, beside streams, and some distance from streams - has implications for cod habitat. Whatever ends up in streams - including, most importantly, sediment from collapsing stream banks and overland flow - affects and potentially degrades cod habitat.

Vegetation is the essential component in restoring and safeguarding cod habitat. This doesn't mean a few isolated trees and a lot of grass. Good riparian vegetation is multi-storied, dense, and consists of predominantly native (preferably local) species.

Healthy riparian vegetation along streams is the key to good cod habitat because:

- *Trees limit erosion*: multi-storied, undisturbed stream-side vegetation stabilises banks and reduces the erosive impact of floodwaters, reducing the sedimentation of streams which fills up all the old cod holes.
- *Trees become snags*: trees that die or are pushed down by flood waters become snags in streams, creating habitat for cod to feed and breed.
- *Trees shade streams*: overhanging vegetation shades the water and moderates water temperatures - essential for the cod's breeding success.
- *Trees drop leaves*: leaves from native plants falling into streams form the basis of a healthy aquatic food web essential for the cod to survive.

Mapping cod habitat

Step 1 in building a future for the cod is getting a clear picture of stream conditions from the cod's point of view. By field surveying, this WWF project has quantified some of the extent of riparian vegetation degradation in the Mary Catchment and draws to the attention of the community the urgent need for vegetation protection and rehabilitation, riparian weed control and extent of instream degradation due to excessive water plant growth. All problems need to be worked on in order to improve water quality in the area. The Cod habitat data for about 300 km of stream has been recorded on a GIS database and is available to the 5 Shire councils, Landcare Groups, Department of Natural Resources/DPI and members of the community requesting the data.

Local people are taking action for the cod

Over the past two years, the Mary River Cod Network Co-ordinator (Barung Landcare) has involved community members through numerous public meetings, displays, information pamphlets, media articles and a regular newsletters. In the Six Mile creek subcatchment, where a remnant population of cod still survive within good habitat, the riparian rainforest communities now occupies only 462 Ha (1.2%) of the Noosa Shire and is recognised as a rare vegetation community. It is reduced to a narrow fringe along the creek in most places and still contains many species - several rare and threatened. An intensive recording of riparian plant species in 25 sites along the Six Mile Creek is being conducted by Dave Burrows (Corridors of Green, Greening Australia). Through public meetings and Landcare contacts, landholders have expressed interest in protecting their riparian vegetation. This is combining with the increasing knowledge base being built up by the Noosa & District Landcare Group in propagation and natural regeneration of this vegetation.

The cod's future depends on the commitment and activities of the people of the Mary River catchment.

The people who can have the most effect on the cod's future are riparian landholders. It is being able to recognise that, with *different* management, the riparian area can be used to both benefit the cod as well as improve property management and capital value. Advantages for the landholder include reduced bank erosion, improved water quality, opportunity for farming

diversity e.g. forestry, bush tucker, providing windbreaks and improving aesthetics. There are also challenges such as weed control, vegetation protection and planting, fencing and providing watering points.

Landholders are not out on their own with this. Resources are available in terms of advice (Landcare groups, DNR, DPI, WWF), funding (Volunteer Riverbank Restoration Grants Scheme), and labour (a number of community and volunteer groups are interested in participating in this sort of work). **It is important to remember that the whole community can gain benefits from better quality water that comes from managing the riparian vegetation differently.**

A future for the Mary River cod means a *better future for the people of the Mary River catchment*

The people who can have the power to have the most effect on the cod's future are the people living in the Mary River catchment. People who live beside streams can do the most, but everyone else has a part to play too, in using water resources carefully and keeping our environment as clean and healthy as possible.

If we do what we need to do to build a future for the cod, it will mean a healthier, more sustainable way of living for the people sharing the catchment with the cod.

Conservation and Recovery of *Austromyrtus gonoclada*

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The Austromyrtus gonoclada Recovery Program is introduced, with a background on the species, the formation of the recovery team and its objectives. In addition, the process used in the implementation of the Recovery Program will be discussed. This includes the protection of existing plants, the surveying of more sites to find new populations, the propagation of Austromyrtus gonoclada and in situ replanting as well as the revision and updating of the plan. In summary, an update on the project is provided along with a report on the current situation.

What is a recovery plan?

The Commonwealth Endangered Species Protection Act 1992 prescribes the Recovery Plan process as the key approach to securing the status in the wild of endangered and vulnerable species and endangered ecological communities. The Act prescribes the content of a Recovery Plan to be approved or adopted under the Act. The Recovery Plan is a comprehensive plan that details, schedules and costs all actions assessed as necessary to support a species, community or ecosystem. The Recovery Team is a group of people of relevant expertise and responsibility charged with assisting the lead agency in writing, implementing and monitoring the Recovery Plan. The Recovery Plan in Queensland is a specific type of management plan that serves four functions.

Function 1 - To collate the current knowledge of a species' distribution, biology, conservation status and threats.

Distribution

In the case of *Austromyrtus gonoclada*, the distribution is as follows:

- Usher Park, Daisy Hill - 3 trees.
- Alexander Clark Park, Loganholme - 2 trees.
- Murray's Road Environmental Reserve, Slack's Creek - 5 trees.
- Land owned by RJH & RJD Murray - 36 trees (However many of these trees may be subsequently shown to be suckers and the total count could go as low as 10).
- Nosworthy Park, Corinda - 1 tree.
- Oxley Creek - 8 trees.

Biology

Austromyrtus gonoclada is a rare and endangered small tree growing to about 8 metres. It has shiny opposite leaves, pink in new growth, and 4-angled new stems. The white five petalled flowers are produced in late spring, with fruit ripening from mid-January to about March. Fruit are black ovoid berries about 1 cm in diameter. The typical habitat of *Austromyrtus gonoclada* is riparian rainforest, with plants growing from 0.5 metres to 2 metres above mean

water level, in alluvial soils containing good moisture at depth. A member of the Family Myrtaceae, *Austromyrtus gonoclada* is associated with *Acmena smithii, Cryptocarya triplinervis, Aphananthe philippinensis, Ficus coronata* and *Syzygium francisii*. Only seven trees regularly produce fruit i.e. MB2, MA27, MA39, MA9, ME, A2 and the tree in Nosworthy Park (N1). The number of seeds / fruit varies from none to three, with averages varying from 0.9 to 2.6. Germination rates for seed collected from certain trees range from 0% (MA9) to 56% (MB2). It appears that seed viability could be as short as 2 weeks. The growth rate of seedlings is also being measured. Most plants reach 30cm tall in 12 months.

Conservation status

Austromyrtus gonoclada is rated as 2E (Queensland Rare & Threatened Plants List - Thomas and McDonald, 1989).

Threats

Austromyrtus gonoclada is threatened by urban expansion, grazing, weed infestation, fire and damage by soil compaction and vandalism.

Function 2 - To set out the objectives and criteria and the actions needed to achieve long-term survival of the species.

These actions for *Austromyrtus gonoclada* consist of:

1. Protection of existing plants by:
   - Establishing voluntary conservation agreements over private land containing *Austromyrtus gonoclada*.
   - Education and public awareness (e.g. display panels).
   - Fencing vulnerable plants.
   - Weed control.

2. Surveying sites of similar habitats to find new populations (so far none have been found).

3. Propagation of *Austromyrtus gonoclada* from seeds and cuttings. This process has been on-going since January 1996 with hundreds of plants grown mainly by Toona Rainforest Gardens, Mudgeeraba, the Brisbane City Council Nursery and Jacob's Well Environmental Study Centre. Seven trees have provided seed for propagation with a further eleven trees providing cutting for grown plants. Replanting of trees into favourable sites began in 1997 and is on-going. To date (15 August 1998) 46 trees have been planted with losses amounting to 14 plants (most of these are suspected stolen). Planting sites are:
   - Murray's Road Webb Site - 10 trees.
   - Murray's Road SGAP Site - 8 trees.
   - Usher Park, Daisy Hill - 6 trees.
   - Riverchase Park - 6 trees.
   - Oxley Creek Recreation Reserve - 9 trees.
   - Nosworthy Park, Corinda - 7 trees.
   - Meadowbank Park - 0 trees (planned for the future).
   - Alexander Clark Park - 0 trees (planned for the future).

- Rafting Ground Reserve - 0 trees (planned for the future).
- Seed Orchard - 0 trees (planned for the future).

Function 3 - To carry out population dynamics, reproductive and growth rate studies

Function 4 - To revise and up-date Recovery Plans

An updated Recovery Plan for *Austromyrtus gonoclada* is now available.

Background

The *Austromyrtus gonoclada* Recovery Team is the first to be formed in Queensland with the responsibility of saving an endangered plant. Logan City Council resolved to initiate the formation of the *Austromyrtus gonoclada* Recovery Team on 5 September, 1995, with the first meeting of the *Austromyrtus gonoclada* Advisory Team held on 13 December, 1995. This team has only met once. A smaller working group, the *Austromyrtus gonoclada* Recovery Team was formed soon after and initially met once a month. We now meet four times per year.

The team consists of:
- Sharyn French - Bushland Management Officer of Logan City Council.
- Jan Glazebrook - Society for Growing Australian Plants.
- Dr Bonni Reichelt - Society for Growing Australian Plants.
- Graham McDonald - Toona Rainforest Nursery and Society for Growing Australian Plants.
- Jim Murray – Landholder.
- David Murray – Landholder.
- Wendy Drake - Department of Environment.
- Wayne Kington - Department of Environment.
- Alex Knight - Department of Environment.
- Glenn Leiper - Jacob's Well Environmental Education Centre.
- Kenneth McClymont - Brisbane City Council.
- Dan Daly - Brisbane City Council.
- John McKenzie - Brisbane City Council.
- Julia Playford - University of Queensland.
- Tanya Pritchard - Greening Australia.

Summary

This tree was first collected at Moggill in the 1850's and then at New Farm in 1875. It then disappeared for over 100 years only to be found again by Glenn Leiper at Murray's Road, Tanah Merah in 1988. Will it disappear again or is its future secure? If the enthusiasm, dedication and skills of the *Austromyrtus gonoclada* Recovery Team is any indication, the tree now has every chance of becoming self-sustaining and able to regenerate in the field. Only time will tell!

The Recovery Process for the Kroombit tinkerfrog, *Taudactylus pleione*

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[4]Conservation Resource Unit, Department of Environment & Heritage, PO Box 42, Kenmore, Q, 4069.

The Kroombit tinkerfrog (Taudactylus pleione) is a secretive frog known from a few sites, totalling about l00ha, at Kroombit Tops, south-west of Gladstone. It appears to prefer rocky seepage zones in rainforest and palm scree. The frog and its habitat are vulnerable to a number of threats. This paper describes progress of the recovery process for the Kroombit tinkerfrog. Standardised population monitoring commenced in 1994. Recovery plan development began in 1996 with the final plan due for completion in 1998. Major recovery issues are the lack of information on life-history and threats. Known and potential threats include inappropriate fire regimes, grazing and the 'unknown causal agent(s)' of frog declines. Cattle-proof fencing around frog sites was completed in 1996 and fire management planning is under way. Targeted surveys at Kroombit Tops have resulted in the location of six new populations. Additional work is planned for later this year to re-survey known populations, investigate other potential sites, and collect basic life-history data.

Introduction

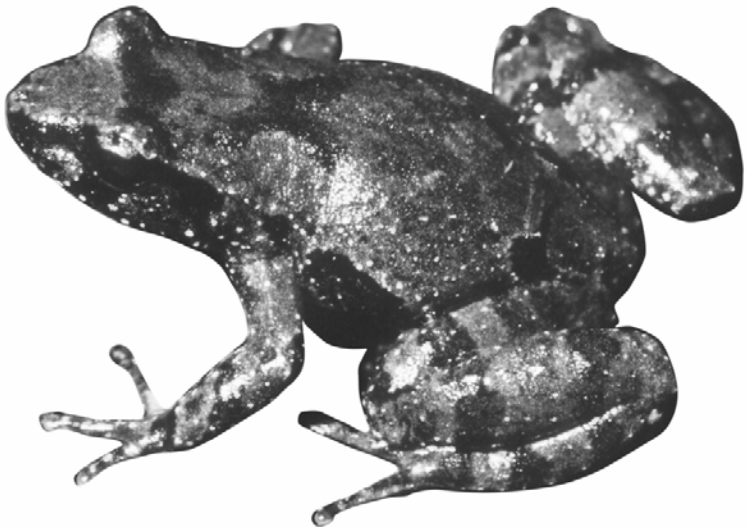
Frogs of the genus *Taudactylus* ('day frogs' and 'tinkerfrogs') are found in high elevation mountain streams in high rainfall areas in eastern Queensland (Ingram 1980; Czechura 1986a; Winter & McDonald 1986). Of the six members of the genus, four have declined or disappeared (see Ingram & McDonald 1993 for a summary and references). Only two species of *Taudactylus* are found south of the Tropic of Capricorn - the southern day frog *(T. diurnus)* and the Kroombit tinkerfrog (*T. pleione).* The southern day frog has declined dramatically and may be extinct (Ingram & McDonald 1993). The Kroombit tinkerfrog is the most recently described member of the genus having only been discovered in 1983 (Czechura 1986a). It is known only from Kroombit Tops, south-west of Gladstone, Queensland. Czechura (1986a, b) described the habitat occupied by the frogs at the 'type' locality *(i.e.* where the frogs were first found). Concerns were raised by Czechura (1986c) that the apparent isolation or restricted distribution of the species may make it vulnerable to extinction. Boyne Island herpetologist Peter Trernul recorded the frogs in a second site in 1991 (P. Trernul pers. comm.). Cunningham & James (1994) conducted a comprehensive search for the species at Kroombit Tops in 1993. Tinkerfrogs were found at the site suggested by P. Trernul but not at any other site, including the type locality. They also described more habitat details, recorded the call, made management recommendations for the species and established a monitoring transect at the Trernul site. Borsboom (1996) reported on

management practices at Kroombit Tops that were beneficial to the frog and detailed the commencement of recovery planning for the species. As a result of targeted surveys over the last two years, the frog has been found at six additional locations (reporting of this work is in preparation). This paper briefly summarises what is known of the frog and describes progress to date with recovery planning and implementation for the Kroombit tinkerfrog. It also outlines monitoring and research planned for the near future. Unless otherwise stated, all reports are based on the authors' observations.

Kroombit tinkerfrog

The Kroombit tinkerfrog *(Taudactylus pleione* Czechura) (Anura: Myobatrachidae) is a small, secretive, terrestrial frog that grows to a snout-vent length of 25-31 mm. The frog is reddish-brown to grey on the back with darker brown flecks, blotches and spots (Figure 1). The undersurface is translucent grey with dense cream and brown mottling and speckling. The call is a series of metallic tinks, each series lasting 2-4 seconds, repeated at 3-10 second intervals (Czechura 1986a). Eggs and larvae have not been seen.

Figure 1 - Adult male Kroombit tinkerfrog

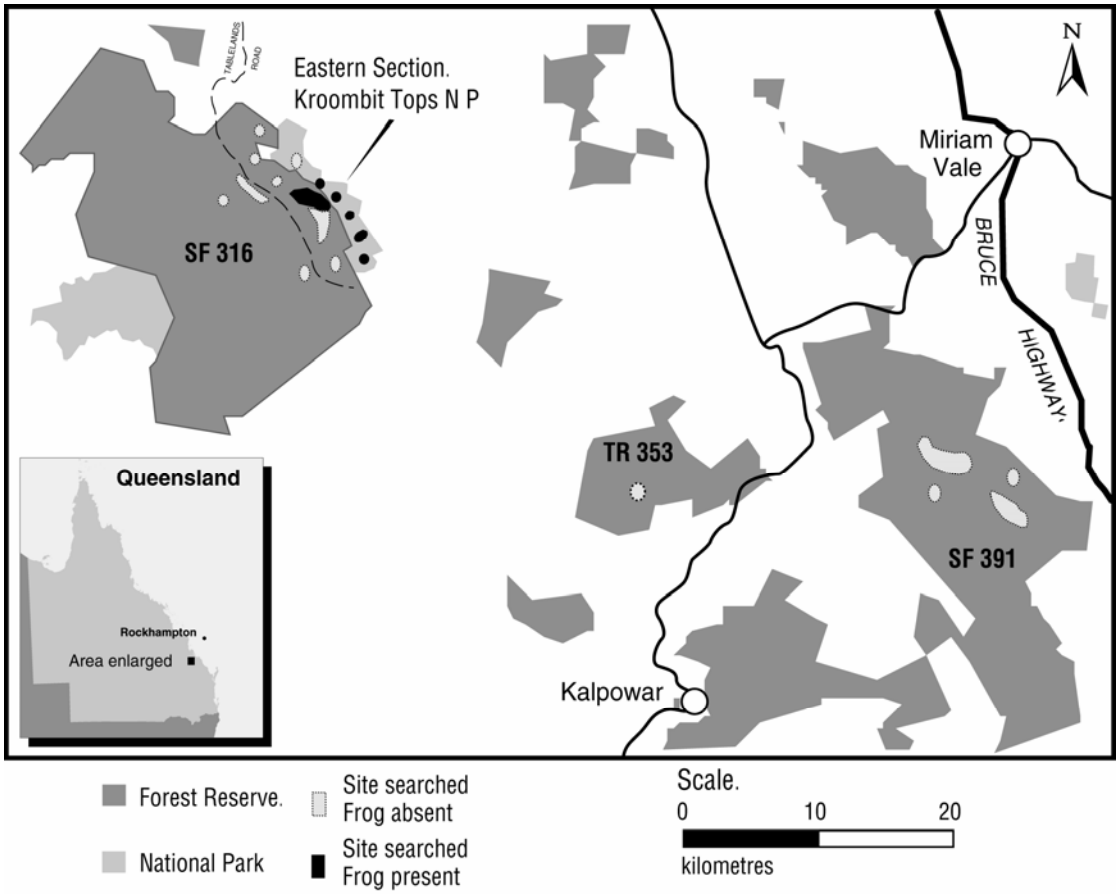


Known only from eight small (<25ha) patches of rainforest in the upper reaches of Degalgil, Diglum and Kroombit Creeks, the species has one of the most restricted distributions of any Australian frog (Figure 2). The species has been recorded only in small, isolated patches gully rainforest between about 500m and 850m above sea level (Czechura 1986a; Cunningham & James 1994; unpublished data).

Three populations occur on the plateau in Scientific Area 48 (SA48) within Kroombit Tops State Forest (referred to the ‘plateau’ populations). Five populations occur below the escarpment in the eastern section of Kroombit Tops National Park (referred to as the ‘escarpment’ populations). It has usually been found among or under rocks, and in leaf litter at, or in the vicinity of, permanent and temporary rocky seepage zones. The vegetation at these localities is dominated by piccabeen palm *(Archontophoenix cunninghamiana)* and/or coachwood *(Ceratopetalum apetalum).* Emergent hoop pines *(Araucaria cunninghamii)* are frequently present. The ground stratum is sparse and often contains dense patches of native

spinach *(Elatostema reticulatum)* in the seepage areas. The total known and occupied habitat is about l00ha. It is not known if these are the only habitats suitable for the frog. Known populations of Kroombit tinkerfrog are shown in Figure 3.

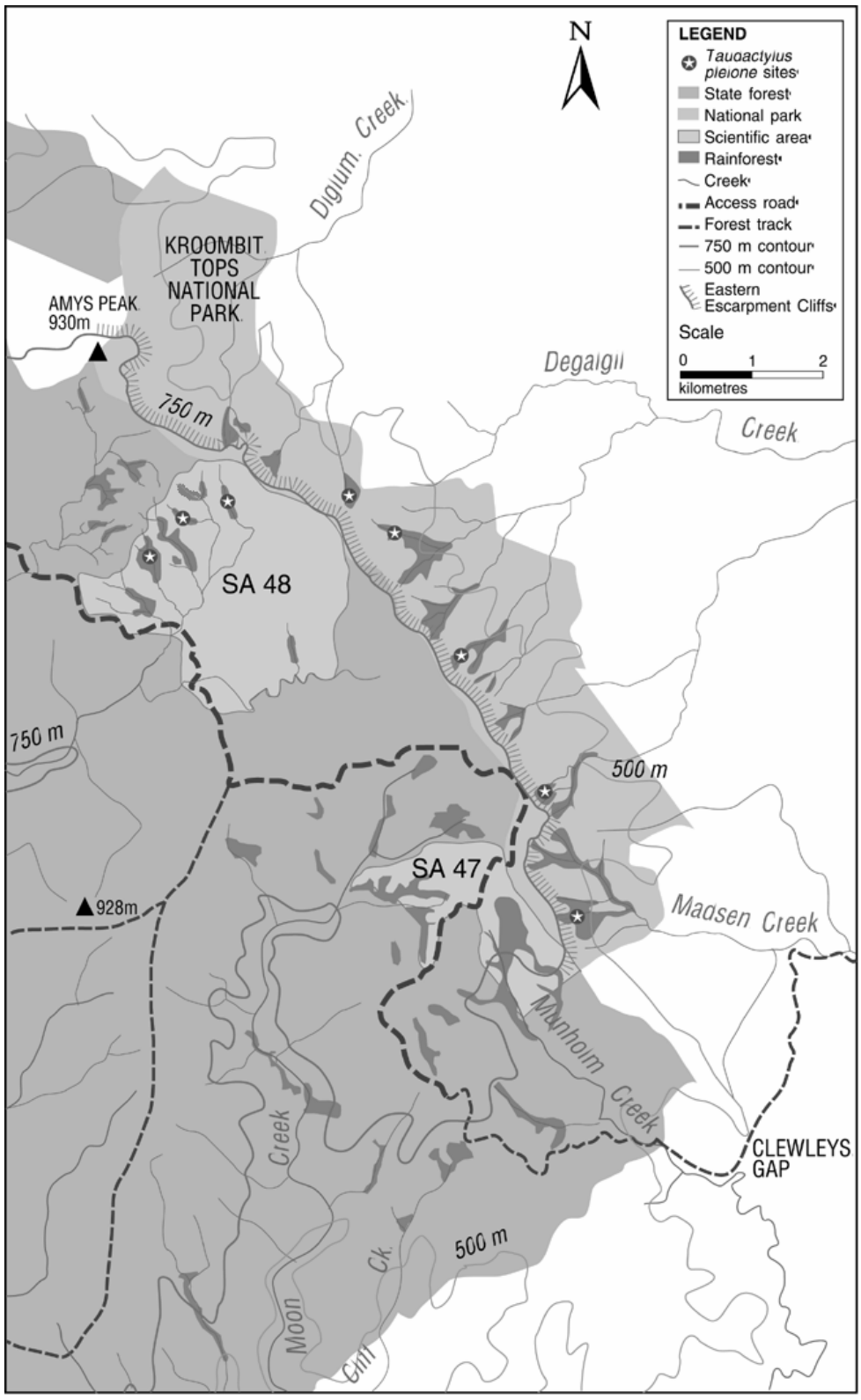
Figure 2 - Areas searched for Kroombit tinkerfrog showing locations found and not found



Little is known of the life history of the Kroombit tinkerfrog. The species has been heard calling between November and March, with calling peaks on warm nights from December to February. When active, calling intensity varies from night to night, but is generally strongest at dusk and early evening. Choruses of males have also been heard in the afternoon during overcast weather. On one occasion in February a male chorus continued (almost uninterrupted) through the night and into early morning. They have been seen or heard calling from rocky perches, rock crevices and forest debris near watercourse channels or seepages. Very few individuals have been seen or heard outside the period November to March. It is possible the species spends the winter deep inside rock crevices and similar shelter as suggested by Czechura (1986b).

Almost nothing is known of the species' breeding biology. Only two gravid females have been recorded, one (the holotype) in early February, the other in mid-January. Eggs, tadpoles and ovi-position sites have not been seen or described.

Figure 3 - Kroombit tinkerfrog locations



Planning for recovery

The South-East Queensland Threatened Frogs Recovery Team is responsible for the formulation, implementation and evaluation of the Recovery Plan for the Kroombit tinkerfrog. Lead agencies for recovery actions are the Departments of Environment and Heritage (DEH) and Natural Resources (DNR). In late 1996, staff from DNR and DEH commenced formulation of the Recovery Plan with input from various members of the Recovery Team and other stakeholders. The final draft was presented to the Recovery Team for endorsement in September 1998. This Plan has a life of five years after which it will be reviewed and, if the species still requires active management, re-drafted.

The long-term objective of the Recovery Plan is to improve the conservation status of the Kroombit tinkerfrog. Specific objectives are to: (1) locate all populations of the frog; (2) improve understanding of all aspects of the ecology of the frog that will aid in the recovery process; (3) establish at least three new and viable wild populations of the frog through translocation into suitable habitat; and (4) have the frog's conservation status downgraded to rare by 2008. Progress towards these objectives will be reviewed in December 1999.

Biodiversity benefits

In addition to the objectives outlined above, the Recovery Plan actions will result in a number of other biodiversity benefits.

Other species of frog share some sites with the Kroombit tinkerfrog. These include: tusked frog *(Adelotus brevis)*; copper-backed broodfrog *(Pseudophryne raveni)*; great barred frog *(Mixophyes fasciolatus)*; stony creek frog *(Litoria lesueuri)*; and a new treefrog related to the Barrington Tops and the cascade treefrogs *(L. barringtonensis & L. pearsoniana,* respectively). Recent allozyme and mitochondrial DNA sequence studies (M. Mahony *et al.* unpublished data) suggests that this treefrog is a new species endemic to Kroombit Tops and is hereafter referred to as the Kroombit treefrog *(L.* sp. cf. *barringtonensis).* The fatal Chytrid fungus has been found in four of these species (tusked frog, great barred frog, stony creek frog and Kroombit treefrog) (Berger *et al.* 1998; *L.* Berger pers. comm.). In addition, the tusked frog appears to have declined in some parts of its range, especially populations at higher elevations (Hines *et al.* in prep.; Gillespie & Hines in prep.). The monitoring and habitat protection-related actions in the Plan will assist the conservation of these species.

Another apparently endemic species, the Kroombit Tops spiny crayfish *(Euastacus monteithorum)* is found in many sites where the Kroombit tinkerfrog has been recorded. Although surveys have been limited, it has been recorded only from high altitude watercourses in rainforest at Kroombit Tops (Morgan 1989). Habitat protection actions will also benefit this species.

The coachwood-dominated rainforest that is present at the plateau localities is significant. The community is at the northern limit of its distribution at Kroombit Tops and occurs nowhere else between Kroombit Tops and the NSW border (McDonald & Sharpe 1986). The fire management-related actions will assist the conservation of this distinctive community by minimising the risk of wildfire.

Recovery actions

Table I lists the actions (or tasks) required to achieve the specific objectives of the Recovery Plan. Criteria for evaluation of progress of the Recovery Plan are also shown.

Table 1 - Objectives, criteria and actions for recovery of the Kroombit tinkerfrog

Specific objectives	**Criteria**	**Actions (Tasks)**
1. Locate all populations of the frog.	1.1. All populations of the frog located in predicted habitat and range.	1.1.1. Develop and apply a predictive survey detection model to surveys for the frog. 1.1.2. Develop a predictive habitat model to determine frog survey areas. 1.1.3. Survey for the frog.
2. Improve understanding of all aspects of the frog's natural history that will aid in the recovery process.	2.1. Determination of reproductive behaviour, oviposition sites and developmental mode.	2.1.1. Monitor mating, egg laying & fecundity in field & laboratory. 2.1.2. Monitor egg & tadpole development in the field & laboratory.
	2.2. Determination of diet and feeding behaviour.	2.2.1. Monitor feeding in the field and laboratory. 2.2.2. Analyse scat and stomach contents in the field.
	2.3. Determination of movement patterns.	2.3.1. Tag and monitor movement.
	2.4. Determination of refuge sites.	2.4.1. Tag and monitor movement.
	2.5. Determination of seasonal and climate related activity patterns.	2.5.1. Monitor climatic and environmental variables.
3. Establish at least three new and viable wild populations of the frog.	3.1. The successful establishment of at least three new breeding populations in suitable habitat at Kroombit Tops.	3.1.1. Identify genetic distinctiveness of wild populations. 3.1.2. Develop captive breeding program using appropriate genetic stock. 3.1.3. Identify at least three sites for re-introduction of the frog. 3.1.4. Release captive bred frogs & monitor success of release.

Table 1 (continued)

Specific objectives	Criteria	Actions (Tasks)
4. By 2008 the frog's conservation status of vulnerable to be downgraded to rare.	4.1. Amelioration of all threats to the frog and its habitat with a resultant increase of at least 25% in monitored populations. Possible threats are disease, inappropriate fire regimes, feral and domestic stock, feral pigs, visitor impacts, and timber harvesting activities.	4.1.1. Recovery coordination. 4.1.2. Monitor known populations. 4.1.3. Develop an interim fire management regime that excludes fire from the frog's habitat. 4.1.4. Identification of the appropriate fire regime for the frog. 4.1.5. Exclude domestic stock from all sites where the frog occurs. 4.1.6. Exclude feral pigs, horses and cattle from all sites for the frog. 4.1.7. Restrict human access to State land sites where the frog occurs. 4.1.8. Develop and disseminate procedures and protocols for handling and research. 4.1.9. Prevent degradation of the frog's habitat by timber harvesting. 4.1.10. Prevent degradation of the frog's habitat by clearing. 4.1.11. Monitor water quality and associated environmental variables at breeding, developmental, activity and refuge sites for the frog. 4.1.12. Information and education dissemination to the public and all levels of government. 4.1.13. Community participation in the recovery process.

Known and possible threats

Disease

Disease is one of a number of suggested causes in the sudden decline or disappearance of four of the six *Taudactylus* species in Australia (Richards *et al.* 1993, Laurance *et al.* 1996). The declines and disappearances commenced about 1979 and include other species of Australian frogs, especially upland rainforest species (Richards *et al.* 1993, Laurance *et al.* 1996). Recently a fungus belonging to the Chytridiomycete group has been shown to be lethal to frogs of several species in Australia and overseas (Berger *et al.* 1998). The fungus has been associated with some frog declines, but its role (if any) in past precipitous frog declines in Australia is not yet known. It is currently regarded as a threat to the Kroombit tinkerfrog.

At present there is no indication of decline from disease in the tinkerfrog. However, the Chytridiomycete fungus was recorded for the first time at Kroombit Tops in 1998. The fungus was the cause of morbidity in two individuals of the treefrog *Litoria* sp. cf. *barringtonensis,* both found in Kroombit Tops State forest in May 1998 (L. Berger, pers. comm.). This is of particular concern for the conservation of the Kroombit tinkerfrog as its known distribution is highly restricted, estimated population size is small, and it belongs to a genus susceptible to sudden decline or disappearance.

The Kroombit tinkerfrog is being closely monitored and standardised hygiene procedures (including sterilisation of footwear and use of disposable gloves) have been adopted to reduce the risk of spreading potential infective agents. The hygiene procedures will apply to all frog species within the known distribution of the tinkerfrog. Should populations of the tinkerfrog show signs of a dramatic decline, then a captive husbandry program will be recommended to the South-East Queensland Threatened Frogs Recovery Team for immediate implementation using husbandry techniques currently under development for other threatened frogs.

Inappropriate fire regimes

An inappropriate fire regime in and immediately adjacent to the habitat of the Kroombit tinkerfrog has been identified as a possible threat to the frog (Cunningham & James 1994). During a drought in 1994, a high intensity wildfire burnt through rainforest in both the State forest and National Park at Kroombit Tops. In addition to direct effects, this fire, in combination with a later flood, removed leaf litter, altered the stream hydrology and in some places destroyed the forest canopy over seepage areas. A reduction in the abundance of some frog species detected at a monitored plateau site in SA48 was observed following the fire. Most notable was the great barred-frog that was not detected again until January 1996. The Kroombit tinkerfrog was detected after the fire (January 1995) but activity appears to have declined since.

A joint fire management strategy for Kroombit Tops State Forest and Kroombit Tops National Park is being formulated. As a part of this process a fire management workshop was held in April 1997 specifically to determine the appropriate fire management to protect the frog and its rainforest habitat in SA48. The workshop was organised by the Recovery Team and attended by staff from DEH, DNR and Department of Primary Industries Forestry (DPIF).

Planned burning to reduce fuel will be carried out to protect the rainforest patches containing Kroombit tinkerfrog populations. An unburnt buffer zone of approximately 30m will be left adjacent to the rainforest. It is anticipated fuel will reach appropriate levels for burning approximately every three years. Fuel sampling will be used to determine the actual frequency of planned burns. The fire management program will be implemented, monitored and assessed jointly by DEH and DNR.

Feral and domestic stock

Domestic cattle (and associated feral cattle and horses) have been in Kroombit Tops State Forest since at least about 1900 (0. Lindley pers. comm.). The majority of the State Forest is under grazing lease (Schulz 1994). Cattle and horses have been observed in rainforest where

the Kroombit tinkerfrog occurs, with increased usage during dry conditions. Gross physical damage and fouling by stock of creek banks and adjacent seepage and swampy areas have been observed where the frog occurs.

Cattle-proof fencing around SA48 was completed by DNR in April 1996 with funds provided under the Commonwealth's Drought Control of Feral Pests program. The purpose of the fencing was to protect biodiversity in the Scientific Area through reducing the impact of cattle. Construction of the fence is also a *defacto* protective measure for the frog and its habitat. Although most cattle had been removed by May 1998, the small number of cattle that remain are still damaging frog habitat. Removal of the remaining cattle is a high priority and further musters will be conducted. Funding is being sought to assist with regular fence maintenance, and a community-based program will be established to aid in monitoring the condition of the fence.

Stock management is currently not a priority at the escarpment locations as there is no evidence of cattle or horses using the area. Cattle activity at the escarpment sites is monitored regularly by DEH. It is unlikely stock will ever use the area due to the steep and unstable terrain, lack of permanent drinking water and lack of feed.

Feral pigs

Feral pigs cause considerable disturbance to soils, litter and vegetation and also prey directly on frogs, as well as other vertebrates (McGaw & Mitchell 1998; Pavlov 1995). Until recently feral pigs had not been recorded at Kroombit Tops. At the beginning of 1998, feral pigs were found for the first time in the western section of Kroombit Tops National Park. If feral pigs invade SA48 they are likely to focus on rainforest patches and associated watercourses, which will include critical habitat for the frog.

Eradication of pigs from the western section of Kroombit Tops National Park is a high priority. If pigs become established at any Kroombit tinkerfrog locations, pig-exclusion fencing is likely to be the only practical solution.

Visitor impacts

It is not known what level of impact from visitors is acceptable for the Kroombit tinkerfrog. It is possible visitors to tinkerfrog sites could disrupt the frog's lifecycle, especially during the breeding season, or trample or disturb its habitat. This is particularly likely in the vicinity of seepage areas. Visitor numbers are low at present.

Before SA48 was established, there was little protection from human activities. There was a camping ground and numerous tracks in proximity to the plateau frog sites. Scientific Area 48 is now a restricted access area requiring a permit for entry. Permissible public use of SA48 is now restricted to research and bush walking (K. Watson pers. comm.). It is unlikely that large numbers of people will visit the escarpment locations as access is very difficult. Visitor impacts are being monitored at all Kroombit tinkerfrog sites.

Timber harvesting activities

Timber harvesting and associated roadways and snigging tracks impact on forest structure

and composition, drainage patterns and water quality. Harvesting operations in, adjacent to, or upstream of rainforest occupied by the Kroombit tinkerfrog are likely to have an adverse effect on the tinkerfrog population.

Kroombit tinkerfrog locations are currently protected from rainforest timber harvesting by DPIF policy. In addition, all plateau populations occur within SA48, which was established in 1986 and gazetted in 1988 (Qld. Dept. of Forestry 1987). There has been no hardwood timber harvesting since 1986 (K. Watson, pers. comm.). Accordingly, we consider threats to the tinkerfrog from timber harvesting activities have been minimised.

New Kroombit tinkerfrog sites

Threats will be assessed at any new Kroombit tinkerfrog sites found as a matter of priority and appropriate management actions will be implemented. New sites will need indefinite protection from all threatening processes including those detailed above. Management of Kroombit tinkerfrog populations on private land will require negotiation and cooperation between the relevant State agencies (DNR and/or DEH) and the landholder (also see community participation section).

Ecology and distribution surveys

Assessment of the habitat requirements, conservation status and threatening processes for the Kroombit tinkerfrog is hampered by the present lack of knowledge. In particular the eggs and tadpole have not been found. It is not known exactly when, where and under what environmental conditions reproduction is occurring. Similarly, little is known of habitat use by non-calling individuals (*i.e.* juveniles, females and feeding males). It is not possible, at present, to estimate abundance and the degree of turnover within populations, or the degree of movement within and between sites. Research is also required to document diet and feeding behaviour. The results of these ecological studies should assist with monitoring and survey design by providing predictive models of habitat suitability and survey effectiveness (*i.e.* to estimate the probability of detecting the frog on a site for a given survey effort).

Based on current knowledge the Kroombit tinkerfrog is vulnerable to extinction due to its restricted distribution, extremely fragmented habitat and small breeding populations. Although the frog is now known from eight rainforest patches, surveys have failed to find the frog in 14 similar rainforest areas of Kroombit Tops. At known sites the Kroombit tinkerfrog is not active every night, so it is possible that populations in other areas have been overlooked. Limited additional areas at Kroombit Tops and elsewhere on the Dawes Range and Many Peaks Range have not been surveyed and may harbour populations of the Kroombit tinkerfrog.

Collection of temperature and calling data commenced at one site in April 1998. The forthcoming peak activity period should provide the first detailed series of data relating temperature and calling activity. These data and rainfall data will help to determine the factors influencing calling behaviour and hence detectability of the frog. This may also provide an indicator of breeding times.

Population searches (with the assistance of volunteers) are planned for the 1998-99 peak activity period. There are three components to this work. Firstly, all known sites will be revisited at least once for comparison with previous surveys. Secondly, all areas of likely

habitat (not yet checked) that can be identified with available resources will be surveyed to determine presence or absence of the Kroombit tinkerfrog. Thirdly, areas already surveyed without success will be re-surveyed. These surveys will be conducted using a standard survey methodology. Data to be recorded include: abundance of Kroombit tinkerfrog, abundance of all other frog species, habitat details, climatic variables and behavioural information.

Intensive observational surveys are also planned for the 1998-99 peak activity period. It is intended to observe calling individuals throughout the night at several localities. In addition to recording standard survey attributes, detailed notes will be made on movements, calling duration, male-male interactions, male-female interactions (particularly mating), micro-habitat use and predation. Particular attention will be paid to any females observed.

Monitoring presence and abundance

Over recent years drought, fire and flood have resulted in changes to the structure of Kroombit tinkerfrog habitat. The effects of these changes on frog abundance and activity are poorly known. Regular monitoring of known populations is essential to determine continued presence, record levels of calling activity (Kroombit tinkerfrog and other frog species) and to monitor the effects of stock removal, fire management and habitat change.

Standardised monitoring of the Kroombit tinkerfrog commenced in 1994 (Cunningham & James 1994). Opportunistic records date back to 1991 (P. Trernul pers. comm.). Monitoring surveys of a plateau population have been conducted regularly by DEH regional staff using Cunningham & James (1994) methodology since January 1996 at a permanently marked 300m transect in SA48. This transect is surveyed for calling males at least eight times a year (monthly during the peak activity period). All species heard (or seen) are recorded but no destructive searching is conducted. This method minimises disturbance to the frog's habitat during surveys. No frogs are handled unless absolutely necessary. An automatic call recorder is used to monitor between surveys. It records for up to two minutes a night (depending on the season).

Monitoring of one escarpment population in the National Park commenced in April 1998. A temperature data-logger and automatic call recorder have been installed. It is hoped that a rainfall data-logger can be installed at this site in the near future. Additional monitoring of escarpment populations is carried out by listening for calls from the top of the escarpment above the sites.

Monitoring surveys at the transect (plateau population in SA48) failed to detect any calling activity during the 1997-98 'season'. On a number of occasions, choruses of tinkerfrogs were heard in the escarpment populations on the same night that the transect was silent. In addition, the automatic call recorder has failed to detect any calls since it was installed in December 1997. Opportunistic surveys of the other known plateau populations (including the type locality) have also failed to detect any calling activity. These results must be interpreted with caution as previous experience indicates activity levels of the species can vary enormously from night to night, even in the apparent peak activity period. The data does suggest that the plateau populations have shown a dramatic reduction in calling activity.

Genetic research

Sequencing of mitochondrial DNA from these samples has confirmed that the Kroombit tinkerfrog is a distinct species that is most closely related to Liem's tinkerfrog, *Taudactylus liemi* (M.

Cunningham, unpublished data). Future genetic studies will address movement among and between plateau and escarpment sites. This in turn may indicate the ability of the species to naturally recolonise suitable habitat. Accordingly, genetic material (a small section of a toe) is collected from a small number of individuals at each site as part of the population search program.

Captive breeding

Should populations of the Kroombit tinkerfrog show signs of a dramatic decline, then a captive husbandry program is to be implemented immediately using husbandry techniques currently under development for other threatened frogs. Captive breeding protocols will be determined by the Recovery Team before initiating the program.

Information dissemination

1. Public

Signs will be erected at main access points into SA48 indicating the presence of the Kroombit tinkerfrog and listing other endangered vulnerable and rare wildlife present. Signs will outline measures required to minimise disturbance by the public and point out the requirement for permits.

The South-East Queensland Threatened Frogs Recovery Team will establish a local information network should it be necessary to provide recovery information to private landholders. The aim will be to establish a personal link and a voluntary commitment to the recovery process for the frog.

A brochure will be prepared by the end of 1998 to raise public awareness throughout the region of the recovery process for the Kroombit tinkerfrog. An information display is planned for installation at the National Park lookout on the escarpment adjacent to SA48. One article has been published on the recovery process (Borsboom 1996) and more are planned.

2. Government land managers & planners

A species management profile (SMP) has been developed for the Kroombit tinkerfrog by DNR. The SMP has been disseminated to appropriate local and district DPI forestry and DNR land managers. Workshops will be conducted for officers involved in land management, planning and development assessment (where relevant). Written reference material on the frog fauna and frog population declines will be provided to workshop participants.

Community participation

Private landholders and grazing lessees will be encouraged to become actively involved in the recovery process should the frog be found on land under their care or use. Depending on the tenure of the land this may include voluntary conservation agreements, or variation of lease or permit conditions upon renewal. The effectiveness of community-based protective measures will be assessed regularly by the Recovery Team and, if protective measures are inadequate, altered or alternative strategies considered.

One option being considered is formation of a Kroombit Threatened Species Action Group (KTSAG). It is envisaged this group would facilitate local community participation in the frog's recovery process. Such a group could be established in Rockhampton or Gladstone.

The role of a KTSAG would be developed in collaboration with the Recovery Team but might include:

1. assistance in monitoring of feral pig and horse activity at Kroombit Tops, to be conducted in conjunction with other activities *(i.e.* bushwalking, sightseeing);
2. regular participation in the Recovery Team's survey program aimed at locating all sites where the frog occurs;
3. establishing a "Community Watch Program" to report on any illegal or suspected illegal activities at Kroombit Tops that could impact on the Kroombit tinkerfrog *(i.e.* unauthorised burning, visitation or camping in the Scientific Area);
4. assistance to DNR in maintaining the cattle-proof fence around the Scientific Area by regular fence checks and reporting damage to DNR;
5. monitoring the calling of the frog in Kroombit Tops National Park from the lockout on the eastern escarpment;
6. fund raising or lobbying for funding *(e.g.* pig-fence materials, construction and maintenance);
7. provide media coverage on the recovery process;
8. assistance in the development and distribution of the brochure and display as well as the recovery process in general; and
9. assistance in the construction and maintenance of pig-proof fencing around critical habitat for the frog.

Likely sources for membership of a KTSAG include Landcare Groups, Capricorn Conservation Council, Wildlife Preservation Society, and regional natural history, bushwalking, bird and frog groups.

Conclusion

Considerable progress has been made with recovery actions for the Kroombit tinkerfrog. However, management for the species, continues to be hampered by a lack of understanding of the species' ecology. Accordingly, emphasis for future work is to meet this shortcoming at the same time as monitoring known populations. In particular, research will focus on improving our knowledge of: distribution; threatening processes; breeding biology and influence of climate; micro-habitat use; genetic variation; and the effectiveness of management actions.

Acknowledgements

Murray Willson and Gary Mehiert (DNR Indooroopilly) produced the maps used in this paper and the accompanying presentation. Brent Tangey (DEH Rockhampton) compiled and mapped survey and monitoring data. Rhonda Melzer and Grahame Byron (DEH Rockhampton) provided valuable comments on earlier drafts of this manuscript. Warren Williams, Peter Auschra and Mark Roe (DEH Gladstone) and various volunteers have assisted with surveys.

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Conservation and Recovery of the Richmond Birdwing Butterfly, *Ornithoptera richmondia* and its Lowland Food Plant, *Pararistolochia praevenosa*

Revised 29 August 1998.
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Three indigenous Aristolochiaceae, Aristolochia sp. (afl. pubera), Pararistolochia praevenosa (F. Muell.) Parsons, and P. laheyana (Bailey) Parsons, are food plants for larvae of two papilionid butterflies in South-Eastern Queensland and northern New South Wales. Aristolochia sp. is the principal food plant for larvae of the common Cressida cressida, while P. praevenosa and P. laheyana are food plants for Ornithoptera richmondia. The naturalised, A. elegans from South America, attracts oviposition by the butterflies but it is poisonous to the larvae when they feed on the leaves. An understanding of the ecology of Pararistolochia spp. and its rainforest communities is providing a basis for conservation of O. richmondia. The upland P. laheyana though adequately conserved in the Queensland / NSW Border ranges, sustains the butterfly only when certain climatic conditions prevail. Threatening processes for the lowland P. praevenosa are identical (except for A. elegans) to those for O. richmondia, since only mature plants sustain breeding colonies of the butterfly. Recovery actions, particularly community participation, have reduced the threatened status of O. richmondia.

Introduction

The Aristolochiaceae have a world wide distribution in the Americas, Europe, Africa, Asia, Australia, New Guinea and the Solomon Islands. Parsons (1996a) separated some Australian species from the genus *Aristolochia* and assigned them to *Pararistolochia* Hutchinson and Dalziel, based on their ribbed, indehiscent fruit, and differing from *Aristolochia* spp. which have dehiscent pods that split while attached to the vine. However, the shape of the fruit (elongated vrs. rounded, respectively) referred to by Parsons (1996a) is not a consistent character for separating the genera (unpublished). Stanley and Ross (1983) characterised three indigenous species from South-Eastern Queensland, *Aristolochia* sp. (afl. *pubera* R.Br.), *P. praevenosa* (F. Muell.) Parsons and *P. laheyana* (Bailey) Parsons, while Parsons (1996a) described several new species from northern Queensland and Papua New Guinea.

The Aristolochiaceae are important food plants for larvae of butterflies of the family Papilionidae. For example, in Europe the larvae of *Zerynthia polyxena* Schiff, feed on *Aristolochia clematitis* L. while in the tropical Americas and Africa, Aristolochiaceae serve as food plants for a range of other genera of papilionid butterflies. In South-East Asia, Papua New Guinea, the Solomon Islands and Australia, *Aristolochia* and *Pararistolochia* are the predominant food plants for the butterfly tribe Troidini, the largest of all the butterflies (*Ornithoptera* spp. and *Troides* spp.) (D'Abrera 1975, Haugum and Low 1978-79). In

Australia, species of Aristolochiaceae are food plants for larvae of five butterflies: *Cressida cressida* (Fab.), *Atrophaneura polydorus* (Linn.), *Ornithoptera priamus* (Linn.), *O. euphorion* (Gray) and *O. richmondia* (Gray). All are abundant (Common and Waterhouse 1981) except *O. richmondia*, which in recent years has been considered a threatened species (Sands et al. 1997).

Aspects of the ecology of the vines, *P. praevenosa* and *P. laheyana*, the biology and conservation of *O. richmondia* are discussed, including an update since studies by Sands et al. (1997).

Identity and distribution of Aristolochiaceae in S.E. Queensland

Aristolochia sp. (afl. *pubera*) is a common vine mainly in lowland, open or wet eucalypt forests of South-Eastern Queensland, from about Maryborough to the mid north coast of New South Wales. First thought to be *A. pubera* (Stanley and Ross 1983), the vine was recently (Queensland Herbarium 1994) listed as an undescribed species. The stems (3 - 16 cm) may be prostrate or grow among low plants; the alternate leaves (1.5 x 3.0 - 4.0 x 7.0 cm) are cordate, the apex acute rather than obtuse as in *A. pubera* from northern Queensland. *Aristolochia* sp. is sometimes very common, for example, in the Brisbane Forest Park where it is the principal food plant for the "common greasy" butterfly, *Cressida cressida* (Fab.). No threatening processes have been identified for this butterfly or its food plant. *Aristolochia* sp. is tolerant to bush fires, regenerating soon after the small stems and leaves have been burnt. *C. cressida* will also oviposit on, and immature stages successfully develop on small seedlings of *P. praevenosa* and the northern *Aristolochia tagala* Chamisso.

Pararistolochia praevenosa occurs in lowland, subtropical rainforest (< 600 m) on basaltic slopes, creek banks, on volcanic soils bordering rivers and streams, and occasionally on sandy loams over volcanic soils, *P. praevenosa* originally occurred from near the mouth of the Mary River, Queensland, to Grafton, NSW. The vine now remains in natural rainforest fragments near Kin Kin, between Noosa and Coolum, at Mount Mee, Nerang, Burleigh, Mount Tamborine, the Upper Tallebudgera Valley with most in the Connondale Range, the Blackall Range and edging the Stanley River. In NSW, *P. praevenosa* was once common on the Tweed, Richmond and Clarence Rivers but is now confined to small areas near Mount Warning, Lismore, Byron Bay, Broken Head and other areas north from the Richmond River to the Queensland border.

P. praevenosa is an erect vine up to 10 or occasionally 20 m. Large vines branch close to ground level, producing slightly flattened stems 1-2 cm in diameter with a distinctive raised, reticulated bark. Older stems sometimes emerge horizontally and layer, forming colonies of vertical vines. Growth occurs throughout the year, particularly after rain. The mature alternate leaves are tough, lanceolate (base slightly cordate) with short twisted petioles. Leaves on vines on alluvial soils are usually smaller and narrower (*ca* 16 x 6 cm) than those from volcanic soils (>*ca* 22 x 10 cm) but all are variable. Mature flowers (September-November) are pollinated by midges, *Forcipomyia* spp. (Diptera: Ceratopogonidae) which are trapped by inwardly-directed hairs in the flowers, reversing their direction when senescing to release the pollen-bearing insects. The orange fruit fall intact when ripe (March-April) and seeds germinate after dispersal on the ground, mainly by brush turkeys.

Pararistolochia laheyana was until recently (Parsons 1996a) considered to be a variety of *P. deltantha* (F. Muell.) Parsons, a species from northern Queensland and Papua New Guinea. *P.*

laheyana is a common understorey vine on volcanic soils in montane rainforest (> 600 m), known only from the NSW - Queensland Border Ranges: at the summit of Mount Warning, on the northern, western and southern rim from Springbrook to the McPherson Ranges, the Richmond and the Nightcap Ranges. *P. laheyana* is a sparse, rambling vine rarely ascending more than 4 m. The smooth, almost slender stems (*ca* < 0.8 cm) bear alternate dark green leaves (*ca* 6.0 x 1.8 to 13.0 x 7.0 cm) with slender twisted petioles. The flowers were figured by Stanley and Ross (1983). They vary in colour from maroon, to green or bright yellow and are pollinated by midges.

Plant communities supporting *Pararistolochia praevenosa*

Very few areas of lowland rainforest support *P. praevenosa* despite many appearing to be associated with suitable plant communities. The plants most commonly associated with *P. praevenosa* in South-Eastern Queensland are listed in Table 1. Thirty four sites have been identified in South-Eastern Queensland, of which only 7 are in National Parks.

Table 1 - Plants associated with *Pararistolochia praevenosa* (S.E. Queensland) [1]

Species	% when present	Species	% when present
ARECACEAE		MONIMIACEAE	
Calamus muelleri	50	Wilkiea macrophylla	100
ELAEOCARPACEAE		MORACEAE	
Elaeocarpus grandis	62	Streblus brunonianus	75
Sloanea woollsii	38	Ficus coronata	88
EUPOMATIACEAE		MYRTACEAE	
Eupomatia laurina	75	Waterhousea floribunda	75
		Syzygium australe	50
FABACEAE		SAPINDACEAE	
Castanospermum australe	75	Arytera lautereriana	50
Millettia megasperma	50	Diploglottis australis	75
FLAGELLARIACEAE		STERCULIACEAE	
Flagellaria indica	75	Argyrodendron trifoliolatum	62
LAURACEAE		ULMACEAE	
Cryptocarya triplinervis	88	Aphananthe philippinensis	100
Endiandra pubens	100		
MENISPERMACEAE		VERBENACEAE	
Carronia multisepalea	62	Gmelina leichhardtii	88
Sarcopetalum harveyanum	50		

[1] From censuses of 8 of 34 known sites
(Compiled mostly by P. Grimshaw, Queensland Department of Environment)

The Richmond Birdwing, *Ornithoptera richmondia* and its biology

Of about 30 species of Troidini in South-East Asia, Papua New Guinea, Solomon Islands and Australia, *Ornithoptera* is considered to have evolved in Australia from Gondwanaland faunal elements. Morphological evidence indicated that *O. richmondia* separated from the *O. priamus* group of species at an early stage, and it may well represent the most primitive of the two taxa (Parsons 1996b). In this respect, *O. richmondia* has a special, international significance for

understanding the evolution and taxonomic relationships of the largest butterflies in the world and their conservation. Although not considered internationally to be threatened, Collins and Morris (1985) recommended monitoring of the species to determine its conservation status. *O. richmondia* was considered by Sands et al. (1997) to be a "vulnerable" in Queensland and New South Wales.

The biology and morphology of *O. richmondia* were described by Common and Waterhouse (1981). Males are smaller (*ca* 12-14 cm) than females (*ca* 14-16 cm) but both sexes are otherwise similar to *O. euphorion* and *O. priamus.* In males, the green and the gold spots on the upperside of *O. richmondia* are more restricted than in *O. euphorion* while white patches on females of *O. richmondia* differ from the cream of *O. euphorion*. Adults emerging in spring tend to be smaller than those in summer and autumn (Common and Waterhouse 1981), a characteristic attributable to loss in mass from the overwintering pupa. Shortage or poor quality of available food plant, particularly young leaves of *P. praevenosa,* may also contribute to the small size of adults. Coastal populations of *O. richmondia* are mostly bi-voltine, adults appearing from late August until November and again from February until May but there is a great deal of overlap in summer months. Occasional sightings have been made in June and July. At altitudes above 600 m the species is uni-voltine with adults appearing from November until February. On rare occasions adults migrate, observed near Christmas Creek, Queensland and at Limpinwood, NSW in January 1994 (Sands et al. 1997). At Cudgen, NSW in April 1969, migrating adults were observed flying in a northeastern direction towards the coast (G. Newland pers. comm.).

Females deposit pale yellow eggs (diameter 2.3 mm x 2.0 mm), usually singly beneath the leaves of the food plant, where very young or very old leaves are avoided, or occasionally on stems and other plants supporting the vines. Occasionally two or rarely up to 13 eggs may be deposited on a single leaf. Immature development is dependent on temperature. Eggs hatch in 8 -13 days and larvae consume their egg shell. There are usually five larval instars or occasionally six when nitrogen content is low. Instars 1 - 3 are black or dark purplish-brown with fleshy black spines except for two bright yellow spines on segment 4. The colour of instars 4 - 5 is very variable: usually black, brown or creamish-grey with the spines on segment 4 sometimes paler. The duration of larval development ranges from 25 - 46 days. Low nutritional quality of the food plant may protract the rate of development of larvae. After each ecdysis larvae consume their exuvium. Prior to pupation, larvae usually leave the food plant, spin a broad silken pad beneath a leaf and strengthen the petiole with silk to prevent dislodgment. They then suspend themselves by a central silken cremaster, attach the anal prolegs to the pad and become torpid for 2-3 days before pupating. The pupae are bright green, unlike any other known *Ornithoptera* spp. In coastal populations larvae pupating in spring or early summer months emerge within 25 - 40 days but larvae pupating in late summer or autumn overwinter in diapause for 127-275 days. Pupal diapause is initiated by decreasing day length and terminated by an increase in day length, temperature, rainfall and possibly other factors. The shortest period recorded from egg to adult was 66 days between October and December.

Butterfly - host plant interactions

A. praevenosa is the only indigenous food plant for the larvae of *O. richmondia* in lowland rainforests. At higher altitudes (above 800 m) on the border ranges of Queensland and NSW, the birdwing may also breed on another vine, *P. laheyana*, in favourable seasons. Understorey ascending growth of *P. praevenosa* is preferred by ovipositing females and lateral and canopy growth are less frequently utilised. The foliage of *P. praevenosa* suitable for commencement of feeding by newly-eclosed larvae is limited since they can survive only on sub-apical, expanding

leaves or soft expanded leaves and they avoid the pubescent apical growing tip. Young leaves at the 5 - 6 th node from the apex may be too tough to support feeding by 1st instars. However, late instar 2 and instars 3 -5 consume the tougher leaves with their larger mandibles, flowers, seeds and stems. When soft foliage of *P. praevenosa* is unavailable, 1st instar larvae starve and their levels of mortality may reach 85%. Larvae of *O. richmondia* prey on eggs or larvae of their own species in ecdysis as well as pupae especially when the availability of soft leaves is limited. Rarely will more than two larvae share leaves on the same stem of *P. praevenosa* without attacking one another. Larvae in instars 3 - 5 often alternatively feed on the stem and leaves and consume whole leaves in 5th instar. Fifth instar larvae frequently girdle the stem, a behaviour which induces wilting. This provides an increase in the solids content of the diet and may cause changes in the nutrient content of the leaves. If fed on *A. tagala*, 5th instar larvae sometimes completely sever the stems, a behaviour well known in other *Ornithoptera* spp.

The leaves of *P. laheyana* are overall softer than *P. praevenosa* and most terminal growth is acceptable to first instar larvae. As larvae mature, older leaves and the stems of *P. laheyana* may be consumed. Larvae feeding on *P. laheyana* appear to be less prone to cannibalism than on *P. praevenosa*, due probably to the greater availability of soft plant tissues. Most plants of *P. laheyana* though smaller, can carry more larvae than *P. praevenosa*, a factor that influences the occasional greater abundance of *O. richmondia* on the Border Ranges. When fed after eclosion from eggs, the larvae of *O. richmondia* will develop on *A. tagala*, a major food plant for *O. euphorion* in northern Queensland. However, when eggs are deposited on young leaves of this vine, a raised necrotic patch of tissue develops between the egg and leaf, and larvae often fail to eclose. *A. tagala* is therefore not considered suitable for planting in the field as a recovery action for *O. richmondia.*

The food requirements for adults of *O. richmondia* are not specific and they will visit the flowers of many different native and exotic plants to gather nectar, preferring white and red blooms. Near breeding sites, *O. richmondia* are frequently observed feeding at the flowers of *Callistemon* spp., *Eucalyptus* spp., *Castanospermum australe* and *Alloxylon pinnatum*.

Conservation of *Parastolochia* spp. and the butterfly

Threatening processes

1. Degradation or disturbance of habitat

Most arthropods are dependent on certain types of vegetation and adapted to particular climatic regimes, latitude and altitude. In eastern Australia particularly in South-Eastern Queensland, the loss of coastal plant communities from urban development and farming are the most serious threatening processes. Mangroves, riverine, creek vegetation, heathlands and wetlands are the most seriously threatened. In many cases the geographical ranges of common species are shrinking and local extinctions of butterfly species are commonplace. Destruction of lowland coastal rainforests affect the survival of several species including *O. richmondia,* which cannot adapt to other habitats without presence of the food plant. Most arthropod herbivores including *O. richmondia* are narrowly specific, adapted to feeding on one or a few or closely related plants. The floral nectars required as food for adults are actually enhanced by urbanisation since they can utilise many of the flowers cultivated.

Montane forests and associated plant communities in eastern Australia have been conserved better than in the lowlands. Many rare butterfly species are permanently protected in National

Parks and world heritage areas on the eastern Divide are therefore not subjected to threatening processes. The habitats for *O. richmondia* include the Border Ranges (>800 m) where the food plant, *P. laheyana,* is mostly in National Parks and no threatening processes have been identified. However, these high altitude populations of *O. richmondia* on the Queensland - NSW Border Ranges suffer from periodic extinctions, a natural process resulting from climatic stress. Recolonisation is then dependent on butterflies that migrate from the lowland populations.

Local government reserves are not sufficiently protected in Queensland and there are examples where fauna and flora reserves have been re-zoned for urban and commercial development, resulting in the destruction of valuable habitats. Small roadside remnants of vegetation which support *P. praevenosa* must be preserved by appropriate negotiations between local government, road and State authorities to ensure their long-term survival. Private property often contains important habitats for threatened fauna and flora. When plant communities are significant, administrative mechanisms such as memoranda of understandings, are needed between local government and State conservation authorities to ensure their preservation. There is an urgent challenge in Queensland to develop new strategies for permanently protecting threatened plant communities in a way satisfactory for land owners, local government and State conservation authorities.

2. Weeds

Exotic weeds are serious threats to arthropods including *O. richmondia*, especially when they engulf the plant communities which include their food plants. Introduced grasses and vines are serious threats to *P. praevenosa.* and they change the whole range of interactions between arthropods, their native plant hosts and plant habitats. Some introduced ants are also known to take a toll of native arthropods, either as predators or by displacement of native ants and they frequently influence the abundance of rare species, especially in disturbed areas.

The ornamental Dutchman's Pipe vine, *Aristolochia elegans*, originally from South America, attracts oviposition by most birdwing butterflies but the early instar larvae are poisoned when they attempt to feed on its leaves (Straatman 1962). The Dutchman's Pipe has escaped from gardens to become a serious weed. For the Richmond birdwing the introduction of this vine has been a major disaster, speeding the extinction process particularly in National Parks and forested areas. Egg counts made over several years in Burleigh Heads National Park showed that female *O. richmondia* deposited significantly more eggs on Dutchman's Pipe than on its own native food plant growing nearby (Sands et al. 1997).

3. Inbreeding depression

Inbreeding depression occurs in some species of butterflies but not in others. As shown by Orr (1994) inbreeding depression occurs in *C. cressida* and *O. richmondia,* both species being adapted to migrating between isolated breeding colonies. By contrast, inbreeding depression was not detected in two other papilionid butterflies, *Graphium macleayanum* (Leach) or *Papilio anactus* Donovan, species which have open population structures. The detrimental effects of inbreeding depression demonstrated in *O. richmondia* by Orr (1994) under laboratory conditions, has also been observed at breeding sites isolated by urbanisation (Sands unpublished). For species such as *O. richmondia,* adequate gene pools and inter-

linking corridors are considered to be necessary, factors that have received serious attention in the recovery plan for *O. richmondia*.

4. Fire

Unseasonal fires can result in death of plants especially when high winds drive the fires into rainforest during very dry periods. Burning forest at the edge of farms poses a serious threat when the fires enter the forest understorey. Destructive fires are usually started intentionally, for example the "cold burns" on the Sunshine Coast in November 1994, which escaped control in strong winds. Once burnt, plants of *P. praevenosa* do not regenerate from root stock and seeds fail to germinate. Small patches of vines at Dunethrin Rock, near Nambour (R. Parsons per. Comm.) and near Beerwah have not recovered after fires.

5. Pesticides

Although an important factor for several species of Lepidoptera, *O. richmondia* has not been identified suffering from pesticide applications or drift. However, insecticides used near water courses for midge and mosquito control and herbicide drift from farms, pose a threat to vines and the immature stages of the butterfly on the vines.

6. Collection of specimens and legislation

The collecting of specimens is the least of all threatening processes for all butterflies (Sands in press), yet one most targeted by conservation authorities, particularly in Queensland. The threatening processes for vertebrates have been re-drafted into legislation for butterflies, a seriously counter-productive decision, since it is preventing contributions by a number of serious collectors, to scientific knowledge. Collecting specimens is not generally considered to be a threatening process in Australia (New 1995) and occasional claims (e.g by Dunn et al. 1994) that this is so, have not been substantiated. When species are very highly valued, for example the endangered Queen Alexandra birdwing, *Ornithoptera alexandrae* Rothschild from Papua New Guinea, sustained collecting of immature stages may have an impact on their populations.

Unlike vertebrates, arthropods have evolved natural feed back mechanisms to cope with high levels of natural mortality and apart from the need for adequate habitat and food, the abundance of most arthropod populations is regulated by natural enemies and climate. Unless arthropods including *O. richmondia* are kept under persistent pressure by the over-collection of adult and immature specimens in island populations, populations will automatically return to a range of natural levels of abundance. There is a small demand for specimens of *O. richmondia* by collectors of butterflies in Australia and overseas. Since the quality of field-collected specimens are rarely adequate for cabinet displays, the demand can be met by a few reputable commercial dealers, by providing reared specimens without affecting the wild populations.

Recovery actions

The Richmond birdwing is a flagship project for the recovery of threatened butterflies in Australia. By combining the efforts of scientists, officers of the National Parks and wildlife services, students and communities, a "turn around" for the declining numbers and

contracting distribution of *O. richmondia* has occurred. Females of *O. richmondia* have been seen ovipositing on cultivated vines at Alstonville and near Brisbane in urban areas. At Beerwah a community group has enriched garden areas previously depleted of natural growth of vines, resulting in a marked positive response in the number of all stages present in the area. Though previously considered to be a threatened, butterfly numbers in several localities in Queensland and NSW have responded and the conservation status should now be reviewed. Continued cultivation of food plants and community efforts to preserve plant communities supporting *P. praevenosa,* is ensuring success of the project but the efforts must be continued to sustain the recovery of this species. Difficulties are being experienced with protecting remnant vegetation on private property, roadside land, and council flora and fauna reserves. Except for those plant communities in National Parks and flora reserves, administered by the Department of Environment in Queensland, several categories of land ownership continue to remain threatened.

Practical conservation for *O. richmondia* has been based on cultivating *P. praevenosa* in gardens, environmental reserves and schools. While the genetic identity of vines introduced into schools and private property has not been regarded as important, for flora reserves and enrichment planting in National Parks, the selection of local genetic plant material has always been practiced. Since 1992, when Balunyah Nursery at Coraki, NSW were provided with seedlings, cuttings and seeds of *P. praevenosa,* more than 29,000 vines have been distributed to retailers and community groups participating in the program (S. Herd, pers. comm.).

Considerable scientific information is still required to provide an accurate assessment of the conservation status for *O. richmondia*. This includes the effects of temperature on development, pupal diapause and desiccation, natural mortality (particularly diseases) and several other components for life-table construction. With co-ordination by CSIRO's Education Program, the Double Helix Science Club has introduced research on the food plant vines and a range of conservation activities into more than 150 schools. In South-Eastern Queensland and northern NSW, students are monitoring temperatures, rainfall and growth parameters of the vines, and aspects of the life history of the butterfly when immature stages are present. Community participants are locating and recording the presence of food plants and distinguishing them from vines with a similar appearance for example, *P. praevenosa* is easily confused by untrained observers with *Parsonsia* spp., *Hypserpa decumbens, Carronia multisepalea* and *Deeringia arborescens.*

Recently students at Holland Park State School have successfully raised seedlings from seeds from their own vines while at the Ingleside State School in Tallebudgera Valley, immature stages of the butterfly have been monitored on vines cultivated from local genetic stock. Members of community groups and students are learning to recognise natural predators such as ants and mites which attack the immature stages of *O. richmondia* and are contributing new information about seasonal behaviour, immature development, natural mortality and adult food sources. As they develop biomass, planted vines are expected to become much more attractive to ovipositing butterflies and they will support many more individuals than at present. It is estimated that most will be of sufficient size to each support one developing larva after 5 years of growth but it will take a much longer period before planted vines are able to support colonies of *O. richmondia*.

Acknowledgments

We thank Paul Grimshaw, Queensland Department of Environment for providing much on the identity of plants associated with *Pararistolochia praevenosa*, and Scott Herd, Balunyah Nurseries for information on the sale of plants to the public.

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The Dead Parrot Society? The Story of the Coxen's Fig-parrot Recovery Team.

Peter O'Reilly, O'Reilly's Rainforest Guesthouse, Green Mountains via Canungra, Q, 4275.

Being reponsible for saving Australia's rarest parrot from extinction is a burden of dire portent. The species has all but disappeared from the face of the planet, abandoning even its most favourite haunts. Since 1993 the Coxen's Fig-parrot Recovery Team has faced up to its task with considerable enthusiasm despite being unable to catch more than a fleeting glimpse in thousands of hours of targeted searches. Depressing as that may be, there is a bounce in the step of team members as new techniques have helped us discover some missing pieces of the Fig-parrot jigsaw.

To be charged with the responsibility of saving Australia's rarest bird from extinction, is surely a quest of Holy Grail proportions. Thousands of hours of targeted searches that fail to produce a single feather are not only demoralising, but lead only to scepticism and diminishing support. And then, to add insult to injury, there is the mockery. The jibes about the "Dead Parrot Society", and "Coxen's Fig-ment of the imagination Parrot."

Coxen's Fig-parrot (*Cyclopsitta diophthalma coxeni*) is one of three sub-species of Double-eyed Fig-parrot found in Australia. The others are Macleay's (*C. d. macleayana*) and Marshall's (*C. d. marshalli*) fig-parrots, both of which are found in tropical north Queensland. It has been proposed that Coxen's is a separate species, however, until we can obtain fresh material for DNA testing, their taxonomic status will remain a subject for conjecture. It is incongruous to many that taxonomy is of importance to species recovery, however full species status would greatly assist the team in increasing both government funding and search effort from the bird watching public.

Literature reviews indicate that Coxen's Fig-Parrot feeds predominantly on a variety of fig tree species and it is speculated that they exhibit altitudinal movements in response to the fruiting phenology of these species. Anecdotal evidence and studies of related subspecies' breeding habits, suggest nesting activity occurs between August and December and that relatively small home ranges are occupied during this time. Amazingly, over 130 years after coxeni was described by Gould, we still have no formal description of its nest and eggs.

The Recovery Team was formed in 1993 at the initiative of the Queensland Dept. of Environment and Heritage and, under the guidance of the Commonwealth Endangered Species Program, administered and funded by the then Australian Nature Conservation Agency (now Environment Australia). Other players have included The NSW National Parks and Wildlife Service, State Forests NSW, Queensland Museum, Wildlife Preservation Society of Queensland, Threatened Species Network, Currumbin Sanctuary, University of Queensland, Griffith University, and O'Reilly's Rainforest Guesthouse.

Initially we had a small number of significant problems. We couldn't find it. After a number of sightings through the mid-eighties the bird apparently disappeared off the face of the planet. The 1991 drought had a major impact on many dry rainforest areas, and this may have

played a significant role. We had practically no knowledge of the ecology of the bird, other than that derived from its sibling subspecies.

The aforementioned factors are obviously functions of its rarity and we could only take educated guesses at the causal factors of this increasing rarity. It has always been assumed that the loss of lowland rainforest and the consequent lack of continuity in fig supply is the proximate cause of species decline, and in the absence of any data to the contrary that is still our belief. Thus reafforestation, particularly with fig species, is needed to reverse the process. The enormity of the task and the lead time into habitat restoration and eventual fruit production is demoralizing, so our initial task is to buy time to safeguard coxeni until that threat has been removed.

Finally, security issues around the bird and any nest sites discovered, has always been a major concern. A pair of Coxen's Fig-parrots is a name your price commodity in world avicultural circles. Egg collectors are another threat, as they like to tick the rarities just like twitchers do. Consequently sharing recently won information with the broader public in order to improve their search effort has contained risks that have been seen as largely unacceptable.

Despite the difficulties, these problems were overcome and species recovery plans were generated and the strategies therein implemented.

Worldwide experience has shown captive breeding programs to play an integral role in the recovery of species for which all but the most optimistic have given up hope. Consequently a captive-breeding program has always been seen as the only viable option to buy the time necessary to attempt habitat restoration. Currumbin Sanctuary have, for many years, been working with the Macleay's (Red-brow) Fig-parrot perfecting dietary supplements, breeding techniques, swapping of eggs and young between breeding pairs, and generally marking the boundaries of what could be done safely if we were to obtain Coxen's eggs or chicks from the wild. So successful has Currumbin's work with the analogue species been, that the next step in their preparation is the release and radio tracking of captive bred birds. Successful completion of this project will augur well for the Coxen's captive breeding program should it be required.

Firstly we have to find the thing. In early times we contracted a very competent ornithologist to search the areas where fig-parrots had been known to frequent. Many hours were spent lying under fig trees staring up at the canopy, some 30 to 40 metres up, in a vain attempt to spot the tiny green bird. The very quiet habits of the species and an apparent preference to run along the branches rather than fly from fruit cluster to fruit cluster made this method a very unrewarding pastime. These early surveys suffered from the paucity of knowledge of the species and were based on some preconceived ideas on species distribution, ecology and habits. Consequently they were unsuccessful. It soon became apparent that the best way to increase the chances of locating this species was increased search effort through public help. We were being frustrated by reports of the bird filtering back to the recovery team months after the event and felt that immediate reports were necessary to give us a fighting chance.

A full colour brochure explaining the plight of the species and how to identify it was sponsored by Currumbin Sanctuary and distributed through the ornithological press. Numerous sighting reports, both old and new were generated because of this brochure. With records flowing in we had to set up a process of evaluating the credentials of each report and

thus a sightings report form and a records appraisal committee complete with appraisal protocols were established. We are still working on developing a relational database to obtain maximum benefit from the information generated in this process. Macleay's fig-parrots involved in the captive-breeding program were also used in the field acting as caller birds to attract their southern cousins. First used in semi-permanent aviaries at known fig-parrots sites at O'Reilly's Plateau, more recent innovations involved temporarily raising small cages into the canopy of fig trees in northern NSW.

In 1996 recovery team action stepped up a gear. A naturalist experienced with all Australian subspecies of Double-eyed Fig-parrots and their nesting habits in the wild, was engaged to provide training to selected members of the Recovery Team in habitat recognition and nest search techniques. These training sessions involved intensive two weeks surveys of prime habitat in NSW and Queensland. Success was immediate with old nest sites providing information on the bird's nesting preferences, habits and ecology. There were also two close encounters with the species:- a call and a fleeting glimpse. Sure that's not much, but we were getting desperate!

Further developments with survey methods.

Canopy level observations in high priority areas increases our chance of spotting birds and allows us to get a better assessment of their flight path from fed tree to nest. Grey Goshawks are seen as the most likely fig-parrot predator, leading us to the conclusion that goshawks may be better at finding them than we were. Nets were erected beneath Goshawk nests to catch and identify the rejected feathers, heads and feet. Unfortunately the goshawks ate more than they rejected so much of the evidence gathered was very second hand in nature and largely unidentifiable.

With our rapid increase in knowledge of the species it was time to reassess some of the earlier records, particularly those that had been rejected. The stuffed bird line up similar to a police line-up has been very fruitful, adding credibility to records where the observer was not a dedicated birdwatcher. Consequently, we have been able to expand the range of the bird both north and south by hundreds of kilometres.

Despite the enormous effort of a few dedicated individuals, we have still to find an active nest complete with birds. Increasing the search effort is viewed as the most likely manner in which this will be achieved, however funding and time are very limited resources. Subsequently volunteer community surveys have aimed to make a significant contribution by placing as many observers as possible into the field at the top priority sites. In NSW surveys have been conducted at Mebbin State Forest and Cambridge Plateau. In Queensland we felt the access and number of summer records in the Moore Park area north of Bundaberg made that area a top priority. While these surveys are yet to produce a fig-parrot, the publicity generated many more reports of earlier encounters. In the Moore Park Area the Bundaberg City Council have introduced vegetation protection orders specifically aimed at preserving fig-parrot habitat.

Other community awareness projects.

More new improved brochures, targeted publicity, production of slide shows on the species and the recovery efforts, the Plant a fig tree campaign and the Coxen's Fig-parrot Tee shirt

now available through selected outlets (NSW NPWS., QDEH., O'Reilly's, and Currumbin Sanctuary).

Despite considerable survey effort in the last few years, effective conservation action continues to be hampered by a lack of knowledge of the bird, its whereabouts and ecological requirements. That is our role, your role is to provide a long-term hope for the species through the restoration of rainforests throughout SEQ. Good luck to us both and to Coxen's Fig-parrot.

6. Perspectives on Rainforest Conservation and Management

The Black-breasted Button-quail (*Turnix melanogaster*) - its Relationship with Dry Vine Scrubs and Tolerance to Disturbance

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The Black-breasted Button-quail (BBBQ) is the only true rainforest dwelling button-quail on earth. It is listed as "Vulnerable" in Queensland and "Threatened" nationally. BBBQ's primarily occupy the drier rainforests of central and south-eastern Queensland and north-eastern New South Wales, but also occur in transition forest between rainforest and dry sclerophyll forest, coastal thickets, older hoop pine plantations and brigalow softwood scrubs of the region. Historical information and recent surveys indicate that the species has been recorded from forty State forests, one timber reserve and fifteen conservation reserves in Queensland.

The biology of the species in the wild is still little known. The main processes threatening its survival appear to be: (1) loss of habitat and habitat fragmentation due to forest clearing (it has been estimated that its range has been reduced by as much as 90% owing to European land clearing schemes); and (2) habitat degradation by domestic stock and wallabies. Other processes thought to threaten survival include: (1) inappropriate fire regimes; (2) predation by feral cats; and (3) disturbance of habitat by timber harvesting.

To obtain better information about the biology and ecology of the BBBQ and the effects that potentially threatening processes have on survival, we have been undertaking detailed studies of the species using radio-telemetry. Studies have been carried out to date in the remnant vine scrubs surrounding hoop pine plantations in the Blackbutt Ranges and in remnant vine scrub of the coastal lowlands, near Maryborough. At one of these localities we have been monitoring behaviour and movements in response to logging activities in adjacent hoop pine plantation. It is anticipated that these studies will provide suitable information upon which to base management recommendations.

Introduction

The Black-breasted Button-quail (BBBQ) is unique in that it is the only true rainforest dwelling button-quail or quail-like species in the world. It is listed as Vulnerable on the Queensland Nature Conservation (Wildlife) Regulation 1994. It is similarly recognised as vulnerable by the Commonwealth (Endangered Species Protection Act 1992). In the world it is still attached to the IUCN CITES Appendix 2 category, but there has been recent review of its status.

The biology of the species in the wild is still largely unknown and only recently have radio tracking studies been carried out *in situ* (DNR documents in prep. and published, Smith *et al.* (1998). Aviary studies have produced a very "cooped-up" view of the behaviour and social system of this organism. It is likely that this behaviour may be exhibited by the species found

in isolation in small remnants of favoured habitat. The observed social behaviour of the species may lie in the degree of isolation. Observational studies of birds in the wild have revealed that females defend a territory against other females (Hughes and Hughes, 1991, through observational studies, no markings of birds), and can consort with a number of males. The male it seems undertakes incubation duties and must defend the nest against females and other species. The male incubates from 3 to 5 eggs. Chicks are cared for by the male. In the aviary, males, eggs and chicks will be attacked by females if housed together (review by Flower et al. 1995).

While the breeding and social behaviour of the species in different sized remnants, with different human induced disturbances largely remain a mystery, the ecological importance of the species (as a Decomposer and Insectivore) is self-evident. They hunt small invertebrates that live in the leaf litter by pivot feeding, ie. by standing on one foot and scratching at the leaf litter with the other. The saucer-shaped scrape marks left by this method of feeding are called platelets, and are produced by some other birds; including other species of Button-quail. In effect the BBBQ aids in the decomposition of the leaf litter layer (by turning and aerating) which is composed mostly of hard leaved species in the forests with which they are primarily associated. It has been suggested that the occurrence of BBBQ is largely dependent on a particular type and depth (25 to 35 mm) of microphyll vine forest leaf litter (J. Aridis, B. Hamley pers comm). The species still occurs in disturbed forest, but requires a well-developed shrub layer and sufficient ground debris.

Sightings and specimen records suggest it was endemic to south-east Queensland and northern New South Wales, between Rockhampton and Lismore, and west to the Great Dividing Range. Odd records in far flung places suggest that the species could be irruptive, could have escaped from aviaries or naturally occur at very low densities over a very wide geographical area.

During WWF's “Search for Australia’s rarest bird,” Bennett (1985) suggested that the range had been reduced owing to habitat destruction.

The historical record

The best account of the historical records of BBBQ have been summarised by Flower et al. (1995). The essential points are as follows:

- Earliest known records of *T. melanogaster* are from Moreton Bay and Brisbane Valley (Gould 1837).
- In 1867 George Masters collected specimens from littoral thickets in the Wide Bay area and from scrub on "Pine Mountain." It is unclear as to which Pine Mountain he was referring. Presumptions have been made that this was Pine Mt, Shoalwater Bay.
- Eggs have been collected from near to Grafton by Anderson and Jackson (1892).
- Confusing records have come from
    - Le Soeuf (1897) 40 km south of Cooktown,
    - Bravery (1970) who recorded birds 2 km N.E. of Atherton in the 1960's,
    - Grant (1887) from near to Cairns (although specimens were of doubtful providence).
- Strange records still occur (e.g. recent reports from near Canberra).
- Bennett (1985) accepted records from near Rockhampton and Duaringa in the north, to Boonah and the Queensland border in the south.

- Bennett (1985) noted that post 1970, BBBQ in Queensland had been restricted by habitat loss to an area from near Gympie in the north, south to the border and west to Nanango and the Bunya Mountains.

Research by Queensland Forestry early 1990's – Phase 1

Given that the bird was known from numerous State forests (Bennett 1985) and that harvesting was occurring on those State forests it became an issue to:

- examine the extent of the geographical range;
- investigate the tenures on which populations were occurring;
- provide information on habitat requirements and factors that affect distribution;
- identify threatening processes;
- provide information on regional conservation status; and
- provide management information as a means of ameliorating the impacts of forest management.

Wide scale surveys were carried out by Paul Flower with initial assistance from Chris Corben and later Dion Hobcroft, with funding obtained by John Kehl from NRCP (National Rainforest Conservation Program). Predictions were made as to the type of habitat that the species would be found most commonly in and where fragments of the proposed "suitable" habitat were to be found. Surveys were carried out across the range of predicted locations. While the initial wide scale surveys suggested that the species could be found in at least 13 apparently isolated groups from near to Monto in north to Border Ranges in south and west to Palm Grove in the north and the Bunya Mtns in the south, recent evidence (Schulz, unpublished report to DNR Forest Wildlife group) has extended the accepted range from near to Marlborough. Previously known populations from Rockhampton to Duaringa are apparently extinct. The most recent findings in Timber Reserve 55, north of Marlborough extends the northern limit to the dry corridor that runs between Rockhampton and Mackay.

The species is not typically found in high rainfall closed forest, but in drier rainforests (rainfall approx. 800-1200 mm annually) with a permanent, ground leaf litter layer. The ground shrub layer in preferred (rainforest) habitat ranges from absent to dense, with the upper-storey canopy cover (rainforest emergents) also varying; however the canopy cover of shrub species in the mid-storey is typically 70-80%. In Eucalypt regrowth habitat the upper-storey canopy cover is usually less dense but still accompanied by a dense dry vine scrub understorey. Softwood scrubs of the Brigalow Belt bio-geographic region may also be important habitat for the species. BBBQ also occur in Acacia thickets on sandy soils (Great Sandy National Park), as well as in transition forests, old hoop pine plantations and lantana thickets.

The tenure for most (60%) known BBBQ sites occur on Queensland's State forests. A significant proportion of State forest sites occur in scrub breaks beside hoop pine plantations which were established in cleared dry rainforest areas.

Significant areas of BBBQ habitat have been cleared for grazing, farming, urban development and establishment of hoop pine plantations. It was estimated, extrapolating from figures of Catterall and Kingston (1993) that 90% of former habitat could have been cleared. Bill McDonald (Queensland Herbarium) (pers. comm.) is of the opinion that from 5,000 to 10,000 ha of dry vine scrubs are left in Queensland. Cats and rats are known predators, domestic/feral stock and wallabies may cause

disturbance to habitat which may be exacerbated by increased pasture areas and fragmentation of forests. One of the great unknowns is continuing practices of forestry (now that clearing of rainforest habitat has largely been halted).

Subsequent to habitat studies associated with these wide scale surveys and more recent investigations, we were able to implement a system for handling inquiries about this species in relation (particularly in our context) to timber harvesting, as well as other types of forest use; the Species Management Profile.

The Species Management Profile (Phase 2) – adaptive management scenario

What is a species management profile?

Species Management Profiles (SMP) are the means by which information on the known and possible threats to listed species can be accessed by Queensland forest managers. They are part of the "Fauna & Flora Information System" initially devised by John Kehl for DPI Forestry managers to fill a perceived information void. The SMPs were written by the Forest Wildlife group for adoption, implementation and modification overseen by the Forest Allocation and Use section of DNR.

The SMP (Figure 1) provides information on a species by species basis (scientific name, broad category of animal and a photograph). Each profile contains a brief summary of the biology of the species; its habitat preferences; conservation status (legally); a map of its known range; and the State Forests, National Parks and Timber Reserves it is known to occur on.

On the flip-side (not shown for reasons of “Commercial-in-Confidence”) the Species Management Profile contains important information about threats (known and suspected), and recommended management precautions to ameliorate possible negative impacts on its survival.

Where is it used?

At present it is mainly accessed by DPI Forestry.

Where could it be used?

It would be appropriate for use in a wide variety of situations, across all tenures. (e.g. in provision of information for Agroforestry enthusiasts.)

Research by Queensland Forestry mid-1990’s to present – radio-tracking era (Phase 3)

Home range data has been gathered at four sites using radio-telemetry. Two of these have occurred in the Yarraman-Blackbutt area (DNR) and one in a coastal lowland dry rainforest at Lenthalls Dam (DNR for Hervey Bay City Council). Methods are described in Smith *et al*. (1998). Another radio-tracking study was also conducted on the plateau at Ravensbourne National Park by Anita Smyth (pers comm.).

Figure 1. Species Management Profile - Black-breasted Button-quail

Turnix melanogaster Black-breasted Button-quail

CONSERVATION STATUS: Vulnerable[1]

SPECIES TYPE: Bird **Family:Turnicidae**

- **Currently occurs in 14 isolated groups of sites in south eastern and central Queensland.**
- **Primarily occurs in drier rainforests, but also occurs in transition forest between rainforest and dry sclerophyll forest, coastal thickets, older hoop pine plantations and brigalow softwood.**
- **Recorded from forty state forests, one timber reserve and fifteen conservation reserves in Queensland.**
- **The main threatening processes are: loss of habitat and habitat fragmentation due to forest clearing; and degradation of habitat by domestic stock and wallabies. Possible threatening processes are: inappropriate fire regimes; the destruction of nests and disturbance of habitat by timber harvesting; predation by feral cats; and degradation of habitat by feral cattle, horses and pigs.**
- **Protective measures for operations conducted under the *Forestry Act 1959* should aim to maintain the current area of preferred habitat (ie. dry rainforest types) in suitable condition for BBBQ habitation. There is a need for: the identification of critical habitat; the establishment of protected zones around nests and known habitat; the maintenance of appropriate fire regimes; and the exclusion of cattle and horses from critical habitat.**

SPECIES PROFILE

DESCRIPTION

The Black-breasted Button-quail (**BBBQ**)*Turnix melanogaster* is a quail like species growing to 18 cm in length.[6] Adult males weigh about 115 grams,[5,9] and females about 145 grams.[5] It is distinguished from true quails by having 3 toes pointing forward and no hind toe.[6] The plumage is mottled and females have a black head and chest.[6,]

BIOLOGY & ECOLOGY

This elusive bird lives on the forest floor.[4,6] It is a reticent flier that relies on stealth rather than flight to avoid danger.[3,5,6,8] When motionless on the ground it is extremely well camouflaged with its mottled plumage. Its diet consists of seed and insects.[6,15] Feeding birds leave shallow circular depressions,[3,5,6,8] about the size of a dinner plate (platelets), in leaf litter and loose soil.[2,3,6,7] Similar platelets are made by Painted Button-quail.[2,6,15] Information on breeding in the wild is scarce, but based on captive breeding and limited observations in the wild[9,14,15] it is thought to occur from September to April.[3,6] Females are believed to defend a territory against other females, and can consort with a number of males.[2,3,5,6,8] The male incubates the 3 to 5 eggs[3,6,8,14] in a grass lined depression under ground vegetation.[3,6] The chicks are cared for by the male. Home range estimates vary from 1.5 to 31 ha.[5,8,9,]

HABITAT[2-4, 6,8,9,14]

Not typically found in high rainfall closed forest. Prefers drier rainforest types where rainfall is approximately 800 to 1200 mm annually. A canopy cover of 70 to 80% and permanent litter at least 25 to 35 mm deep are also preferred. The ground shrub layer can range from absent to dense. Softwood vegetation of the Brigalow Belt bioregion is important habitat. The BBBQ has also been recorded in vine scrub regrowth. In south east Queensland Acacia thickets on sandy coastal soils also appear to be important to BBBQ. Dry sclerophyll forest records of BBBQ are normally adjacent to dry rainforest. The BBBQ also occurs in transition forest between dry sclerophyll forest and dry rainforest/scrubs. Records from Hoop Pine plantations are from older plantations with a well developed understorey that can include lantana thickets.

CONSERVATION STATUS & DISTRIBUTION

Current Conservation Status

Queensland: Vulnerable[1]

Australia: Endangered[13], Vulnerable[16]

Former Distribution & Status

Status at the time of European settlement is unknown. Historical records from the 1800's suggest the former distribution extended from Grafton in north east NSW to Rockhampton in Queensland and in north Queensland (where status is currently unknown).[2-4]

Current Distribution

Currently occurs in fourteen isolated areas in southern Queensland, from NSW border, north to Marlborough and up to 400 km inland. Populations from Duaringa to Rockhampton appear to be extinct. Recorded from the following state forests/timber reserves in Queensland: SF 67, SF 74 (Nangur), SF 82 (Brooyar), SF 117 (Kunioon), SF 118, SF 132 (Brovinia), SF 135 (Brooloo), SF 151, SF 200, SF 207, SF 215 (Cannindah), SF 220 (Kilkivan), SF 242, SF 254, SF 256, SF 257,SF 258, SF 289, SF 274, SF 283 (Colinton), SF 298, SF 302, SF 309, SF 316 (Cooyar), SF 329, SF 355, SF 359, SF 379, SF391, SF 435, SF 466, SF 494 (Moggill), SF 506, SF 528, SF 618, SF 637, SF 639, SF 673, SF 695, SF 960 and TR 55. There are unconfirmed records from SF 986, TR 46 and TR 96. Recorded in fifteen conservation reserves in Queensland, of which eight are national parks.[2]

Radio-tracking revealed habitat use

- BBBQ utilised Microphyll Vine Forest and lantana thickets, but did not venture into grassy understorey of young Hoop Pine plantation or into agricultural land (Eliza L.A.).
- BBBQ were found in Microphyll Vine Forest and mature Hoop Pine plantation with well developed shrubby understorey. A dead female was found in a logged Hoop Pine compartment.
- BBBQ were found to roost on tracks and one dead female was found on the track.

Examination of the effects of forest management practices

- Fire changes the structure and floristics of habitat, decreases quality for BBBQ (e.g. from dry rainforest to *Acacia* thickets) Long term effects are unknown.
- Clearing of mature Hoop Pine plantations (frequently used by some populations) occurs.
- Logging can occur in dry rainforest where Forestry define it as dry sclerophyll forest due to the presence of *Eucalyptus* or lack of larger rainforest emergents.
- Clear-felling (largely on Freehold) causes loss of habitat. Regrowth following clear-felling can harbour BBBQ.
- Home range data is equivocal. Data suggest that small home ranges occur in good quality habitat (ie. all through Yarraman-Blackbutt except following logging of Hoop Pine plantations). Corridors surrounded by Hoop Pine may support larger populations than other remnants. Home ranges are larger where habitat is greatly fragmented or habitat is of poorer quality.
- Low-intensity selective logging may not adversely affect all populations. BBBQ may indicate the healthiest trees.
- Current processes identified as threatening: 1) Loss of habitat and habitat fragmentation due to forest clearing and changes in floristics/structure. 2) Habitat degradation as a result of domestic stock and browsing wallabies.

Time for re-writing (of the SMP) - Phase 4

We are currently entering this phase. This is being done in the context of a dwindling resource (timber) because of constraints being placed on forestry to curb harvesting activities. We still know very little about the ecology and behaviour of the species, but there will be some modifications to the adaptive management strategies outlined in early versions of the SMP.

All alterations are made in consultation with the stakeholders, and are aimed at adequately protecting and conserving the species with minimal impact on production values. At present, DPI Forestry's concern (as the main protagonist in the debate) is maintaining a flow of wood commensurate with demand. SMP re-writing and future research on BBBQ need to take this into account.

Any persons interested in the debate should consult our network regarding updates.

Conclusion

- There is spatial variability of home ranges across the landscape.
- There is variability in home range requirements depending (for males) on whether chicks are being raised.
- There are effects due to disturbance:
    - Changes in home range size of individuals.
    - Turnover of individuals (immigration/emigration).
- BBBQ can survive and occupy some modified landscapes, but not tree clearing.
- BBBQ is an important decomposer that probably occupies highly productive areas in the landscape.
- Due to the majority of known populations in Queensland occurring on State Forest, management prescriptions need to account for timber production values in addition to conservation of the species.

Research and Information

BBBQ's probably play a significant role in forest litter decomposition, which would bring clear nutrient recycling benefits to forest managers. It will be important to research and establish these relationships so as to communicate these benefits to forest managers, tree growers and primary producers.

Research into social behaviour, degree of genetic isolation and its association with rich soils at the micro-habitat level may be fruitful lines of research. The readiness of Industry to adopt Integrated Pest Management (IPM) systems that incorporate so-called "green technologies" has nowhere been more clearly demonstrated than by the Sugar Industry (Brazil *in litt*.). The insectivorous BBBQ may well occupy a vital place in such IPM systems.

The database of known locations of BBBQ contains 211 records. We cannot vouch for the accuracy of all. There is furthermore, a modelled database containing indicative information on where the species might be found. This is based on an analysis of the data using a decision tree approach.

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Acknowledgments

Thanks to Mike Gregory for the invitation to attend this highly stimulating conference and to Benjamin Hamley for his editing of this manuscript.

Table 1 - Percentage of sites sampled where Black-breasted Button-quail occurred by tenure type (N= 62 sites). Adapted from Flower *et al.* (1995)

Tenure Type	Percentage
State Forest	55%
National Park	16%
Freehold	13%
Other	16%

Table 2 - Average Home Range Sizes in Hectares (Standard Deviation)

Locality	MCP	Individuals tracked
Eliza L.A.	3.4 (1.3)	1 male, 3 females
Ashby (pre-logging)	3.9 (1.8)	1 male, 3 females
Ashby (during logging)	5.9 (0.9)	1 male, 3 females
Ashby (post-logging)	9.3 (6.0)	1 male, 3 females
Lenthalls Dam	15.7 (7.2)	1 male, 1 female

Hughes and Hughes (at Widgee) 1.5 hectares per female.
Smyth (at Ravensbourne) 11 to 26 hectares.

Rainforest Recovery as a Metaphor for Human Recovery

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Rainforests nurture sustainable livelihoods. The values that rainforests offer relate to healing, learning, production, building, sustenance and exchange. Through their ability to modify light and produce an oxygen rich atmosphere, among other things, rainforests heal humans. Humans rest in their shade, bathe in their pools and enjoy waterfall spa baths; they sunbathe on the sheltered edge out of the wind.

Similarly rainforests stimulate learning. To understand rainforest is to understand any mature ecosystem. Education and information about rainforest attributes provides valuable human insight into the issues of our times. Rainforest recovery is a metaphor for human recovery through its myriad of attributes which can be compared to issues that humans currently face (for example many species - tolerance; intrabiotic nutrients - consumer choice; Web-like food chains - income from diverse sources; succession to climax - life phases and crises).

In addition rainforests are inspirational to visit. It is preferable to build habitations in areas dominated by introduced species and to utilise these species for material needs. Most houses in bushland can promote fuel-free or fire retardant moist rainforest conditions in fire prone sectors. In addition, habitat for native wildlife can be enhanced through sensitive and sensible building approaches. Further, Rainforests provide sustenance. Rainforest bioarchitecture can be replicated in intensive food forests to design ecologically integrated layers of a productive food canopy and understorey in small areas. Rainforests also allow for the exchange of skills and information in many forms, including opportunities for ecotourism, ecoeducation, crafts, harvesting, medicine, etc.

Rainforest contains high amounts of material, information, energy networks and partnerships. Mature rainforests tend to make transactions within their systems and disturbances are quickly adjusted.

Such principles are relevant to human situations. Rainforest environments satisfy fundamental aspects of human fulfillment. Observations and experiences are described.

1. Air purification - healing conditions.
2. “Outdoor universities”: teaching – learning.
3. Resources, tools are available.
4. Shelters.
5. Storage areas.
6. Pure water, nutrition.

1. Air purification - healing conditions.

Rainforest ecosystems provide the backdrop to the human drama. This “ideal” habitat suggests a belief that humans forage along rainforest edges within the closed canopy and out into more open natural communities nearby. Rainforests offer healing oxygen-rich atmospheres with abundant mood enhancing negative ions engendering thrilling responses from many people. Suggestions of a new religion, “Biophilia” (love of life), celebrated by E.O. Wilson, an ecologist from the USA.

2. “Outdoor universities”: teaching – learning.

“Outdoor classrooms, living scientific laboratories, cathedrals and storage facilities” are just a few of the terms ecologist Len Webb used in a popular book written a few decades ago describing attributes of Rainforests and other natural communities. Enormous amounts of employment can be generated by interpretative and educational programs encouraging identification of original native species and invasive exotics.

3. Resources, tools are available.

Resource disrimination strategies allowing rainforest regeneration include selective harvesting of valuable exotics. Camphor laurel and jacaranda are favoured for furniture and wood turning. All exotics have value when transformed appropriately whether as fibrous tissue, craft items (e.g. baskets) or mulch. Madeira vine requires persistent and attentive techniques to minimise re-infestation. Temporary human campsites near outbreaks may realign our cultural trends towards addressing ecological necessity. “Where are the bush regenerators?” “Camping up the gully at the madeira vine outbreak.”

4. Shelters.

Rainforests provide shelter. People's desires to live near rainforest can be used to the forest's advantage. Eucalypts near rainforest can be cut sensitively – those with the fewest habitat features. By milling solid timber from Eucalypts suffering die-back and death, any hollows and burls can augment the habitat of nearby areas. Material that is normally burned or chipped can be placed vertically or horizontally on the ground or in trees as shelter, roosting and nesting sites for diverse Australian animals. Forestry techniques that include selective harvesting of non-habitat trees allow remaining hardwoods to grow bigger more quickly. Exposed branches tearing with windshear produce hollows appreciated by native animals. Ecological awareness can enhance habitat value by augmentation programs using previously discarded forest debris. Hollow branches and logs of all sizes make nearby dense forest areas very attractive when placed with awareness of the ecological niche requirements of native animals.

5. Storage areas.

Storage in rainforests occurs on many levels of organisation; genes, cells, organisms, strata, litter, soil, rock and water bodies. Animal activities have real insurance value. For example bush turkeys scraping and mounding reduces fire risk and concentrates valuable resources of humic-rich organic matter. Inspiration exists for the innovative use of human cultural

byproducts, such as lawn clippings and pruning debris, which can form compost heaps (bush-turkey style) with heats of decomposition adequate to destroy invasive exotic plant propagules placed within the heaps.

6. Pure water, nutrition.

Nutritional cosmopolitan herbs tend to colonise fertile clearings in rainforest recovery schemes. Celebrated in Tim Low's Book ("Wild Herbs of Ausralia and New Zealand", Angus and Robertson, 1991) such species could be Australia's "biggest untapped source of food". *Galinsoga parviflora*, *Chenopodium album*, *Urtica* spp., *Stellaria media*, and *Crassocephalum crepidioides* are some examples. These herbs are appreciated by native animals and have been consumed by humans for millennia. Native plant foods are gaining favour. Bunya pine nuts are an ideal human food (50% carbohydrate, 15% protein, 10% fat). Macadamia nuts have worldwide regard. Wild ginger is a tongue teasing appetiser.

Many common foods favoured by humans come from rainforest environments. Food forestry designs of highly productive closed-forest species (e.g. avocado, custard apple, mango) can be established in areas unsuitable for native rainforest recovery (e.g. urban areas). Most common food plants are non-invasive. Those that are (e.g. loquat and Brazilian cherry) can be avoided.

Conclusion

Some of these techniques are demonstrated in Gold Coast City at:

- Hippocrates Health Centre, Mudgeeraba.
- Camp Eden, Currumbin Creek Road.
- Gecko City Farm West Burleigh (Ph: 07 5534 1412).

Human healing and harmony is engendered by considering and acting on the six features discussed.

Rainforest Restoration - the Army at Canungra

15 October 1998
Don Lynch, Land Manager, Land Warfare Centre, Kokoda Barracks, Canungra, Q, 4275.

"THOSE WHO THINK IT CAN'T BE DONE HAD BETTER GET OUT OF THE WAY"

The Land Warfare Centre (LWC) is located within a 5500 hectare training area around the Darlington Range, part of the Great Divide. The base is about 756 km South West of Brisbane, 30km from the Gold Coast, and forms the green link from Tamborine Mountain through to Lamington National Park. The terrain is a mix of rugged basalt and rhyolite country with some sandstone sediments and alluvials along the major stream lines and lower areas. Vegetation consists of significant heath and eucalyptus/corymbia mixes on poorer soils with very good stands of rainforest here and there on basalts and wetter gullies. In 1996 the training area was placed on the Register of the National Estate for its natural values.

All environmental matters at the LWC are addressed in the 1997 LWC Environmental Management Plan. One of the sub-plans of this document is weed control. Weed control includes declared plants and those not covered by legislation, but considered to be environmental weeds. Actions include the removal of all weeds on areas with good soil and their replacement with rainforest plants and/or natural regeneration processes without competition from undesired species. Restored and regenerated lands will once again be available for training activities when growth rates have achieved canopy closure. Works are carried out under the supervision of the Land Manager by LWC staff, contract, volunteers and environmental groups.

LWC is very active in the training of environmental groups in the techniques of rainforest restoration, the conduct of public field days, the development of restoration doctrine, and control of environmental weeds. Currently there are 27 different sites at all ages ranging from 1991 to 1998, and sizes between less than a hectare to 24 hectares.

This paper includes an overview of Army involvement in rainforest restoration, a description of some sites, discussion on techniques used, maintenance measures, and future intentions.

The Land Warfare Centre - natural and military history

The Land Warfare Centre (LWC) is located near Canungra on the Darlington Range, a spur of the Great Dividing Range. It is situated principally in the Coomera River/Back Creek drainage line surrounded by Tamborine Mountain to the North, Beechmont to the South and Lamington National Park to the South West. It consists of a 5,500 hectare rugged mix of basalt and sandstone soils with craggy rhyolite outcrops. The sandstones are overlaid with richer alluvials in parts of the major stream lines. Vegetation ranges from heath through open forests to rainforests (sub-tropical and dry) depending on the soil type and aspect. Rainfall average is 1200mm, but ranges between 750mm and 1700mm. The climate is monsoonal

with the majority of the rain in the period February - May. The training area is prone to fire in the heaths and eucalypt forest with regular frosts in the lower, open spaces. Most weather comes in the angle from South East to West.

The first impacts on the district were from cedar cutters who appeared in the 1880's followed by extensive hoop pine milling. The Lahey Sawmill at Canungra was for many years the largest mill in the Southern hemisphere and extracted enormous amounts of pine. The milling of pine, cabinet and hardwood timbers cleared much of the land and opened it up for the mixed farming and dairying which further developed the district. The Army has had an influence in the area since 1942, when it was decided to establish a Jungle Training Centre at Canungra to train the troops needed to stem the advance of the Japanese on Australia. It was a very large training camp in time with tough and effective standards honed in the local area, in the adjacent private land and in the nearby National Park.

The camp closed in 1946 but re-opened in 1954 as the Jungle Training Centre (JTC), on a smaller scale to train troops for service in the Malayan emergency. This was followed in the 1960's through to the early 1970's by training for Borneo and South Vietnam. The unit had a name change in 1976 from JTC to Land Warfare Centre (LWC). Parts of the present training area have been in constant military use for 44 years and intermittent use (less the period 1946 - 54) for nearly 50 years.

Army's care of vegetation and promotion of regrowth can easily be seen by comparing the training area with much of the adjacent farming etc lands. The training area was increased to its present size in 1970 with the resumption of some adjoining properties. LWC is used for dismounted training (Infantry) only, with areas set aside for the live firing of Infantry weapons. The type of training carried out requires good vegetation cover to be effective, so great care is taken to maintain the natural values of the environment. Army has always been aware of the simple fact that its impacts on the natural environment, other than in the heat of conflict with an enemy, must be low, environmentally friendly and sustainable, and has strict rules in relation to such matters as rubbish, cutting, firing on ranges, digging etc. The care of the training area by LWC over many years was recognised in 1996 when it was placed on the Register of the National Estate for its natural values.

Regeneration and restoration

Note: Within this paper the definition of the terms "restoration" and "regeneration" are as given in Robert Kooyman's book Growing Rainforests, i.e:
“Restoration” - assisted repair, and
“Regeneration” - internal process of self-repair.

Restoration at LWC dates back to around 1970, when the training area was seen to be infested with Groundsel Bush (*Baccharis halimifolia*), a declared weed. Action was commenced to control it with herbicide treatment in conjunction with the planting of various eucalyptus species in an effort to suppress regrowth. Many were unsuited as they did not create the shade needed to suppress the Groundsel and other prevalent pests such as Lantana (*Lantana camara*). Any Groundsel removed on the better soils was quickly replaced by Lantana. Planting was also poor with low success rates caused by: choice of wrong species (*Eucalyptus grandis* and *E. microcorys* on poorer soils); lack of water; carelessness; predation by wild cattle and wallabies; fire; seedlings not planted at all; planting poor stock;

and wrong seasonal conditions etc. This practice was in place from around 1970 to 1989. Groundsel was controlled but the restoration was only successful in patches. 1990 saw a shift in direction: the control of Groundsel and restoration of degraded lands became separate issues. Groundsel Bush was being controlled, the spraying was to continue but replanting on Groundsel sites was discontinued as the logistic effort and success rate made it uneconomic. The direction and effort was shifted to the restoration and regeneration of those areas in the training area with good soil, accessible, with good training potential but degraded, principally by Lantana.

The theory was to restore lands that could in time be used for training and only control noxious weeds in those areas which were difficult to access and therefore of lesser training value. Thus began the LWC restoration of rainforest program now eight years old. At the same time other environmental weeds such as Privet, Camphor laurel and Chinese Elm, mostly around the barracks area and old farm areas, were targeted for eradication.

The process begins

The clearing of weeds followed by regeneration or restoration or both is addressed in the Weed Control sub-plan of the LWC Environmental Management Plan of 1997. This plan incorporates the Land Management Plan of 1990, which addressed the natural environment and expanded upon it to include the total working environment. Noxious, declared plants such as Groundsel, Fireweed etc are controlled throughout the entire training area, together with selected environmental weeds, mainly by contract with an operator able to deal effectively with the difficult terrain. Meanwhile, selected areas are chosen for regeneration/restoration by Land Management staff and by contract. Selection of an area for this process uses simple criteria:

- Soil which has in the past sustained, or can sustain rainforest.
- Frost-free area with good aspect.
- An area accessible to a labour force and logistic support.
- Degraded land but with potential for training use if restored.
- Relatively level and "user friendly" site.
- Capable of, in time, being linked to other good training areas in the program.
- Preferably not too heavily degraded.
- Preferably able to sustain live firing ranges when restored.

Once an area has been selected for regeneration work, the following sequence is set in motion:

- What methods are needed to prepare the site? Manual, mechanical, herbicide, or any combination of these methods.
- Where is the labour force and what will it cost for labour, machinery, herbicide, plants, stakes, fertilizer etc?
- A budget and priority is allocated to the task, based on the selection criteria, in particular its potential to be linked with other areas and its training value.
- Stores, labour etc are acquired to commence the task.
- Work commences based on budget availability and the priority allocated to the task.

Clearing

Clearing is best carried out during the dry period (June - November), when access to sites is easier and more reliable, clearing creates less disturbance and the principal weed, Lantana, has less leaf cover and may be under stress. Obviously though, if herbicide is being used, then the period of maximum growth is the optimum time. Clearing toward the end of a dry season also allows the use of herbicide with a flush or weed regrowth at the first rains.

The advantages and disadvantages of the three methods are:

Method	Advantages	Disadvantages
Manual	• Causes less environmental damage; soil disturbance, damage to, and loss of, potential regeneration stock.	• Requires good plant ID and manual work skills. • Slowest method • Most expensive (labour costs) • Physically demanding.
Machinery	• Fastest method, particularly in heavy growth. • Less expensive than manual method for the amount of work completed. • Soil disturbance stimulates seed bank and early colonisers from adjacent area (including weeds). • Requires a small labour effort (operator and safety person).	• Can create significant environmental damage with soil disturbance and loss of plant stock. • Can only work on accessible ground. • Some plants covered by spoil. • Not as thorough as manual and requires follow up. • Difficult to use on unstable (wet, sloping etc) ground.
Herbicide	• Very effective in areas of heavy weed growth. • Does not require a large labour force. • Can be carried out and left for some time. • Less expensive than manual and machinery methods. • Does not affect seed bank in the soil.	• Requires care and good application skills. • Does not discriminate with young stock lost to herbicide. • Difficult on hilly terrain. • Some damage possible in cutting access lanes.

In summary, the use of machinery is the fastest, particularly on heavy growth, but with environmental penalties; manually is environmentally the most friendly but slowest and most expensive method; whilst herbicide is very effective in areas that are badly degraded with little regeneration stock under the weeds. You may wish to use a combination of methods - manual on the less degraded areas, particularly if labour is voluntary - machinery on heavy, difficult parts - herbicide to gain access etc. LWC makes extensive use of a bobcat with a skilled and experienced operator accompanied by a safety person with good plant ID skills.

The herbicide used on heavy stands of Lantana is glyphosate which has little to no effect on any seedling growth under the dense cover of the weed. Starane and water is effective on Cockspur regrowth around four weeks after clearing by machinery and at clearing if done manually. Garlon and diesel at 60:1 is also effective but the diesel affects application equipment and operators, and so preference is given to the water-based mix. Lantana is best treated at all stages with glyphosate, though much care and skill is needed during regrowth applications. Large trees are mostly attacked by cut stump method with glyphosate at 1:1 or stem injection with glyphosate or Garlon and diesel mix. Small trees are generally treated by

basal bark method using Garlon and Diesel or cutstump, if large enough, whilst 2,4-D is used as an overall spray on all but the largest Groundsel, when basal bark or cut stump methods are used. The timing of herbicide application must occur at the best growing times for it to be successful.

Tools used in clearing are: cane knives, brush hooks, mattocks, small saws and secateurs, all clearly marked in yellow whilst clothing, to include gloves, should form a total cover and be robust. All vegetative material should be left on site as mulch and effort should not be wasted in clearing it from trees - it will fall in time. Work is carried out in teams of two, using the buddy system, off a face and working up a slope if one exists. Plant ID skills are critical, whilst good sharp tools are necessary.

Planting

Plants are selected from the LWC training area species list except for arboretum or cabinet timber plantings. Most are purchased, budget permitting, in one litre bags with some from propagation in our own nursery, using local seed and others of smaller stock hopefully potted on since purchase. We find the most successful stock to be around 40cm+ in size and not root bound. All stock is well watered in the pot before planting. Bottom branches are trimmed to improve form and to reduce the chances of herbicide poisoning if the site is programmed for weed control with herbicide. Mulch can be cane mulch or paper or both, with the planting hole being at least twice the size of the plant.

Fertilizer: Dynamic Lifter, or in some cases none at all, unless specific fertilizers are being trialed. The plant is slightly dished in the hole and given five litres of water with no follow up unless a drought situation arises early in the site program. On occasions an irrigation line is laid to the site from a nearby stream. Water is applied from 20L plastic Army water drums. Spacing: two to three metres at random intervals depending on successional stage, species and the purpose of the planting, unless there is natural regeneration stock in place and we are “booster” planting. Use plants appropriate to the site, i.e. dry rainforest, edges (quick canopy), gap, riparian etc and note the species in place at and around the site. Preference is to plant during the period January - April, but if soil moisture is good, at any time, particularly around November. Be wary of open area planting during hot periods.

Good planting skills are essential together with the appropriate tools such as planting mattock (long neck), long-handled shovels, heavy crowbar, knife and secateurs. As for clearing, teams of two should be formed, the planting supervisor should position the stake with plant and planting teams should follow on to complete the task. On no account have individual team members do specific tasks, i.e. one person dig holes, another plant, another water etc. This method is boring, provides no sense of achievement and leads to "misses".

Maintenance

Most planting projects fail because of inadequate or, in the worst cases, no follow-up maintenance. Failed projects abound that in reality have been a waste of time and resources because the initial purpose and enthusiasm were lost or waned, and little or no thought was given to maintenance. In initial planning and budgeting, time, resources and money must be set aside for maintenance. Maintenance can be manual, by herbicide, or by both with manual preferred as it is the friendliest with no damage to stock, planted or wildlings. Herbicide

maintenance is potentially dangerous but may be used where no other species are required other than those planted, or there are enormous quantities of grass or soft weed which threaten the survival of the project. Maintenance requires lots of effort over a long period and can be expensive unless labour is voluntary.

The period of maintenance is determined by the soil, spacing, species mix, weather conditions, the quality of maintenance, aspect (sunlight and weather) and quality and size of planting stock, but must continue to canopy close. Obviously the effort required becomes less as the cover increases. It is essential to keep soft weeds and grass away from stock and keep all weeds on site below the height of plants and preferred regrowth. Stakes are important. Grass and soft weeds have an enormous impact on survival and growth rates, and therefore on the period of maintenance. Stake natural regrowth (wildlings) as they appear and remember natural regrowth is the cheapest method of regenerating a site. Don't destroy a good tree just to plant another. Use herbicide carefully and sparingly.

Weed control

It can be expensive and labour intensive to keep all unwanted growth out of a restoration site and there will be a need to assess time available, labour and resource costs against the size of the task. When this has been done, a control program can be prepared. The program will be flexible and normally a compromise which overcomes the problem somewhere short of the optimum. The lesser the compromise, the shorter the period to canopy close. Hard weed control is very specific, of short duration and can normally be done with herbicide if it can't be hand removed (e.g. Cockspur). If the initial clearing was effective, the only real problem is going to be from grasses and soft weeds such as Cobbler's Pegs, Thickhead, Fleabanes and Billygoat Weed etc, particularly on more open sites with good soils near a seed source with good sunlight levels. Often you will compromise and settle for keeping weeds away from plants with a regular work effort. Don't use whipper-snippers without protective sleeves on each plant and don't leave long periods between work efforts as plants all too quickly are consumed and lost to weed regrowth. Be warned: the period of time, work effort needed and tedious nature of weed control often causes well-intentioned regenerators to give up entirely or not direct enough effort to the task. Result: another failed project. Always keep in mind:

The restoration formula:

Enthusiasm + Time = Success

Community activities

LWC is active in the public arena with the promotion of regeneration and restoration as a means of improving our vast areas of degraded rainforest lands in South East Queensland. A large public field day is conducted each two years with a theme of rainforest restoration together with smaller events directed toward weed control and organised plantings with environmental groups. In addition to activities on Army land, the LWC joins with other groups and organisations in environmental works throughout the community. LWC supports the Green Corps program both with the practical training of teams and as a partner agency supporting their own team. The unit is also involved in:

- Committees such as Farm Forestry, Pest Management, Water Advisory, and various shire development etc committees.
- Support of environmental groups.

- Support for university research projects.
- Many visitations to inspect projects and seek advice.
- Surveys (frogs, botanical, koala etc).
- Support of ex-service groups in environmental ventures.
- Work experience.

Works are open for public inspection by appointment and we are prepared to offer advice and make research results available to those interested in improving their natural environment.

Future Directions

The LWC plan is to continue with the implementation of our EMP and to support the community with information and practical assistance in the restoration of rainforests. The current level of works in the training area will proceed at a pace dictated by the budget allocation from year to year. Works will go forward and those in place will not be allowed to deteriorate. In the restoration of degraded lands it is sensible to be realistic about what can be achieved. Don't over-extend. A small successful venture is most satisfying and a real boost to the natural environment, whilst a large incomplete area will further degrade and have only a negative influence. Remember this in your considerations:

The environment: "If you can't make it better don't touch it".

Growing a Rainforest Garden

Graham McDonald, Toona Rainforest Nursery, 12 Pharlap Avenue, Mudgeeraba, Q, 4213.

This paper looks at 'growing a rainforest garden'. Reasons for venturing into this style of gardening activity are expressed as well as a brief outline of how to prepare and plant a garden, reflecting on a 'real life' case study in Mudgeeraba. The successes and failures that have taken place throughout the garden's 14 year life are illustrated and the outcomes that it has produced (including the provision of wildlife habitat, climate control and maintenance, as well as the wildlife that it supports like butterflies and birds).

Growing a rainforest garden

A natural rainforest ecosystem is an extremely complex natural system containing thousands of life forms all interacting and depending on each other for the long term stability and sustainability of the system.

Is it possible to create such a system from scratch in a time frame of only a fraction of that required for the rainforest to develop naturally? The answer is uncertain and depends on a number of factors all of which must come together over a short space of time.

The soil type is not important but must have reasonable drainage and a high input of organic matter initially.
The plants chosen must be:

- Local provenance origin or similar.
- Mulched and watered until established.
- As many diverse species as possible.
- Readily available.

The trees must all be planted in a 1 to 2 year time frame with a minimum number of 'pioneer' species except in areas of harsh local conditions (e.g. frost, strong winds). The understorey should be added 2 to 3 years after the initial plantings but can be added later. (More tree roots makes establishment difficult.) The gardener ideally should have some basic knowledge of the plant material, planting and maintenance techniques and most importantly be COMMITED to the long term success of the garden. This means keeping down weeds by vigilance and mulching for 4 -5 years until canopy closure occurs.

The area planted should be as large as possible (minimum 10 metres x 10 metres) to allow for diversity, minimising edge and wind tunnel effects and as near as possible to circular or square.
Planting times should coincide with moister and cooler conditions, e.g March / April / May in SE Queensland. The area planted should not have a canopy to start with as canopy trees will not grow rapidly in the shade and with root competition.

Some questions answered

1. Do I need to supply my rainforest with megalitres of water to keep it alive?

   NO! If you have chosen local species for your site you may never need to water except in extremely dry periods or when the plants are establishing a root run. Watering is minimised by using lots of mulch e.g. sugar cane. Beware that heavy mulch can also prevent light rain from reaching the soil surface. A healthy rainforest garden needs about half the water required to keep a lawn green.

2. Can I use recycled water from the septic?

   YES! Rainforest plants are generally happy with water high in nitrogen and phosphorus.

3. Does a rainforest change the microclimate in my yard?

   YES! The temperature in the rainforest is up to 5°C cooler in summer than outside and in winter the canopy prevents frost. The trees also break the wind and help to protect the house from bushfires and storm damage.

4. Rainforest trees are HUGE! Will the trees grow too large for my garden?

   NO! Most rainforest trees when planted 2 - 3 metres apart grow only 1/3 of their height in a natural rainforest. (Exceptions may be emergent species.) Be careful to choose the smaller species (under 10 metres) if space does not permit.

5. Can I grow a rainforest where rainforest has never existed?

   YES! However, in less than ideal shallow clay soils on exposed sites, you must deep rip and mulch soil heavily and choose species from dry vine scrubs to suit these conditions.

6. When can I expect to see large increases in species and species diversity of birds, butterflies, etc.?

   This generally takes 4 to 5 years or longer depending on:
   - The State of health of surrounding bushland (if any).
   - The plant species selected (be as diverse as possible).
   - The lack of, or presence of linking corridors of green.

7. Are rainforest gardens no-maintenance systems?

   Almost! but not quite. A rainforest garden is a style of garden which after 5 years is about as close to no-maintenance as a garden gets. Some bird-distributed weeds which like shade may need constant removal, e.g. *Protasparagus plumosus*, *Ochna serrulata*.

8. Do I need to have a degree in chemistry and soil science to grow rainforest plants successfully?

   NO! Just follow the guidelines given and success can be assured.

Rainforest, The Weed

Ernie Rider, Department of Natural Resources - Forestry, Rockhampton, Q, 4701.

Rainforest is a weed plant community. Even in the far west of Queensland the last trees one sees before the desert are rainforest species viz. Atalaya hemiglauca and Ventilago viminalis, with the coolibahs and red gums "cowering" on the drainage lines. Given half a chance it will reclaim beautiful Open Forests and even Woodlands, destroying these ecosystems and infesting the soil with pathogens. Really it needs to be kept at bay by the judicious use of fire, as every farmer should know.

Not only is it destructive in interaction with other communities but it causes stressful competition among its own members and inhabitants. Is it then any wonder that it should spread its pernicious influence beyond its own boundaries and diffuse its naked Darwinism into other spheres.

In addition to its actual weed status it has become, metaphorically, a mischievous and divisive weed in our society, corrupting our youth, our Christian religion and aiding in the suppression of our much misunderstood attempts at the Westminster system of government.

Rainforest - the weed

Rainforest - scrub, jungle, the green hell; call it what you will - is by any estimation demonstrably a weed community festering in our otherwise glorious Australian environment and many of its members are fixated on destroying surrounding communities by no-holds-barred aggression.

It is a genetic backwater in that superior species e.g. the eucalypts and acacias evolved way back in the Cretaceous (some 35 million years ago). Not only that, but most of this original temperate flora was invaded only recently (in the Tertiary, ca. 15 million years ago) by insidious Indo-Malesian elements which dragged us even further back along the evolutionary trail to a more primitive state. Indeed, until the rainforest was driven back by climatic changes, most of our fauna could not have evolved in the grass-rich Grasslands, Woodlands and Open Forests.

Such is its apparent antipathy towards the more advanced plants that it is always trying to take over their habitats. Ask any forester; the best tree communities, the giant eucalypt/brush box Tall Open Forests, these days have to be protected from being smothered, by the judicious use of fire. If you were a cane farmer, would you like your fields to be taken over by such an unproductive array of plants (and the vermin that comes with them!)?

Not just that the higher plants are overwhelmed by sheer weight of greedy numbers but, as discovered in Tasmania recently, the rainforest actually fosters the production of soil pathogens inimical to the survival of our lovely eucalypts which thrive on "mineral soils". Foresters are instinctively aware of this and practice the art of top-burning of wet sclerophyll eucalypt heads after logging to achieve successful regeneration. Easier still is clear felling

with broad-scale burning since this further reduces competition, the way nature intended with its episodic wild-fires.

If you have lived and worked in the rainforest you would know what a hostile place it can be. Leeches and their haemophilia and subsequent itching; ticks and their debilitating poisons; mites with their unbearable itching and the transmission of scrub typhus and leprosarial lesions; deadly plants with poisonous sap, fruit or timber; prickly plants some with tendrils that can lift a man or rip him open; giant stinging trees against whose stings only morphine might prevail; giant forest funnel-web spiders; savage cassowaries; huge snakes; vicious rats that can gnaw through a jam tin with ease or chew the soles of your feet off as you sleep, if sleep you can in the depressing closeness of the air; and all around the sickening stench of decay.

Most of us have heard of Darkest Africa but it might as well be “darkest rainforest”. Much has been made of the beneficial products of the rainforest, even though most of them have required genetic manipulation to produce an acceptable, tamed product. One simply doesn’t talk about the bad things that inveigle their ways out of the jungle to wreak havoc in our world: pests and diseases debilitating and deadly.

Whilst rainforests can easily be seen to be an actual weed community is it any wonder, given their intrinsic nature? None of them, with the exception perhaps of the mature araucarians, can just innocently grow and exist to display their beauty, breed, regenerate and prepare for the rigours of old age like the majestic eucalypts. No, their constituents are persistently engaged in a savage life and death struggle not only with their fellows but with lower organisms which proliferate there.

Having persisted for so long, as you might imagine, rainforest plants are tough. The last trees before the desert are rainforest in origin viz. *Atalaya hemiglauca* (whitewood) and *Ventilago viminalis* (vine tree). Whilst their betters, river red gums and coolibahs, require the congeniality of the drainage lines just to cling to life these uncivilised survivalists brazen it out on the dry ridge-tops. Their primitive origins in the innate practice of naked Darwinism, the survival of the fittest, with all its ruthless brutality, cannot be suppressed even to-day. Nothing else stands a chance!

Even or, should I say, as you might expect, the rainforest community turns in on itself. Competition is so severe that individuals are variously eaten, choked, starved, dehydrated or poisoned by their companions. Some species such as the southern silky oak and the yellowwood consist of individuals which act in such a putatively selfish manner that they will “cut their noses off to spite their faces” by poisoning all of their kind *en masse* once they reach a certain size. Strangling figs (What an evocative sobriquet!) attempt to dominate by a policy of engulfment and root competition. Many of the vines seem to try to prevent re-establishment after disturbance by climbing over and dragging down young saplings. However when we think of the impact rainforest has had on our human society it is revealed as a divisive and corrupting influence. From the suggestive and less than acceptable names of some of these plants we progress to stages more criminal.

How sinister can you get with a name like *Apophyllum anomalum* literally the plant with no leaves and no name! What has it to hide? Some are designed to mock the unfortunate like the attacks on the speech-impaired with e.g. *Rhodosphaera rhodanthema*, *Blepharocarya*

involucrigera, *Endiandra anthropophagorum* (also with its thinly veiled hints of cannibalism!), *Tabernaemontana pandacaqui* and the stuttering *Tinospora tinosporoides*. Dyslexia is encouraged with e.g. *Cossinia* c/f *Cassinia*. *Acacia maidenii* can be regarded only as sexist. The unfortunate condition of obesity is lambasted with *Fatuoa*. There are derogatory remarks like *Labichea* and *Medinilla balls-headleyi*! There are downright lies e.g. *Pouteria singuliflora* - for Goodness' sake - it's often covered in flowers! Bad etymology and spelling are encouraged e.g. *Dysoxylum* should, by derivation, be *Dysoxylon* and *Livistonia* flows better off the tongue than *Livistona*. We may perhaps ignore a little *Acianthus fornicatus* but when it comes to sex, especially penis-envy, suggestivity plumbs new depths. I mean, who wants to know about the *Dicksonia youngiae*! It becomes doubly nasty when combined with racism. We might think its OK to mention a white bean but should we really be talking about yellow beans and black beans? Why do so many rainforest plants seem to pretend to be what they're not e.g. *Cupaniopsis anacardioides, Spartothamnella juncea, Morinda jasminoides, Homalium alnifolium, Balanophora fungosa, Denhamia oleaster, Calophanoides hygrophiloides* - the list goes on and on? No wonder many of our youth have an identity crisis!

Rainforest has divided our society like no other form of vegetation. Everyone knows rainforest soils are among the best for farming and grazing but some value it virtually intact e.g. I have seen dry rainforest providing excellent shade for pig-styes. Many can see why patches have to be conserved/preserved but replant it: you'd have to be mad!

The Judaeo-Christian ethic is to go forth and multiply and replenish the earth. All things should be under our dominion. Are we now to understand we are to have a new ethic, not only to save the rainforests but to re-establish them? Surely this leads us down the path towards Buddhism or even pagan animism! Let us turn our faces from such apostasy!

Our youth these days faces a hard task, to grow through the confusion of puberty and develop a well balanced adult outlook. How corrupting are such species as the bottle trees? They pervert our youth with their patent symbolism and infer that it is perfectly OK to litter the landscape with the empties after profligate overindulgence with alcoholic beverages or spirituous liquor! Rainforest not only provides a place where these juveniles can get up to funny business but transfers its stresses to those ill prepared to cope. It's dog eats dog, the survival of the fittest, death and decay, and dynamism so confusing that disillusionment can often quickly ensue.

Rainforest has led to the corruption of science. It is mainly the body of scientists, that elite class, who values rainforests so highly. Being so smart it is very tempting to employ any means to achieve their goals e.g. biased reporting, mixing the practices of science and politics, tailoring investigations to pre-conceived out-comes.

Because rainforest has become such a divisive issue it has been used by political parties to achieve other ends. Since the issue is so emotive to many, rainforest policies can be tied to rafts of other issues thus denying us even more of the true democratic process. Because of the political brou-ha-ha people conceive strange ideas not only about rainforests and local priorities. Many now believe Cape York to be a solid block of tropical jungle. I remember one local government member going off to Tasmania to protest about the Franklin whilst at home the level of the town dam was raised thus wiping out a swathe of rare AMVF and it is still planned to raise it further!

This complex of political aims and shadow-boxing can further lead to the public service following the whims of the government of the day. Instead of offering the minister the best advice, it would be so expedient to second guess his/her opinions and provide what is thought to be what is desired to be heard; thus attacking the fundamentals of the separation of powers inherent in the Westminster System.

Thus rainforest rather than being regenerated needs to be restricted and carefully controlled!

Harmonious Change (Green the World)

Dennis Martin, PO Box 155, Ubobo, Q, 4680.

This paper covers the challenges that rainforests face in the Gladstone region into the next millennium. In addition the effects of the dominant species and their role in these communities will be discussed. The value of rainforests to society must be recognised in order to bring about harmony, ultimately so that we can manage these rainforests sustainably into the future.

Harmonious change (green the world)

In this paper I want to speak to you about my second most important subject. The 3 P's of Forest management, Plant, promote and protect. I'll do this in three points:

1. The challenges for the forests (rainforests in particular).
2. The value of forests to society.
3. Bringing about harmonious change.

The challenges for the rainforests

The forests have had to cope with tremendous changes in the past, but change is a fact of life, you see the only thing that static in this world of ours is the fact that everything is changing.

The challenges are firstly, a denial of space caused by: Farms, roads power lines, dams, urban spread etc. Society needs all of these things so we have to grow better forests on the space available to them and on any little corner we can use in other areas as well.

Secondly and this is the real enemy of our rainforests, is not a denial of space, the axe, the chainsaw, the bulldozer, introduced species, or disease. It's the dominant species, it's man, man or woman with a one tracked mind controlled by the hip pocket nerve. People who can only see dollar signs where ever they go.

By far the worst thing that man does is allow wild fires to get at our forests. Fire is the main cause of destruction in the rainforest, small blocks in particular, because there are not enough scrub wallabies in a small scrub to control the grass around the edges. Fire not only lit by people is what does the major damage to our rainforest. During the stormy season Sept-Dec. lightning does light some fires that turn into wild fires because no rain or not enough rain comes with the storm. But more likely it's a fire that's lit after a storm but doesn't go out and continues to burn until it's out of fuel or good rain comes.

So you see the main negative effect on the forests of Australia has been caused by the dominant species. Like I said earlier a man or woman with a one tracked mind.

The dominant section of that dominant species have played their part in the destruction of the forests without doing anything physical. Governments and bankers have encouraged, even forced ordinary people to clear even marginal land, in the name of progress. But it's good to see a change of attitude these days.

The value of forests to society

- Forests are a major source of the essential to any group of people.
- Forests improve the Fertility of the soil.
- Forests improve the Quality of the water.
- Forests improve the Purity of the air.
- Forests grow resources (environmentally friendly building material).
- Forests also grow jobs, jobs to harvest them (sustainably of course), jobs to plant them, jobs to promote them and jobs to protect them.
- Forests are also good just to walk in.

It's really good to hear the government talking about growing forests as carbon sinks. (A tremendous opportunity exists here to solve the unemployment problem as we develop this program, putting the three P's of forest management into practice).

Bringing about harmonious change.

It takes all types of people to make a world, the challenge is to get them all to work together.
The experts tell us there are three types of people:

- Those who make things happen,
- Those who watch things happen,
- And those who shake their head and wonder what happened.

Yes there's still people wondering where the forests went.
I'm pleased to be a part of a group that's determined to make it happen.

Too often people play the blame game. It's too late to blame someone for the problems we have, they haven't got enough money or resources to fix up the problem caused by years of neglect.

What we need to do is consider the four A's of Attitude:

- Accept;
- Adapt;
- Appreciate; and
- Act…

Act to bring about positive change. You see if you don't instigate change you will become a product of the changes taking place. There's no doubt about it the world is reacting negatively to the pressures put upon it by the dominant species, the changes won't be good unless some group of mankind inspires the majority to act a little better, in fact live in harmony with nature.

We, my wife and myself are in a fortunate situation, because we live on Harmony Farm:

Where there's no weeds and there's no waste.
Where there's no work and there's no worry.

You see weeds are nothing more than biomass that builds the soil, work is the exercise we need to stay healthy. (Success in life all depends on Attitude).

Summary

Let me summarise by saying:

The three P's of forest management will be a reality when we understand:
1. The challenges of the rainforest.
2. The value of forests to society.
3. We all develop an attitude of tolerance and work together to bring about harmonious change.

Conclusion

To bring about harmonious change everyone needs to do an attitude check by asking the question "is it possible for every person on earth today, to live as I live". Reduce your demands on the resources of the planet and get organised and work to bring about change. Change that will see the resources for the future increase and there will be enough for everyone's needs. Because as I said earlier if we don't instigate change we will become a product of the changes taking place.

We will be successful bringing about harmonious change when the majority of the people see that waste is generally only fertiliser in the wrong place. And worry is caused by trying to get someone else to do something that I'm not prepared to do myself. In other words "if you don't live the life you believe you will soon believe the life you live".

Weed Control Techniques used by LWMA - Lockyer Landcare in Dry Vineforest Management

Steve Fox, Technical Officer, Lockyer Catchment Centre, PO Box 61, Forest Hill, Q, 4342.

The Lockyer Watershed Management Association (Lockyer Landcare) has been involved in dry vineforest conservation in the Lockyer for over a decade. The following notes briefly describe the four major weeds of local vineforests and control techniques that the group has found successful in this area. The techniques may not be as effective in other areas or soils.

Lantana (*Lantana camara*) is a high priority as it competes with native species for light, nutrients and water in the dry vineforests. Also, it grows particularly thick on the forest margins and then carries periodic fire further into the forest, destroying it. Hand removal is the most effective method where the areas are reasonably small and labour is plentiful. Previously undisturbed lantana will usually pull out of most pliable soils and is generally not prone to reshoot or sucker. Not too many seeds germinate and can be easily pulled out on an ongoing (annual) basis. For larger areas the group uses Roundup with a large droplet size applicator and 2m long wands so that whole bushes can be easily covered.

Madeira vine (*Anredera cordifolia*) is a high priority because of its smothering growth habit and vigor. It is having a massive impact on vineforests in the Lockyer but we have had little success in controlling it. Hand removal is only practical where individual vines are found. In such cases it is vital to remove all underground tubers. Spraying is an option for knocking it back although we have done little and it has not had much benefit. Livestock enjoy grazing Madeira vine and seem to keep it knocked down in some situations.

Green panic (*Panicum maximum*) is a high priority as it competes with native species, especially in revegetation areas. Also it grow thickly on forest margins and carries in periodic fires. Grazing helps keep it under control but can knock seedlings around, especially in small remnants. In regeneration areas, mulch or carpet can help slow invasion. Roundup and pre-emergent herbicides can offer efficient control for up to 4 months. Encouraging other groundcovers including native grasses that may have been reduced by previous grazing can help reduce re-invasion.

Asparagus fern (*Asparagus africans*) is a priority due to its smothering growth habit. The group has found that cutting off the top of bulbs and applying neat diesel might not always work.

The group has found that at their working bee volunteers benefit from setting achievable goals for each occasion. For example, we might have a weed specific, area specific working bee. Working bee objectives are achievable, measured and celebrated!

The Use of Fire in Preserving the Eucalyptus Forest and Rainforest Vine Scrub in the Boyne Valley

Frank Bowman, “Newry”, Ubobo, Q, 4680.

This paper looks at fire management in relation to the conservation of rainforest remnants in a grazing landscape. Regrowth management and the need for rural economic issues to be considered in Landcare programs are also discussed.

The use of fire in preserving the eucalyptus forest and rainforest vine scrub in the Boyne Valley

I have lived on the cattle property Newry for the past 50 years and have taken a great interest in the use of fire and its effects on trees and pasture during droughts and the non-drought years.

Our property Newry 2,280 ha and our property in the Callide Valley 666 ha combined run 1,200 cattle. Tree cover on Newry consists of blue gum, lemon scented gum, narrow leaf ironbark, some broad leaf ironbark, hill type and river flat bloodwood, swamp mahogany, Moreton Bay ash, wattle, corkwood wattle, red flowered corkwood, gum top box and paperbark, oak, and bottlebrush in the river and creeks. Two small areas of rainforest vine scrub are fenced off from cattle. One is approximately 20 ha, the other 80 ha. No attempt is made to protect these areas from fire, as they will not burn providing the area around these scrubs are burnt every 1 to 2 years, to reduce ground litter. I have seen drought fires, flames 15’ to 20’ high, hit these scrubs and just die. This would not be the case if the surrounding area was not burnt, for example for ten years. The build up of ground litter would be immense, hence the outer perimeter of the scrub would be severely damaged and would be invaded by lantana. It must be remembered that no matter how hard people try to save an area from fire, sooner or later it will get burnt, especially in rural Queensland. The same criteria applies to eucalyptus, as the build up of bark, branches etc. over a 10 year or even a 5 year period, which I have seen, causes immense damage to the trees. They then send up sprouts from ground level and along their trunks.

Captain Cook described Australia as a land of flame. Three bush fires were burning when he was at the town of 1770. I believe the Aboriginals regularly burnt much of the country in Central Queensland.

To stay viable we have to Tordon eucalypts and wattle on Newry every year due to regeneration. For economic reasons we do not leave scattered trees (park like appearance) anymore, but leave clumps, so as to stop regeneration over a wide area. There will be a lot less trees and less poles and mill timber available with this method.

The enclosed newspaper clipping [reproduced below] which I read out to the conference at Tanyalla was in the Gladstone Observer a couple of weeks before the meeting. The economy of rural Australia should be noted when any Landcare issues are written about.

Standard in bush dropping

> The standard of existence in rural areas was dropping below internationally accepted levels, Human Rights Commissioner Chris Sidoti said in Central Queensland yesterday. Mr Sidoti said people in the bush were being made second-class citizens by Australia's plethora of economic rationalist policy. Touring Central Queensland until Monday, he said the commission was closely investigating how policies formulated in the city were effecting country residents. "Human rights provides a broad standard", Mr. Sidoti said. "There is a right to adequate health care, children have a right to education, education should be accessible to children with a disability". "In many cases, yes, we are falling below the standard in what we are providing". Mr. Sidoti said the lack of acceptable health care was a big issue facing rural Australia. It was creating great division between rural and urban Australia, and increasing the level of insecurity bush people felt about their future.

A Fire at Treetops? - Fire Management and Nature Conservation

Bruce Boyes[1] & Nicholas Cox[2].

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[2]Nicholas Cox, Consultant, WWF South-East Queensland Rainforest Recovery Project, C/- GPO Box 528, Sydney, NSW, 2001.

Fire management is one of the most contentious and difficult vegetation management issues. The example of "Treetop Sanctuary" in the Lockyer Valley shows that current rural fire management practices often have a very poor scientific basis and as a result are having serious negative impacts on biodiversity. The significant vegetation of "Treetop Sanctuary" is profiled, fire management practices in the Lockyer Valley and their negatives discussed, and solutions to the problems outlined.

Introduction

"Treetop Sanctuary" is a 150 acre (62.5 hectare) property located in the southern Lockyer Valley, approximately 100 km west of Brisbane, South-East Queensland. The western end of the property, where there is road access, is on a flat-topped plateau with an altitude of approximately 500 metres. The eastern end of the property drops away into a steep-sided sandstone gorge. The plateau area and gentle slopes leading towards the rim of the gorge feature tall open woodland, dominated by eucalypt and acacia species, with dry rainforest in the remaining gully line and gorge areas. Approximately 60% of the property is tall open woodland. The geology of the property is predominantly Heifer Creek Sandstone, rising to Walloon Coal Measures on the plateau area. On adjacent properties there are large basalt caps, rising to 700 metres, overlying the Walloon Coal Measures. The area is in the foothills of the Great Dividing Range, which is located approximately 10 km to the south.

The owners of Treetop Sanctuary, Peter Keys and Leanne Jackson-Keys, have established a small-scale health retreat/environmental tourism enterprise on the plateau part of the property. By establishing a health retreat/environmental tourism enterprise, the landholders are able to make an income through retaining, rather than clearing or modifying, the significant natural vegetation on their property. "Boutique" guest accommodation is in cabins in six renovated historic train carriages. Other facilities include a seminar room, dining room, kitchen, and health therapy rooms. Walking tracks lead to rainforest areas, lookouts over the gorge, and other features. A Fire Management Plan has been prepared for the property (Cox, 1998).

Nature conservation values

"Treetop Sanctuary" has very high nature conservation values:

- A large number of rare and threatened species, including a newly described species.
- A large number of flora species normally found in sandstone vegetation communities further inland.

- Areas of endangered dry rainforest ecosystem.
- Forms part of a larger area of highly significant continuous bushland.

Flora

So far only large-scale vegetation survey work has been carried out in the Heifer Creek area. However, the survey work, carried out by Mr. Paul Grimshaw of the Queensland Department of Environment and Heritage, has revealed very high nature conservation significance (Table 1), including a newly described species, *Boronia splendida* (Duretto, 1999). It is likely that finer-scale surveys will yield further significant finds.

Table 1 - Endangered, vulnerable and rare species - Treetop Sanctuary

Species	**Common name**	**Details**
Boronia splendida	Splendid Boronia	Pending Vulnerable (V) species
Acacia blakei ssp. *diphylla*		Listed as Vulnerable (V) in NSW
Bertya opponens		Rare (R) species

Boronia splendida is a woody shrub growing up to 2.5 m on well-drained sandy soils. It covers an extensive area of the property and ranges from just to the east of the Treetop Sanctuary buildings down on to the slopes of the gorge. It is by far the dominant understorey species, and is in abundance throughout the property. Although found over a wide area, known populations of *Boronia splendida* are geographically isolated, small in size, and threatened by clearance and fire. It is expected that *Boronia splendida* will be given a conservation status of Vulnerable under the *Queensland Nature Conservation Act* 1992. Aside from its biodiversity value, *Boronia splendida* is also likely to have commercial value. The potential for commercial production as a garden plant or as a cultivated cut-flower plant is currently being investigated. It is likely to be ideal for these purposes, with its attractive fragrant foliage and spring pink flowering. It also has potential for yielding essential oils.

The Heifer Creek area, where Treetop Sanctuary is located, also features populations of several plant species that are normally found a considerable distance further west and north-west (Table 2).

Within a species, there are typically wide genetic variations that are the result of adaptation by the species to local conditions across the range of the species. The genetic variation will sometimes be so great that some populations of the species actually constitute a subspecies, or possibly even a new species altogether. An example is the koala fern *Caustis blakei*, which grows in South-East Queensland coastal Wallum heath areas. There are also populations of koala fern in the Helidon Hills, an upland sandstone area across the north of the Lockyer Valley. The koala fern populations in the Helidon Hills are genetically distinct enough to actually be a subspecies, *Caustis blakei* subsp. *macrantha*. Although the species itself is common, the Helidon Hills subspecies has a very restricted range and habitat which has resulted in its pending listing as a vulnerable (V) species.

Table 2 - Other significant species, Heifer Creek area

Species	Common Name	Details
Eucalyptus bakeri	Baker's mallee	Very disjunct eastern population. Species is normally found on western Darling Downs.
Eucalyptus melanoleuca	Yarraman ironbark	Very disjunct south-eastern population. Species is normally found from Yarraman to North Burnett. Listed as Rare on the *Queensland Nature Conservation Act 1992*.
Allocasuarina inophloia	Thready-bark casuarina	Disjunct eastern population. Species is normally found on Darling Downs. Second disjunct population in the Helidon Hills.
Eucalyptus sideroxylon		Disjunct eastern population. Species is normally found west of the Great Dividing Range. Located on Treetop Sanctuary. Would probably have also been on adjacent properties prior to clearance.
Triodia sp.	Spinifex, porcupine grass	Very disjunct eastern population. Species is normally found in western Queensland.

The genetic distinctiveness of the Helidon Hills koala fern was only recently identified, the result of studies carried out by the University of Queensland Gatton College. Studies have not yet been carried out on the disjunct populations of *Eucalyptus bakeri, Eucalyptus melanoleuca, Allocasuarina inophloia, Eucalyptus sideroxylon,* and *Triodia* sp., but when they are, distinct subspecies may be revealed. These subspecies could then be expected to be listed as endangered (E) or vulnerable (V). Even if these populations are not distinct enough to be subspecies, they still have conservation value, because species adapted to a wide range of situations stand a much better chance of long-term survival.

Aside from their conservation value, genetically distinct populations of a species can also have notable commercial value. The widest range of natural genetics in plant species that are grown for commercial production purposes means the greatest potential for developing new plant breeds and therefore new market opportunities. The Helidon Hills koala fern is adapted to a different set of conditions than the coastal koala fern, and for this reason is likely to be useful for the breeding of commercial varieties if koala fern is brought into cultivation. For example, in recognition of the potential commercial value of genetic variations amongst natural populations of *Macadamia* species, the Australian macadamia industry currently has a major project to identify and protect natural macadamias. *Eucalyptus bakeri* is being grown as a cut flower species in the Roma district, where it is found naturally. Attempts to grow healthy plants closer to the coast have so far failed. However, it may be possible to overcome this problem through breeding with the genetics of the Lockyer Valley population.

Fauna

So far only general fauna observations have been carried out in the area, but have revealed high bird diversity and presence of several wallaby species including the Brush-tailed Rock Wallaby *Petrogale penicillata* which is listed as Vulnerable (V) on the *Queensland Nature Conservation Act 1992*.

Ecosystems

The plateau area of Treetop Sanctuary and the gentle slopes leading towards the rim of the gorge feature tall open woodland, dominated by eucalypt and acacia species, with dry rainforest in the remaining gully line and gorge areas. Approximately 60% of the property is tall open woodland. The dry rainforest has been identified as Regional Ecosystem 12.9/10.15 - Semi-evergreen Vine Thicket (SEVT), which currently has a conservation status of "Of-Concern".

Fire regimes and nature conservation

Boronia species are extremely fire sensitive. Fire is needed for seed germination, and the frequency of fire needs to be regular enough to germinate seedlings while the soil seed store is still viable. However, if fires are too frequent the soil seed store will be exhausted at a faster rate than it is being replenished from the seed set by mature plants. For *Boronia*, there is an optimum fire frequency - too frequent or too infrequent burning of an area will result in the decline and eventual extinction of the *Boronia* from that area. On Treetop Sanctuary *Boronia splendida* is currently thriving, where there has not been a fire for around 20 years, but appears to be absent from other properties in the area where burning is carried out annually. *Boronia splendida* has been observed to regenerate readily following clearance, demonstrating the existence of a viable soil seed store. (With many species, it is not the heat of the fire that stimulates seedling germination, but chemical compounds in the smoke. The same compounds can also be released from the soil following disturbance, and this is why clearance can stimulate germination of *Boronia splendida*). These factors indicate that a fire frequency of around 20 years is likely to be required by *Boronia splendida*, and that the local practice of annual burns constitutes a serious threat to the survival of the species. This conclusion is supported by the known fire requirements of other *Boronia* species, however further research will be required to more accurately confirm the required fire frequency.

If the fire regimes for the area around Treetop Sanctuary are not to continue posing a serious threat to nature conservation values, then they must account for the presence of *Boronia splendida* and the other significant flora, fauna and ecosystems in the area.

The presence of wallaby species, for example, warrants a very carefully planned fire regime. A widespread and reasonably intense fire would probably force these animals into small pockets where they would either die out through competition with other individuals, or would have to adjust their diet according to the food available. Similarly the timing of a fire is critical to minimise the effects on breeding and available food for young. To minimise the detrimental effects of fire on fauna, animal habitat usage needs to be appreciated. This requires knowledge of the breeding, feeding and refuging habitats of each species.

Fire is also posing a significant threat to the "Of-Concern" dry rainforest remnants in the Lockyer Valley. Fires impact on remnant margins, and will often burn into a remnant for a considerable distance due to the presence of invasive exotic species. Introduced pasture species, in particular green panic grass *Panicum maximum*, are invading intact and semi-intact dry rainforest remnants in the Lockyer Valley, displacing native species and greatly increasing the susceptibility to fire incursion.

The fire management plan for Treetop Sanctuary

To date, fire management planning in the Lockyer Valley has concentrated on hazard reduction for the protection of human life and property and on the maintenance of grazing pastures, but with little or no regard for nature conservation values. As a result, the significant biological diversity of the region is being placed at risk.

Whilst it is clear that fire has an extremely important role to play in the maintenance of natural systems, our understanding of the exact fire requirements of the vegetation on Treetop Sanctuary is limited. What we do know from the presence of *Boronia splendida* is that fire needs to be very infrequent, meaning that any hazard reduction burning on Treetop Sanctuary should be subject to the uttermost caution. *Boronia splendida,* whilst likely to be dependent on fire for its regeneration in the long term, is extremely abundant and so is likely to represent a key species in the ecosystem. An irresponsible fire regime could result in the local extinction of this species and the invasion of unwelcome non-native plant species. This would be an economic disaster as well as an environmental disaster. The property is used as a health retreat and for environmental tourism, and as such the landholders' income is dependent on the long term conservation of the significant natural values of the property. *Boronia splendida* also has potential as a cultivated garden plant, cut-flower plant, or essential-oil plant, and this potential would be lost if it was destroyed.

Because of the need to conserve natural values as well as protect human life and property and maintain pastures, fire management planning must include *hazard protection* as well as hazard reduction and pasture burning.

A wildfire dependant ecosystem

There has been no significant fire on Treetop Sanctuary for at least 20 years and a large quantity of fallen timber and leaf litter has accumulated on the forest floor, increasing the risk of a serious wildfire. Many landholders in the area around Treetop Sanctuary are burning annually or every few years to reduce the accumulated fuel load, with some also burning to promote the growth of fresh grazing pasture. This hazard reduction and pasture maintenance burning is typically justified by the belief that "the Aborigines burnt this every year", reinforced by the observation that "this country was all open 20 years ago".

It is widely believed that before European settlement, Aboriginals burnt the bushland of the Lockyer as frequently as every year. However, this cannot be correct, because many of the Lockyer Valley vegetation types and species would simply not be present if fire had been used as frequently as every year or even as frequently as every five years. *Boronia splendida* is just one example of a Lockyer Valley bushland species whose survival depends on infrequent fire. The Helidon Hills, in the north of the Lockyer Valley, has several ecosystems with a large number of fire sensitive species, as do some other bushland areas in the southern Lockyer. Such ecosystems are more likely to be the product of widely-spaced random wildfire events rather than any deliberate burning regime.

Aboriginals burnt bushland areas to assist with the availability of food resources, hence the description "fire-stick farming". The Lockyer catchment features wide and very fertile creek valleys and alluvial plains, now recognised as some of the world's most fertile agricultural land. Prior to European settlement these lowland areas typically featured forest redgum

(*Eucalyptus tereticornis*) open woodland with a grassy understorey and would have had an abundance of food resources, in particular kangaroos and wallabies. The Aboriginals apparently lived a semi-sedentary lifestyle on the lowland flats and plains, only venturing into the uplands on hunting and food gathering forays or to travel on various pathways to other areas (Ann Wallin & Assoc, 1998).

The Aboriginals probably burnt the lowland flats and plains to promote the presence of fresh green grass to attract the kangaroos and wallabies, and there is historical evidence to support this. For example, Murphy's Creek in the north-west of the Lockyer is reported to have been known to Aboriginal people as *Tamamareen* meaning "where the fishing nets were burnt in a grass fire" (Ann Wallin & Associates, 1998). However, they would have had little or no need to burn the far less fertile Lockyer uplands. Fire would actually have posed a significant threat to the upland dry rainforest areas, which featured food and medicinal resources, and for this reason fire may have even been deliberately avoided in the uplands.

There is evidence to support the view that different tribal groups had very different fire management practices. Just over a small range to the south of Treetop Sanctuary is the West Haldon district, which was apparently a different tribal area with dramatically different fire management practices. The local history book *On the Point of a Spur* (Campanaris 1986) highlights the differences between the two areas:

> Unlike the impenetrable scrub country that surrounded the Mt. Whitestone district in the early 1840's, the West Haldon district bordering the south-west Lockyer was open country. May Cork writes:
>
> > It is worth recording that a descrpition of the district in the early 1860's differs considerably from a description of it at present. At the date mentioned the country was sparsely timbered and well grassed. Soon however, a remarkable change took place and such country became overgrown with small brush, and the number of trees increased enormously.
>
> Most certainly, the change in vegetation cover at West Haldon from a sparse sclerophyll forest to a densely timbered one was due to the removal of the Keinjan tribesman from the area by 1860, who previously practised extensive burning of their hunting grounds.

Cycles of change

Because it is dependant on a 20-plus year fire cycle, the vegetation on Treetop Sanctuary goes through observable changes. When there has not been a fire for more than 20 years, the dominant midstorey of *Acacia* reaches maturity and dies, meaning that the midstorey becomes quite open or even completely open. Following a fire, there is rapid regeneration of the understorey, midstorey, and also of new overstorey plants, which quickly creates a very dense and impenetrable undergrowth. The progression to a more open stage is currently observable on Treetop Sanctuary, with much of the *Acacia* midstorey dying over the past 5 years. It is the open stage that local landholders have observed when saying that "this country was all open 20 years ago", not realising that it is just a stage within a cycle. While local landholders remember the open stage of the cycle, the surveyor who carried out the original survey of the Treetop Sanctuary property over 100 years ago struck the dense undergrowth

stage, reflected in his “very dense undergrowth” and “very heavily timbered” comments for the woodland parts of the Treetop Sanctuary property.

At some point *Boronia splendida* would also be expected to reach maturity and die which would open up the understorey and midstorey even further, but there is not yet any sign of this occuring. Many of the *Boronia* plants have now reached 2.5 metres in height, the mature plant size, but there is no evidence of the commencement of decline. The other known populations of the *Boronia* in the Heifer Creek area last received major fires at the same time as the Treetop Sanctuary population, apparently at a time of very serious wildfires throughout the region, and show no observable difference to the Treetop Sanctuary area population.

Hazard reduction burning

It may be possible to replicate the natural fire cycles of the Treetop Sanctuary area through controlled hazard reduction burning. The reduction of fuel load would reduce the risk to human life and property from wildfire events, and would also reduce the possibility of the whole property being burnt out by a single wildfire. If the entire property was burnt out it would obviously be unattractive to visitors, which would be a negative for the health retreat/environmental tourism operations on the property. Vegetation cover would, however, quickly return.

The difficulty with controlled hazard reduction burning is that very little accurate information is known about the life cycle of *Boronia splendida*. To address this situation, the Treetop Sanctuary Fire Management Plan recommends scientific study of *Boronia splendida*, including the trial burning of small habitat plots with subsequent observation and monitoring. The Fire Management Plan recommends that, apart from the trial burning, no other burning of *Boronia splendida* habitat should be carried out until informed decisions can be made.

Hazard protection

If no hazard reduction burning is carried out, then another way must be found to protect human life and property. This can be achieved through hazard protection, which works on the “rule of 3B’s”: Buildings - Buffer - Bushland. A buffer zone is used to provide a line of defence between buildings and bushland. The buffer zone needs to be kept completely clear of understorey, midstorey, and any fuel load. Fuel load removal in the buffer zone can be achieved through manual removal (picking up brances, raking leaves) or by controlled burning. The overstorey (trees) should also be removed from the buffer zone if local conditions indicate a high risk of crown fires, that is, fires that travel rapidly through the tree tops rather than at ground level. A fireline is constructed along the boundary between the buffer zone and the bushland. This facilitates easy access for back burning in case of an approaching wildfire, and also provides a firebreak for controlled burning operations within the buffer zone. A second fireline can also be constructed between the buildings and the buffer zone. Additional firelines should also be constructed within the bushland areas if possible, as has been done at Treetop Sanctuary, to provide additional lines of defence. Firelines and buffer zones should also be constructed to assist in preventing wildfires moving to or from adjacent properties.

In addition to the Treetop Sanctuary Fire Management Plan, the hazard protection approach has also been used in the Helidon Hills Fire Management Plan (Gardner, 1998). The 35,000

hectare Helidon Hills lies across the north of the Lockyer Valley, and is mostly continuous bushland.

Impediments to successful hazard protection

Key impediments to the successful implementation of the Treetop Sanctuary Fire Management Plan are:

- Many of the local landholders are unaware of the significant species and ecosystems in their area.
- The local Rural Fire Brigades and local landholders are typically unaware of how to manage fire for biodiversity conservation.

A consortium of South-East Queensland Councils has submitted a Natural Heritage Trust (NHT) application to carry out a "bushfire and biodiversity" project that will go a considerable way towards addressing these issues. The project will extensively research the fire requirements of different vegetation communities and will educate and inform Rural Fire Brigades, Councils, and landholders about these fire requirements.

The implementation of the Helidon Hills Fire Management Plan has the advantage of being part of a larger project, the NHT funded WESROC (Western Subregional Organisation of Councils) Sustainable Management of the Helidon Hills Project (Boyes et al, 1998). The project includes education and awareness raising in regard to conservation values and appropriate fire management practices, and will also be facilitating fire management plans for individual properties as part of a large-scale property management planning process.

The WESROC Sustainable Management of the Helidon Hills Project has been able to successfully integrate adjacent land use and management approaches that are often seen as incompatible, for example environmental tourism and grazing. A similar project for the Treetop Sanctuary area would be expected to result in similar benefits.

Conclusion

The example of "Treetop Sanctuary" shows that current fire management practices often have a very poor scientific basis and as a result are having serious negative impacts on biodiversity. Burning is carried out every few years or even annually to reduce fuel accumulations and maintain grazing pasture, at the expense of significant flora and fauna which cannot survive such frequent burning. A solution is to incorporate hazard protection with hazard reduction and pasture burning, but there are impediments to the success of this approach. Many landholders are unaware of the significant native species and ecosystems in their local area, and Rural Fire Brigades and local landholders are typically unaware of how to manage fire to conserve these species and ecosystems. A consortium of South-East Queensland Councils has submitted a Natural Heritage Trust (NHT) application to carry out a "bushfire and biodiversity" project that will go a considerable way towards addressing these impediments. The achievement of optimum outcomes, however, is likely to result only from carrying out coordinated fire management planning across the landscape through projects like the WESROC Sustainable Management of the Helidon Hills Project.

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7. Securing Conservation Outcomes

Keynote address

Carl Binning - CSIRO Wildlife and Ecology

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The Role of Local Government in Rainforest Recovery

Introduction

This paper evaluates the role of local governments in conserving rainforests in South East Queensland. The paper provides an overview of the major findings of a twelve month study undertaken by CSIRO Wildlife and Ecology. A more comprehensive discussion of the issues involved is available in the following report: *Beyond Roads, Rates and Rubbish: Opportunities for local government to conserve native vegetation.* Contacts to obtain this report from CSIRO are provided at the end of this paper.

Because there are no State legislative controls that regulate the clearing of native vegetation on freehold land in Queensland, local government have considerable powers and responsibilities for rainforest conservation. Local governments are an important manager and regulator of land, through their wide ranging responsibilities for land-use planning. For example, most land-use decisions are ultimately made by local government through their role in approving developments under planning legislation.

Local governments are a key player in natural resource management, including native vegetation management, because:

- as the level of government that is closest to the community, they are able to translate the policies of Commonwealth and State governments into on-ground projects for the conservation of native vegetation; and
- as managers of public land and land use planners, local governments are responsible for regulating a wide range of activities that may impact on native vegetation management.

Whilst strategic policies may be developed by higher levels of government, it is local government that must make detailed decisions that balance ongoing development with the need to protect natural resources.

Building partnerships for native vegetation management

The primary conclusion of this paper is that all local councils in Queensland, irrespective of their size or location, can make a significant contribution to the conservation of native vegetation. However, because of the diversity of local government, different councils can contribute to native vegetation conservation in different ways.

The degree of activity of local governments in managing native vegetation varies. Their success is not necessarily dependent on playing a leading role, but in ensuring that they contribute in ways commensurate with their capacity. Fundamentally successful approaches to vegetation management are developed when all organisations with an interest in natural resource management work in active partnership with each other.

Local governments are as diverse as their number: 774 across Australia in 1995–96. They range from large and complex organisations, such as Brisbane City Council with a population of 820 590 and a budget of $1 157 million covering the Brisbane metropolitan area, to small councils in remote and rural areas, such as Bulloo Shire in south-west Queensland with a population of 600 and a budget of $5 million, covering an area of 73 620 square kilometres.

Given this diversity, the expectation that can be placed on each local council must vary. We conclude that the factors determining the role that local governments play are:

- the processes that are degrading native vegetation in different regions and how these relate to the **core functions and responsibilities** of local government;
- the **resources** available to local government, as determined by population size and the rate base; and
- the **coincidence between local, State and National** objectives for the conservation of native vegetation.

Figure 1 summarises the range of circumstances in which local governments may find themselves at different times and the strategies for developing partnerships with local government for native vegetation management.

Figure 1 - Framework for building partnerships with local government

Build Capacity →

	Low capacity and responsibilities for vegetation management	**High capacity and responsibilities for vegetation management**
Coincidence of local, State and nation-wide priorities	• Build capacity • Encourage regional/local planning for natural resource management • Fund and resource with technical skills	• Use regional/local structures to develop and implement strategies for natural resource management • Focus on monitoring outcomes and maintaining minimum standards
Conflict between local, State and nation-wide priorities	• Manage change through structural adjustment • Build capacity	• Develop communication and marketing strategies • Formalise regional strategies and impose conflict resolution

Build Consensus ↑

This framework can be used to identify a range of tools that local governments can employ to effectively manage native vegetation. These tools are drawn from initiatives that innovative councils in Australia are currently undertaking. There are numerous examples of best practice management to draw from different councils, particularly in South-East Queensland. However, if best practice is to be realised, it is necessary to address a number of structural impediments to the more active involvement of local government (outlined below). In the following sections the tools available to local government are firstly discussed followed by a discussion of the key impediments to more active involvement of local government in native vegetation management.

Toolkit for Councils: Opportunities for local government to contribute to the conservation of native vegetation

There are many activities that local governments can undertake to promote the conservation of native vegetation within their existing powers and responsibilities. Opportunities for involvement exist across all tenures and land uses, although the mechanisms and approaches that can be used depend on the circumstances faced.

Perhaps the most important opportunities lie in councils performing their day-to-day functions in a way that does not have an adverse impact on the conservation of native vegetation. Hence a distinction is drawn between the core functions of councils and those that are discretionary, as set out below.

Core functions

- **Land use planning and development approvals:** In regions undergoing significant land use change through urban or agricultural development, local government responsibilities for land use planning and development approvals are the most significant way in which they can contribute to the conservation of native vegetation.
- **Managing crown lands**: In their role as manager of public lands, local governments can make a substantial and direct contribution to conserving native vegetation. By breaking away from their traditional focus of managing public lands exclusively for recreation, there is an opportunity for councils to actively manage these lands for conservation.
- **Managing environmental risks**: Councils are responsible for the management of a wide range of environmental risks, including flood and fire, which may have a direct impact on the management of native vegetation. There is potential for councils to integrate risk management with conservation programs.

Discretionary functions

- **Facilitating community involvement**: Because local government is the level of government closest to the community, it is in a strong position to support community-based programs for the protection and management of native vegetation.
- **Managing grant and incentive programs**: Grant and incentive schemes are a primary means of supporting land use planning outcomes on private lands through voluntary participation of landholders in conservation activities.
- **Providing financial and administrative support**: Because local governments are elected and directly accountable to their communities, have a statutory basis, and have

highly professional financial administration systems in place, they are ideally placed to manage the collection and expenditure of public funds for regional natural resource management.

As highlighted in Figure 1 not all councils perform all of these functions. What is most important is that local governments have access to the full range of tools and that they are encouraged to develop innovative solutions to natural resource management problems at the regional level.

Impediments to local government involvement in native vegetation conservation

If more local councils are to use the tools for sustainable natural resource management the underlying structural impediments to local governments playing an effective role, outlined below, need to be addressed.

- **Culture of local government:** Many local governments focus on their traditional roles and see little role for themselves in natural resource management. The needs assessment undertaken for this study reveals that success is very dependent on individuals taking a leading role to bridge the gap between two interests or organisations that appear to be in conflict. These individuals can be project officers, chief executive officers or councillors. It is not possible to prescribe the creation of more leaders. However, it is possible to identify the institutional, legislative and policy environment that will encourage innovation at a local level.

- **Legislative and institutional impediments**: The most significant impediments to local governments developing innovative solutions to natural resource management problems are the complex legislative and bureaucratic structures that divide and fragment management responsibilities across a wide range of State agencies. Benchmarks for best practice institutional arrangements are described in Box 1. We propose a model for developing locally driven regional action plans for natural resource management strategies to meet these benchmarks. This model is underpinned by a commitment by Commonwealth and State governments to formally accredit, through existing legislation, regional plans that deliver desired outcomes.

- **Funding**: The majority of local governments are unwilling to put in place new programs to protect native vegetation in the absence of secure funding to meet ongoing costs of managing these programs. There is an urgent need to develop long-term funding protocols for natural resource management at the regional level. The proposed model emphasises the importance of the contribution of all spheres of government through formal partnership agreements.

- **Provision of data information and expertise**: In order to be able to sustainably manage native vegetation, local governments require scientific and technical information on the distribution of the different types of native vegetation and ongoing access to individuals with the expertise to be able to interpret this information and develop management strategies. We propose a number of mechanisms for improving the transfer of information.

- **Poor policy coordination and targeting**: Improved coordination and targeting of natural resource management programs is required at Commonwealth, State and regional levels to improve the access that local governments and landholders have to these programs.

Box 1: Benchmarks for a best practice institutional framework for natural resource management

A best practice institutional framework for natural resource management will meet the following benchmarks.

1. Clear definition of the roles and responsibilities of organisations with an interest in natural resource management

- *A clear distinction will be drawn between the statutory processes and decisions of governments, the involvement of experts and stakeholder groups in providing input and advice to these processes and the delivery of services.*

2. The maintenance of outcome-based legislative frameworks that ensure minimum standards

- *Administrative or legislative processes will be in place that ensure that social, economic and environmental values are taken into account in decision-making processes.*
- *Standards established in legislation will be outcome-based rather than input or process-driven, providing flexibility in how outcomes are achieved. The full range of policy options will be available to achieve outcomes.*

3. Delegation and/or accreditation of regional action plans

- *The statutory process will recognise the concept of subsidiarity, that is, the delegation of management responsibilities to the lowest level, with the strictest requirements imposed at any level being the one which must be complied with.*
- *Regional processes that meet minimum standards will be accredited by State governments as meeting statutory requirements.*

4. Flexible delivery of services

- *Partnerships for delivering sustainable natural resource management programs are flexible, encouraging innovation and a wide range of government and non-government sector involvement.*

5. Adequate resources

- *Funding, information and expertise required to meet minimum standards at a regional level will be secured.*

6. Monitoring and review of outcomes

- *Performance indicators and accountability measures will be in place and include provision for regular review of outcomes.*

This paper has provided a brief overview of the main findings of a twelve month study. Further information on all of these issues can be found in the following reports prepared as part of the study:

- **Beyond Roads Rates and Rubbish: Opportunities for local government to conserve native vegetation**. This report elaborates on the key policy opportunities and impediments to local governments playing an active in native vegetation management introduced in this paper. The report is structured as a resource document for both local governments and other levels of government. It provides a synthesis of the findings of the study and puts forward policy guidelines for all levels of government.

- **Opportunity Denied: Review of the legislative ability of local governments to conserve native vegetation** evaluates legal impediments to local governments using a range of innovative incentive-based instruments. A number of important legislative barriers to local government playing an effective role in native vegetation management are identified. For example, no local government in Australia is able to register conservation agreements with private landholders as a covenant on the title to land. Detailed options for amending existing legislation and policies to allow local governments greater flexibility in the delivery of programs for native vegetation management are identified.

- **Conservation Hindered: Impact of local government rates and State land taxes on the conservation of native vegetation** evaluates the impact of local government rates and State government land tax on the conservation of native vegetation. It is found that privately owned lands that are managed exclusively for nature conservation are taxed at a much higher rate than either residential land or land managed for primary production. Options for providing rate/tax rebates or exemptions for landholders who enter legally binding conservation agreements are identified.

Copies of these reports are available from:

Environment Australia: Biodiversity Group,
GPO Box 787,
Canberra, ACT, 2601.
Telephone: 02 6274 1111.

Teddington Weir Vineforest Project - Successful Industry Involvement

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This paper outlines the co-operative relationship that has been developed between Maryborough Environment Group, WWF and Wide Bay Burnett Electricity Corporation. The outcome of this relationship has resulted in the first stage in protecting an endangered ecosystem, which is host to a number of rare and threatened plant species. I will outline the reasons for the initial success of the project and what industry is looking for to become involved in similar community projects.

Introduction

Wide Bay Burnett Electricity Corporation Limited (WBBEC) has been keenly involved in numerous community projects over the five years of my employment with WBBEC.

The following projects have been funded by WBBEC in the past and are an example of WBBEC's commitment to the Environment:

- LEAP projects in vegetation management and demonstration tree plantings (1993-94) - Wide Bay Group Training Scheme.
- Raptor rehabilitation and nesting platforms (1994-95) - Hervey Bay Wildlife Carers.
- Bundaberg Waterwise Garden (1994-95) - Bundaberg Landcare.
- Turtle Friendly Lighting Research at Mon Repos (1995-96) - Department of Environment.
- Turtle Friendly lighting and esplanade walkway at Woodgate (1996) - Isis Shire Council.
- Research into rare and threatened plants in the Goodwood area (1996-98) - Department of Natural Resources and Department of Environment.
- State Landcare Conference (1996) - Bundaberg Landcare.
- Teddington Weir Vine Forest Project (1996-97) - World Wide Fund for Nature and Maryborough Environment Group.
- Direct Seeding Trials (1998) - Greening Australia.
- Yarraman Waterwise Garden (1998-00) - Yarraman and District Historical Society.

As you can see the Corporation is supporting local projects that are helping us all to manage the environment more responsibly. WBBEC is involved with many more projects internally, to ensure its own management of the natural environment is continually improving (e.g. declared plants, erosion control, rare and threatened plants, agroforestry and vegetation management).

What all these projects had in common was someone with a keen interest in the issue prepared to see it through.

I will discuss WBBEC's specific involvement in the Teddington Weir Vineforest project and how this can be translated to industry involvement in other community projects.

Background

First of all I will discuss the organisations and the people behind the organisations that made things happen in stage one of the Teddington Weir Project.

Members of the Maryborough Environment Group (MEG) had made WBBEC staff aware of the importance Teddington Weir for over five years. MEG members took a cooperative approach in trying to come up with solutions that would assist in protecting this special area along with a few other key locations.

Greg Smyrell and Tony van Kampen took the time to educate WBBEC staff (including myself) and convince them of its importance. Convincing other stakeholder groups, such as neighbouring farmers and Maryborough City Council of its importance has proven to be more difficult, compounded by the lack of a focal point such as an Environmental Officer.

To speed up the progress of WBBEC's involvement and to gain commitment from these stakeholders, Greg Smyrell approached WWF to try and include Teddington Weir in a Vineforest Recovery Program. Greg Smyrell was successful in gaining the support of Bruce Boyes (WWF) who also recognised the value of the project (Greg left for an extended South American adventure the week before the project officially commenced – he was the natural choice for Project Officer).

Bruce was hoping that someone would take on the role of co-ordinator as he viewed his role as a facilitator of the process and wanted to stay at hands length. Equally, I wished to assist with the project from WBBEC's perspective: securing funding, project support and ensuring on-ground work was completed. Both Bruce or myself were able to restrict our involvement to our perceived roles, and if we had adopted that approach, the project would not have made it to Stage One.

To my way of thinking then, the project made it through to Stage One because the people involved appreciated the importance of this area through Greg Smyrell's passion and vision. As Arthur L. Stinchcombe (1967) stated about organisations and groups, 'they tend to be created to serve to increase the powers of the genius or inspired leader'.

For projects such as these to succeed, you need someone to inspire others into action and inspired people to act.

Ideally, industry is looking for high profile, easy to manage projects that will give them some publicity and maybe monetary returns (e.g. sequestration benefits). The Teddington Weir Vineforest Project is not the ideal project that is attractive to industry, but the people involved made it happen.

The presence of Rare and Threatened plants in the Teddington Weir area provided a regulatory motivator (e.g. Environmental Protection Act and Nature Conservation Act), which is largely ineffective unless enforced consistently.

I will outline the methodology of the project and the secrets to success.

Methodology

Identification and scope of the problem.

Ted Smith (pers. comm., 1998) compiled a comprehensive list of birds that visit the Teddington Weir area and includes unusual occurrences such as Satin Bower Birds.

Greg Smyrell (1993) compiled a comprehensive species list of vegetation in the area, including *Cossinia australiana, Fontainea rostrata, Xanthostemon oppositifolius* and *Quassia bidwillii*.

Impacts on the Vineforest Community included:

- 11 kV power line.
- Bitumen road.
- Access tracks (dirt).
- Maryborough town water supply (Teddington Weir).
- Cane farmers.
- Maryborough City Council's fire management program.
- Dumping of garden plants.
- Recreational activities (e.g. vehicles).

Management Options

These steps were identified during Stage One of the project. Stages Two and Three may have changed during the evolution of the project, which is not the brief of this paper.

Stage One: Securely Conserve Teddington Weir Catchment Remnant Rainforest (completed).

- Negotiations commence with Maryborough City Council for the Nature Refuge Agreement.
- Educational Vineforest Trail, handout, signage and public launch.
- Tree planting along the power line easement (pioneer species).
- Reduce the slashing and burning being carried by Maryborough City Council staff.
- Restricted access along the power line easement.
- Reconductoring of power line with covered conductor to enable closer approach limits of Vineforest trees.
- Seek external funding for further progress.
- Develop a draft management.

Stage Two: Implement an Education and Promotion Campaign about Rainforest Conservation in the Tinana Creek sub-catchment.

- Appoint a project officer.
- Finalise the management plan for the area.
- Establish a "Friends of Teddington" group.
- Landholders in the sub-catchment with rainforest remnants to be informed about its value.
- Maximise community involvement while minimising human impacts.
- Educate Teddington Weir landholders about management issues.
- Maintenance of trail.
- External funding for the expansion of the project.

Stage Three: Rehabilitate Degraded Rainforest Areas at Teddington Weir.

- Restore continuity of habitat by replanting previously cleared areas.
- Seed collection and raising plants for rehabilitation work.
- Reduce the weed population.
- Investigate the use of an old road to connect the Vineforest Trail with the Teddington Weir picnic grounds (establish if there is community support).
- Maintenance of trail.

Monitoring

WBBEC has been monitoring the revegetation under the 11 kV power line and Greening Australia has monitored the state of the walking track and car park areas. Both have been on an ad-hoc basis given other time restrictions. Photographic records are held by WBBEC of the official opening and reconductoring works.

Discussion

The project identified impacts and tied in WBBEC's activities as part of the problems for the long-term survival of this threatened ecosystem. The project team were not interested in appointing blame on responsible persons, instead, the focus was on identifying the impacts and providing solutions to them.

Greg Smyrell's vision, passion and his role as a motivator for the values of Teddington Weir area, inspired others in the project to ensure the success came, even after he left the project.

The plan has been well thought out and inspired people have directed their energies into the correct areas of influence. There have been pitfalls along the way, such as lengthy delays with the ordering of the covered conductor WBBEC used, which threatened to hold up the remainder of the project. The one thing that made it all happen in a flurry towards the end of the project (like every other one I have been involved in), was the setting of a time frame. Once people have been set a dead line, and they are committed to the project it normally happens on time or close to time. If things are left up in the air with no boundaries, then action will not happen swiftly, if at all (unless it is a small project that involved only a few stakeholders).

Operational Matters

Purchasing covered conductor was one of the most frustrating components of the whole project. WBBEC's planning people wanted to make sure it had been used successfully elsewhere and find out the details before considering their best options. Bundled cable or undergrounding were the suggestion of the project team, but on technical grounds covered conductor was chosen.

This has meant that clearances can be reduced and if trees do come into contact with the conductors, it will not damage them (electrocution is still an issue).

Trying to stop Maryborough City Council (MMC) staff and/or contractors slashing and burning in the area has also been a frustrating process. MCC would be saving money by not

carrying these activities, but because staff had done them for so long they wanted to continue doing them. Once the manager in charge of the Department was identified and the importance of the area explained, they reluctantly ceased their activities.

The threat of publicly exposing their activities was a motivator Tony van Kampen utilised effectively. However, the lack of regulatory support for the protection of the Rare and Threatened species has been a frustration for the Conservationists in the area.

To further demonstrate their reluctance to change their past activities, MCC staff contacted me 8 months after Stage One of the project was completed to see if WBBEC wanted the area under the power line slashed again now that all the fuss was over.

The use of ATCV was highly effective in completing the education trail, installing signage and car park.

The completion of the educational handout was left to the eleventh hour, which meant consultation was left to a bare minimum, but details of the actual trail could be discussed in detail.

The list of invited guests seemed to grow by the hour for the official launch with politics and consultation playing a major role. Much of the political 'fan fair' were unable to attend with other functions taking higher priority, but well balanced speeches by Bruce Boyes and Chris Haazards (Chief Executive Officer, WBBEC), a pleasant walk and some food and drinks made for an enjoyable conclusion to Stage One of the project.

Strategic Matters

The development of a management plan and a draft Nature Refuge Agreement were major stepping stones for others to build to ensure this project continued to grow and the area was protected. If the project finished at Stage One the old practices of MCC and WBBEC would have crept into the management of the area again.

Cost-Benefit Analysis

I have no doubt that this project has cost WBBEC significant resources in time and money. If WBBEC were to have taken a purely commercially focus, I doubt that this project would have been supported without significantly more public recognition (i.e. benefits). The value of this public recognition is also undermined in the Maryborough area due to a lack of public support for conservation issues. In other neighbouring areas, such as the Sunshine Coast, the value of publicity for environmental projects would be regarded more highly by those who handle the purse strings of most organisations.

Ideally, to gain the support of industry you need a public image. You need a project that will have some immediate benefits and some strategic benefits. You should have some form of package to present to the organisation (good marketing - easy to understand).

Conclusions

WBBEC has become involved in this and many other community based projects because of relationships that have been developed with the groups in the Wide Bay Burnett region. From these experiences, WBBEC understands the value of projects presented by community groups and community groups understand that WBBEC is attempting to address its environmental impacts as an organisation.

By no means does this mean that WBBEC is a 'sustainable' business, but a business that recognises the shortcoming of its current framework and looking to reduce its impacts.

Community groups need to make organisations aware of their shortcomings so they can begin to address them. If MEG members did not take the time to educate WBBEC staff it is unlikely that WBBEC would have ever become involved in this project. Finding the right person to educate within an organisation is always the challenge.

Finally, I believe in the power of the individual. It is the individuals that make community groups effective and organisations community minded. It is up to every one of us as individuals to inspire and motivate others for projects to be meaningful and for conservation to be taken seriously by business.

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Can Rainforest Conservation Benefit from Industrial Development?

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Big industry frequently requires a substantial buffer zone around their plant. Licence conditions, community pressures and sound environmental practice can result in sensitive management by industry of the lands contained within the buffer zone as well as on neighbouring lands. Consequently some industries can provide defacto conservation of natural ecosystems within their buffer zone and may provide resources and expertise for the management of nearby ecosystems. This paper briefly examines some local examples of industrial benefits to rainforest conservation and discusses the potential for sensitive industrial design and management to make a significant contribution to rainforest conservation in the greater Gladstone region.

Introduction

The aims of this paper are to stimulate discussion and prompt involvement in the strategic management of the Gladstone regional rainforests. The general perception of industries relationship with rainforests is one of catastrophic impacts such as clearing or forest dieback. Impacts can be subtle, however, and may result in changes in relative community composition or structure without leading to the collapse of the entire community. In these circumstances many conservation values can remain within the community and it is worthy of preservation. Such communities exist within industrial estates and the following discussion examines how they may be included within the conservation estate. Often industry decides to, or is required to, expend resources on the mitigation of environmental impacts. Strategically directed these resources provide the opportunity for further conservation and / or recovery of rainforests. This paper looks briefly at one such opportunity and considers how this opportunity could be taken up within the Gladstone region and within the State or elsewhere.

Conservation on the industrial estate

Defacto reservation

Industries and mines generally exclude or closely manage public access to their lands (e.g. buffer zones or leases). In a number of instances in Queensland such lands include rainforest communities of various sorts. At two sites in eastern coastal Queensland, low microphyll vine thickets / forests occur in industrial buffer zones. The companies involved are providing defacto conservation to these communities by recognising the environmental values of these communities and developing management plans to maintain the communities and integrate their management with adjacent land managers and public recreational users. Although both have experienced a variety of industrial impacts community integrity is largely maintained and natural processes are largely intact.

The conservation of these rainforests is dependent on the maintenance of company policy which is in turn dependent on the transfer of institutional culture between successive managerial teams.

Formal reservation

At least one company in Central Queensland, Stanwell Corporation, has avoided the uncertainty of the transfer of institutional culture through the establishment of a nature conservation agreement with the Department of Environment and Heritage. This ensures that the maintenance of the conservation values of the land are established by contract and are more likely to survive successive generations of management.

The disadvantages of this option are firstly the process takes years, secondly the company is limiting future land use options, and thirdly the company is formally linked with a Government department with which it may have an otherwise uncomfortable relationship.

Conservation off the industrial estate - the greenhouse challenge

Many companies in Australia are seeking ways to offset the production of carbon dioxide by their industrial processes. In some instances the companies are looking to establish carbon banks through the production of timber. The key point in this process is that the company must own the timber and control its fate. This is most easily and best done through the ownership of forests. Standing timber (an existing forest) will however lock up relatively little carbon. The fastest carbon accumulators are regrowth or planted forests. One mining company in Central Queensland is seeking to revegetate a cleared timber reserve as part of its carbon offset while another two large industries are reviewing their options. The total carbon stored in a forest is determined by the net result of photosynthesis minus respiration and losses due to export, decomposition and fire. The highest rates of carbon fixation per unit area occur at low temperatures where respiration rates are minimal e.g. the Victorian mountain ash forests. Growth rates however are low. Similar carbon stores can be achieved by relatively large areas of tropical forests and woodlands with regional optimums being achieved by selecting local environments with appropriate growing conditions. The implications for rainforest recovery are obvious. The strategic selection of cleared rainforest blocks and their management to facilitate regeneration could see an increase in the connectivity of rainforest remnants and the long term preservation of these regrowth communities.

Management of the Gladstone regional rainforests

These general examples indicate some of the opportunities for the restoration and conservation of rainforest communities in this region and throughout Queensland, Australia and the Pacific region.

The Aldoga industrial estate includes the western face of Mt Larcom and encompasses a large area of rainforest. This commitment to industrial development and historic mining interests has precluded National Park establishment on this land. If these impediments continue then defacto reservation of these forests provides a means to conserve the biodiversity values inherent here.

Gallery forests occur within or adjacent to industries throughout the Gladstone region. They are amenable to non-reserve conservation management.

The eastern face of Mt Larcom and much of the surrounding region support rainforest communities - generally on slopes too steep for development. Between these are lands formally supporting rainforests. These lands provide an opportunity for restoration as carbon banks for some of the many greenhouse gas producing industries.

Conclusion

There are benefits for rainforest conservation which can be drawn from managed industrial landscapes. We suggest that the development of a strategic integrated management strategy for the rainforest remnants by the conservation and scientific community in conjunction with industry, landowners, local and State government may maintain the rainforest mosaic within the Gladstone region, and we propose that a working party to initiate the development of this strategy be an outcome of this gathering with the aim of having the strategy in place within five years.

Conservation and Education through Ecotourism

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I always thought it was a genetic thing. For living memory developers and conservationists have fought like cats and dogs. Each individual skirmish just reinforcing the innate distrust and antagonism that exists between these very separate species. Just when the theory seemed proven, along came the accredited ecotourism operator; the perfect hybrid of the developer and conservationist.

Ecotourism may well be the answer to many of our conservation problems. Minimal impact practices, sustainable technologies, sensitive design and ecotourism accreditation pave the way to the successful marriage of business and conservation.

Conservation and education through Ecotourism

I'm sure that throughout the conference speakers have been extolling the virtues of rainforest conservation – and rightly so I might add. The problem with conservation, however, is the economic cost, or more accurately, the opportunity cost, of conserving those resources. That is, the difference between the economic benefit of conserving a patch of littoral rainforest at Canoe Point, for example, and the economic return of developing that site to its fullest potential. At Canoe Point that potential use may be Sheraton Mirage III and thus the opportunity cost of conservation would be enormous in terms of both financial and employment benefits forgone. Such economic rationalist approaches tend to put cost on everything and a value on nothing! I'm sure everyone attending the conference would not need to be convinced of the conservation values of the Canoe Point rainforest, however there is never a place for non-dollar values in the economic formula.

In a relatively rich nation like Australia we are sometimes able to carry the cost, however in many developing areas of the world the opportunity cost of conserving an area from exploitation may be a life, death or livelihood issue for the people who live there. In such cases conservation is rarely the winner.

In short conservation costs too much and returns too little. In this day and age when economic rationalism rules, we require a method of increasing that return on conservation investment in a manner that does not decrease the conservation values of the site.

I'm here to tell you that no other economic activity is more capable of conservative sustainable resource utilisation than tourism, or more precisely, ecotourism. Tourism is the world's and Australia's largest and fastest growing industry. Ecotourism is the fastest growing sector of that industry.

So how do we define ecotourism?

> "Nature based tourism that involves education and interpretation of the natural environment and is managed to be ecologically sustainable."

There are a plethora of definitions, however most proponents agree on five essential principles of ecotourism:

1. Natural area focus.
   Clients personally experience the natural area.
2. Interpretation and education.
   There must be quality interpretation of that natural area and its cultural heritage.
3. Ecological Sustainability.
   The natural environment is the most central and irreplaceable asset of any ecotourism business. Lose it - lose the business. Minimising the business impacts on that environment is a central tenet of ecotourism.
4. Contribution to conservation.
   Ecotourism businesses must contribute to the management of the natural area in which they operate. Not just park use fees, there must be a contribution greater than your legal or statutory requirement. Options include research and monitoring, litter removal, weed control, funding rangers etc.
5. Working with local communities, particularly indigenous communities.
   Employing local people, sourcing local product, putting something back into the local community. Indigenous cultural sensitivity is very important.

Many ecotourism properties, such as O'Reilly's, grew out of farmland and play an active and important role in the rehabilitation and revegetation of that land. Given the increasingly pervasive nature of bureaucracy and red tape in the public sector, operators are finding it more attractive to locate and, if necessary, rehabilitate private land on which to operate. This obviously fits very neatly with the aims and objectives of the conference and the project that initiated it.

Coopers Creek Wilderness Walk in Cape Tribulation is a great example of how an ecotourism venture can conserve rainforest while maintaining the strictest conservation values, and at the same time return a net benefit to the business and the Australian government. The Coopers Creek catchment was seen as being so ecologically significant that the block was included in world heritage listing despite being privately owned. The Federal Government was liable for a major compensation payout to the landholder until the block was purchased by a family concern to operate ecotourism walking tours. Clients in groups of no more than ten, are guided through lush tropical rainforest gullies filled with Fan Palms. The conditions placed on the operators by the Wet Tropics Management Authority, while apparently onerous, allow successful business operation and ensure that the environmental integrity of the site is maintained.

Now I know there are those of you who are thinking that you've heard it all before, and that ecotourism is the flavour of the month, in which every cowboy with a four-wheel drive thinks he can make a fast buck.

Firstly, ecotourism is definitely here to stay. Market forces will demand it. People are more environmentally conscious than ever before, and the children who drive the household

recycling programs and harass their parents into environmentally friendly purchasing decisions are growing up. They are keen to experience and learn about their natural environment, and, as a result, they are very protective of that natural asset.

Secondly, industry self-regulation is alive and well in ecotourism. In November 1996, the Ecotourism Association together with the Australian Tourism Operators Network launched the National Ecotourism Accreditation Program (NEAP). NEAP expands the previously mentioned principles of ecotourism to include customer feedback and evaluation, responsible marketing, and activities that are sensitive to, interpret and involve different cultures especially indigenous cultures. In each of these eight key areas it outlines the core criteria that an ecotourism venture must fulfill in order to gain the basic level of accreditation. Also included are sets of more strict criteria relevant to each key area. If an operator can achieve compliance with 80% of the criteria relevant to their business, they will receive advanced accreditation under the National program. The benefits of the scheme extend to committed ecotourism operators, natural resource managers, ecotourists, and conservation minded people such as ourselves who want only sustainable business operations to be allowed into natural areas of significant conservation value.

These benefits are primarily derived by the exclusion of the cowboy operators, and through the provision of a guarantee of quality. NEAP is being well promoted throughout the country at this time and rapidly gaining both operator, travel agent and consumer acceptance.

Quality of life and the enjoyment of introducing people to the joys and wonders of nature are two of the features of life in a genuine ecotourism business that are often quoted as being of greater benefit than the financial gains. The people involved in such business are there because of a passion for the environment in which they operate. They are the modern conservationists who are ensuring that conservation will have a financially viable future and that government conservation actions will be accountable in every sense.

Local Government's Role in Rainforest Establishment and Management in North Queensland

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The NQ Joint Board is a regional local government organisation actively involved in rainforest restoration through the Wet Tropics Tree Planting Scheme. The Board operates across 10 local shires covering the Wet Tropics World Heritage Area. Tree planting activities to recreate rainforest ecosystems commenced in 1989 when Geoff Tracey developed the idea as a tree planting scheme as alternative employment for displaced timber and forestry workers. To date the Scheme has revegetated more than 500 ha of rainforest across the region. With the advent of Integrated Catchment Management and the Natural Heritage Trust, the Board has further developed its role as a professional manager of the region's vegetation resources. Additional activities include:

- *Revegetation plans prepared for each of the catchments covered by the wet tropics bioregion.*
- *Development of an integrated package of vegetation protection and management through local government and strategic revegetated.*
- *Development of Local Government Pest Management Plans across all member shires.*
- *Promotion of farm forestry utilising rainforest cabinet timber species as an alternative land use on cleared areas throughout the region.*
- *Provision of natural resource management services to member Councils.*

On-ground works involve the revegetation of riparian areas, establishment of wildlife corridors, stabilisation of erosing areas and reinstatement of freshwater wetland vegetation. These works aim to enhance and protect the region's biodiversity and restore waterways back to healthy, functioning ecosystems. Plantings utilise a mix of native pioneers, secondary species and primary species in an attempt to kick start natural successional processes whilst reducing time to site capture. Follow up maintenance until site capture and monitoring of the sites is an integral part of the program's success.

Regional Local Government cooperation for managing North Queensland's revegetation program

The North Queensland Afforestation Program Joint Board is a joint local government with 10 member Councils established for the management of tree planting programs in the wet tropics of north Queensland. The Board was established by Order in Council in 1991 and has since

been involved in the implementation of farm forestry and environmental tree planting schemes across the member Council areas. To date these schemes have established 2,000 ha of farm forests working with over 500 landholders and rehabilited around 500 ha of riverbanks, wildlife corridors and other areas important in the management of biodiversity.

Today, the Board manages the Wet Tropics Vegetation Management Program funded through the Natural Heritage Trust. This program involves the integration of sustainable management of remnant vegetation and environmental rehabilitation activities.

The Board took over the management of the Wet Tropics Tree Planting Scheme in 1994 (the Scheme commenced in 1989) in addition to the core activity of the Community Rainforest Reforetation Program (CRRP). The focus of the Board's activities to date has been establishing a small-scale sustainable farm forestry industry, environmental repair through revegetation programs and training unemployed rural workers. Under the Natural Heritage Trust, the Board has expanded these activities to deliver an integrated package of sustainable vegetation management through Local Government.

Components of the present Program include:

- Regional strategic planning linked to the FNQ2010 Integrated Planning Process - under this initiative Catchment Rehabilitation Plans have been developed to prioritise the effective use of funding to environmental repair across the 10 shires;
- Vegetation Management Policies - involving the establishment of management plans for remnant vegetation under Local Government Management and to develop initiatives to encourage the conservation of remnant vegetation on freehold lands;
- Education and awareness activities - provision of training courses for community group members and management of Green Corps projects and a Work for the Dole Scheme pilot project;
- Tropical Queensland Vegetation Management Advisory Committee - a Steering Committee to guide regional policy with respect to vegetation and ensure the integration of vegetation activities across Commonwealth, State and Local Governments and community organisations; and
- On-ground works program - delivering approximately 75-80 ha of revegetated lands per annum through skilled Council-based Wet Tropics Tree Planting Scheme work crews across the region (currently focussing on environmental repair but hoping to pick up farm forestry support now that the CRRP has been wound down).

The NQ Joint Board also provides considerable support to community activities such as Landcare tree planting days and through the newly established Greening Australia - Bushcare Support Centre within the NQ Joint Board's offices.

Over the past two years the NQ Joint Board has undergone considerable restructuring to improve the delivery of the Wet Tropics Tree Planting Scheme and other services to the member Councils. New initiatives included the strategic planning studies (later incorporated into the Wet Tropics Vegetation Management Program), a regular monitoring project for on-ground works conducted by a Quality Assurance Committee with independent technical expertise and pursuit of a cost reduction and income generation program.

As the NQ Joint Board operates as an administrator for the Wet Tropics Vegetation Management Program (a $1.2 million per annum program of revegetation works) it bears

many of the overhead costs associated with the management of a large-scale regional project. The Board maintains a small staff with a mix of technical and adminstrative skills. The services provided include:

- The provision of botanical advice and coordination of seedling stock undertaken by the Board's Botanist.
- Strategic planning, assessment and monitoring of the on-ground works undertaken by a Project Officer.
- Budgetting and financial management provided by the Financial Controller.
- Management of payroll, accounts, vehicle fleet, ordering of equipment and general administrative services carried out by an adminstration officer.
- Liaison with Commonwealth agencies, coordination of funding proposals and overall management of the Program by the Chief Executive Officer.

The member Councils each pay an annual precept to provide funding for this coordination unit. To supplement this core funding the Board's staff also undertake the management of a number of related services on behalf of the member Councils. These services are provided on a full cost recovery basis. Current activities include:

- The administration of the Trinity Inlet Management Program.
- Administrative support to the Local Authority Waste Management Advisory Committee.
- Provision of facilitation support to complete Local Government Pest Management Plans across the member Councils.
- Management of a Work for the Dole Scheme pilot project utilising the Wet Tropics Tree Planting Scheme in the member Councils as an employer.
- The coordination of Green Corps funding proposals and provision of training services to Green Corps projects in the member Councils.
- Contracting of technical services such as vegetation assessment and mapping.

The pooling of resources across ten member local authorities has provided a mechanism whereby the Councils can achieve a cost-effective and strategic program of revegetation works which benefits the region as well as the individual member Councils. It has also enabled the member Councils to develop a level of expertise in environmental management which could not be supported by the majority of the members in isolation as most are small rural shires with a limited rate base. In turn, these qualities have enable the Board to access Natural Heritage Trust funding to undertake this program.

Rainforest establishment

The focus activity currently undertaken by the NQ Joint Board is the administration of the Natural Heritage Trust funded Wet Tropics Vegetation Management Program delivered through the member Shires by the Wet Tropics Tree Planting Scheme. This Program delivers approximately 75-80 ha of rainforest revegtation per annum.

Work teams employed through the local shire council operate in each of the ten participating shires of the NQ Joint Board. These teams are collectively refered to as the Wet Tropics Tree Planting Scheme (WTTPS) and they carry out all onground works - involving planting, maintenance and management. The average number of employees in each shire is four; one Technical Supervisor and three crew members to carry out the on-ground works. The WTTPS has established 135 hectares (approximately 360,000 trees) of rainforest across the ten shires

in the two year period since 1996. Most projects involve the revegetation of degraded areas using local rainforest species. WTTPS project aims include:

- The restoration of healthy functioning riparian ecosystems by eradicating infestations of exotic waterweeds (e.g. para grass, *Brachiara mutica*) to reduce erosion, sedimentation and stream chokage.
- Repair and linkage of remnants to enhance and protect region's biodiversity.
- Creation of wildlife corridors for endangered species such as the Cassowary, *Casuarius casuarius johnsonii*; and the north eastern subspecies of Yellow Bellied Glider, *Petaurus australis reginae* (both endemic to the Wet Tropics region).
- Conservation and enhancement of threatened freshwater wetlands.
- Creation of artificial wetlands to act as sediment sinks and fish breeding habitats.
- Site capture of degraded lands to prevent erosion and weed invasion.

The WTTPS provides links between local government and the community. Most shire WTTPS teams play a large role in many community revegetation projects through the provision of technical advice, equipment, labour and plant stock. Under the current structuring of Commonwealth Natural Heritage Trust funding, cooperation between the two groups is essential and, in most cases in the Wet Tropics region, it is not realistic for volunteer community groups to carry out large scale revegetation projects without professional assistance because of the very large time commitment involved. The WTTPS works closely with Landcare groups, Integrated Catchment Management coordinators, River Improvement Trusts, community conservation groups such as the Community Cassowary Care Group (C4 - based at Mission Beach) and individual landowners.

Local Government also directly benefits from the scheme by having direct access to a professional team experienced in environmental rehabilitation without having to pay contract rates. Core shire business carried out by the WTTPS in the past includes tree planting to stabilise creek banks following bridge building works as well as quarry and dump-site rehabilitation.

Project planning

All projects are carefully planned up to 18 months in advance to allow sufficient time for coordinating works programs with landowners, community groups and other stakeholders. Each of the ten participating shires of the NQ Joint Board submits a group of projects for the following planting season. Project submissions are reviewed and assessed by a Quality Assurance Committee (QAC) according to guidelines based on the FNQ 2010 Regional Plan rehabilitation criteria. Projects are required to fit into local integrated catchment plans, catchment rehabilitation plans, regional strategies or meet criteria outlined in the Draft FNQ 2010 Regional Environment Strategy (DoE, 1996). The role of the QAC is to ensure that projects are of a high standard and address regional and local priorities.

Sufficient lead in time is also needed to compile site-specific species lists for each project and collect and propagate sufficient seed to produce two thirds of the WTTPS tree requirements each year (approximately 200,000) in addition to stock for community projects. The remainder of the trees are sourced externally through an open tender process which is called 12 months prior to the commencement of the planting season.

Theory of planting design

The design of WTTPS plantings is based on the theory of rainforest succession. Succession is the process where plant communities respond to disturbances (e.g., logging, fire, clearing) by going through various changes to re-attain the type of vegetation that a site is capable of supporting (Winter et al, 1991). The combination of seedlings used in a planting incorporate species from different successional stages to manipulate the natural repair processes and reduce the length of time required to establish a self-supporting system. It is estimated by Hopkins (1990) that rainforest that has formed a pioneer canopy following a large disturbance could take up to 800 years to develop into a primary forest. Research of a disused dairy pasture at Millaa Millaa on the Atherton Tablelands (north Queensland) showed that after 40 years the regrowth in the pasture was of a similar height to the adjacent undisturbed forest. Most of the pioneer species had degenerated and although many species from the adjacent forest were present very few were fruiting yet. The researchers predicted that this forest was unlikely to produce fruit for up to 100 years (Winter et al, 1991).

There are three terms for rainforest plants which generally indicate at what period in succession they are present in the system. These relate to their growth and reproductive characteristics and their level of tolerance/intolerance to light. Species in these different groups are termed pioneers, secondary or primary species.

In brief, pioneer species are the first plants to colonise an area after disturbance. They tolerate full sun (and are shade intolerant), are fast growers, become fertile early and produce large numbers of seed regularly. The WTTPS uses these species to produce a cover canopy within the first 12-24 months and to encourage and protect the other slower growing and less light tolerant late secondary and primary species planted amongst the pioneers. Common pioneer species used in WTTPS plantings include; Bleeding Heart, *Omalanthus novo-guineensis*; Sarsaparilla, *Alphitonia petriei* and Brown Salwood, *Acacia mangium*.

Secondary species are those intermediates that establish after the pioneers and are usually longer lived than pioneers. Primary species such as Black Bean, *Castanospermum australe* and Red Tulip Oak, *Argyrodendron peralatum* are usually the slowest growing trees that make up the canopy of undisturbed rainforests. WTTPS plantings incorporate mixed species from the different successional stages to quicken the lengthy process of secondary regeneration. By including some primary species into the original planting we aim to increase the likelihood of a future food supply for animals. Many large fruited primary species such as the Cassowary Satinash, *Acmena divaricata* (noted under the Nature Conservation Act 1994 as rare) will not be naturally recruited into planted rainforest plots unless the site is adjacent to OR very close to a large (>200ha - Kooyman, 1996) seed source forest and the appropriate dispersal agent is present - in this case probably a Cassowary!

Observations of the scheme's early rainforest establishment projects (5-8 years old) show that plantings that contain very large percentages of either pioneer or primary species have required more maintenance over an extended time period. Too many pioneer species often results in a decrease in canopy cover at the 3-5 year period due to the change in canopy architecture. This allows more light to reach the ground often resulting in a resurgence of weed growth. The use of too many primary species also often results in an increased need for

maintenance over an extended time period because these plants tend to be slower growing, less light tolerant and suffer a higher mortality rate.

Site preparation and planting

Site preparation is often extremely labour intensive and expensive. It is necessary to remove all competition (e.g., weeds and grasses) from the planting area. This often includes the exclusion of grazing animals through the erection of fences. The most suitable method of weed removal over large areas is through the use of herbicide (such as Glyphosate). For best results two applications of herbicide should be used two months prior to planting to reduce the soil seed bank reserves. In some accessible areas machinery such as a bobcat or excavator can be used to remove large infestations of woody weeds.

Trees are planted randomly and at spacings between 1.5 and 1.75 metres apart. The holes are dug using two-person, petrol driven post-hole augers with 9 inch blades to a depth of approximately 30-40 cm deep. The trees receive one application of fertilizer at the time of planting and are watered in well. Follow-up watering is often required at some sites for several months if no regular rainfall occurs. In some extremely hard, rocky or steep locations the holes are dug by hand with a mattock and crow-bar.

Mulch is not commonly used in all shires because of the high levels of labour and cost involved.

Maintenance

The maintenance is the most crucial component to success in the establishment of rainforest. Planting is by far the easiest stage. If competition in the form of grasses and weeds are not kept away from the plants in the early stages many rainforest species will be smothered or choked and die! The first 1-3 years is the most critical period. After this the tree roots have penetrated deeper into the soil and can obtain sufficient nutrients without adverse effects from competition.

Total maintenance requirements vary greatly for each site. On average coastal areas in the north Queensland wet tropics require maintenance for 1-2 years after planting and 2-4 years for Tableland areas (> 500m above sea level). Plantings have usually reached canopy closure within this period. Maintenance is carried out through the use of herbicides. Although we aim to minimise their use, no other realistic alternative exists for large-scale projects.

Monitoring and evaluation

All WTTPS projects are inspected annually by the QAC to determine whether the aims and objectives outlined in the project submissions are being met. The committee consists of representatives from the NQ Joint Board and outside technical experts. The QAC also provides technical advice and makes recommendations with regard to problem areas if sought by the Technical Supervisor or crews.

How much does it cost to establish rainforest?

There is a great deal of variability in the cost of rainforest establishment. The costs are largely dependent on the terrain of country, the current condition of the land and the techniques employed. Very steep areas infested with woody weeds (e.g., Lantana, *Lantana camara*) and/or exotic vines (e.g., Skyflower, *Thunbergia grandiflora*; Madeira Vine, *Anredera cordifolia*) are very labour intensive and have high costs of establishment. Riverbank projects that require some form of rockwork for stabilisation also have a considerably higher establishment cost. A cost per hectare for rainforest establishment for WTTPS projects fluctuates around $15,000 per hectare. This is comparable to the cost of rainforest establishment (~$18,000) plantings in the Rosebank area of northern NSW carried out by Mark Dunphy (Crook, 1997).

In North Queensland these costs are often criticised as being too expensive and have been directly compared to costs for establishment of farm forestry plantings in far North Queensland through the Community Rainforest Reforestation Program (CRRP). The CRRP has established cabinet timber plots on private property for around $5,000 per/ha (Helling, pers comm.). This is for planting on flat sites only and the landowner is required to carry out all the site preparation and pay a levy of $600. However, establishment costs for Farm Forestry trials of rainforest cabinet timbers in northern NSW vary between $6,000 - $18,000 per hectare depending on the spacings used between trees (Crook, 1997). The large difference between establishment costs of the forestry plots described above is a result of the different aims, objectives and techniques used.

Farm Forestry plantings aim to produce commercial timber by setting up plantations on private property in cooperation with landowners. Seedlings are planted at a density of 900 - 1,100 stems/ha on gentle-sloped land in rows so machinery can be used for establishment and maintenance. Species used are often fast growing "performers" that will give a return in the short to medium term (40-60 years) and can be successfully grown in small forestry tubes (volume ~ 250 ml).

In contrast, rainforest establishment plantings of the WTTPS are often located in the most difficult areas of the landscape, on very steep riverbanks that are not suitable for either cropping or grazing and as a result have often become badly degraded and weed-infested. Most areas cannot be accessed using machinery and weed removal must be carried out by hand. Seedlings are planted at a much greater density, at 3,000 - 4,000 stems/ha and many species (e.g., late secondaries and primaries) need to be grown in a larger pot to allow the plant to establish further before planting out in the field. The combination of increased labour requirements and increased numbers of larger, well-established plants results in a higher cost of establishment for rainforest relative to some farm forestry plantings.

Conclusion

Since 1989, the Wet Tropics Tree Planting Scheme has been instrumental in reestablishing a substantial area of rainforest throughout the wet tropics region of north Queensland. These plantings contribute to the overall environmental management of the region's vegetation, wildlife and watercourses.

The actual community benefit to the region from such works is undefined and makes up just one of the areas identified for future research on rainforest revegetation. Other areas to explore include how to better promote natural recruitment and colonisation of rainforest species, how to create further cost reductions in the revegetation program to make our dollar achieve more on the ground and how to ensure secured funding for the long term to continue the much needed work of environmental repair.

The NQ Joint Board has been successful in establishing a strategic, well-resourced regional program for revegetation activities in north Queensland through the Wet Tropics Tree Planting Scheme. The challenge for the future is to extend the program to a comprehensive integrated management of our vegetation resources.

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Allocation, Regulation and Management - Mechanisms for Achieving Sustainable Land Use

7 August 1998.
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Historically, development - an increase in the intensity of use of land - follows this sequence:

- *the owner of a resource (originally the State) allocates it to a potential user, by proprietorial or tenure-related mechanisms, which alter the legal "interest" in the resource. Leases and freehold deeds are examples;*
- *a State department, council or other public authority regulates activity by the holder, to control use and development. Planning schemes are examples; and*
- *the holder of the resource manages it, to achieve personal goals, by mechanisms such as property management plans and covenants.*

These mechanisms and the circumstances to which each is best suited will be explained.

The paper also explains that all properties in Queensland are valued annually according to market value, with limited scope for concessions. But local governments can apply concessions through rating to encourage desirable forms of land use.

Origin of powers

When Captain Cook planted the English flag at Botany Bay in 1770 he triggered in that single action two quite distinct exercises of the Empire's power: he declared that George III was now the sovereign and entitled through Parliament to make laws; and he claimed ownership of the land. Some 222 years later, the High Court found that the claim to ownership was invalid because the land was already owned. But that lay in the future. In 1788, Captain Phillip commenced to allocate the land of Australia as if it were vacant Crown land.

So in the Australian federation, the States' interest in land is derived from two distinct sources. The more basic power is the *sovereign* power, by which the State exercises authority to legislate on behalf of its people. The second is the *proprietorial* power, by which the State acting as a "landlord" allocates property rights.

Explanation of terms

Historically, development - which is an increase in the intensity of use of land - follows this sequence:

- the owner of a resource (originally the State) *allocates* it to a potential user;
- a State department, council or other public authority *regulates* activity by the owners of the resource; and
- the holder of the resource *manages* it.

Reflecting the three steps described above, the available mechanisms fall broadly into three categories:

- *proprietorial* or *tenure-related* mechanisms, which *alter the legal "status" of the resource*. Leases and freehold deeds are examples;
- *regulatory* mechanisms, which are imposed by the State or local governments to *control the use and development of a resource*. Planning schemes are examples; and
- *management* mechanisms which landholders can utilise for resources under their control to *achieve personal goals*. Property management plans and covenants are examples.

Proprietorial mechanisms

In the Australian constitutional system, the State government is considered to own most natural resources until it allocates them with appropriate conditions to some person or body. Examples in addition to land itself are:

- water, the diversion of which is subject to licences;
- fauna, considered to be owned by the State (irrespective of which property it inhabits) and released under a permit system; and
- commercial timber, owned by the State on leasehold land and not available to the owner of land being freeholded until its value is paid out.

When the State allocates a resource, it may choose to allocate it only in part. The grantee owns the resource only to the extent to which it is released by the proprietor. An example of partial allocation is that when land is freeholded, the title reserves the rights to all minerals and petroleum (and gravel, since 1992) to the State, even though most other resources pass to the purchaser.

Ultimately, tenure mechanisms are voluntary in that a landholder is offered and accepts a tenure with known conditions.

Regaining proprietorship

Should the State require a person's property, it must pay adequate monetary compensation. The State can acquire freehold land by contract of sale, like any other purchaser (termed "purchase"). The State can also acquire leasehold or freehold land by proclamation, either compulsorily (termed "resumption") or voluntarily.

Statistical summary

Area of Queensland	173,660,000 ha
Freehold	14 %
In process of freehold	6 %
Perpetual lease	13 %
Term leases	53 %
Licences and permits	1 %

National Parks	4 %
State forests and timber reserves	3 %
Roads and State reserves	3 %
Unallocated State land and other forms	3 %

The following forms of tenure are listed in order of decreasing private interest and increasing State interest.

Freehold Land

Freehold title is the most complete form available of land alienation from the State. Ownership by the title holder is not absolute, however, as the State is empowered to withhold certain rights such as the right to any minerals or petroleum. **Deeds of grant** from the State are issued pursuant to the *Land Act* when the land is first freeholded, but subsequent dealings in freehold land including the issue of derivative **certificates of title** are regulated by the *Land Title Act 1994*.

About 20 percent (one fifth) of Queensland's 173 million ha is freehold or in the process of freeholding by means of **freeholding leases** (which lead to a deed of grant after the instalments are paid out).

Ownership of allotments in Australia nominally extends up to the heavens and down to the centre of the earth. However, the courts have limited this to just so far in each direction as an owner needs for the ordinary use and enjoyment of the property, and is able to bring under effective control. For example, the owner of freehold land may (subject to planning permission) subdivide in strata and sell the separate strata lots to different buyers.

Any increase in the value of freehold land on account of population growth in the district (so that subdivision or some use of higher intensity becomes possible) belongs to the owner. For leasehold land, this “windfall” profit accrues to the State.

The Torrens Title System

Sir Robert Torrens, a South Australian, was concerned at the plight of people who lost their properties because they could not establish beyond doubt their legal titles, so in the mid-1850s he devised a system known as the Torrens title system. This was based on the creation of a single certificate of title the validity of which is guaranteed by the State. The previous system relied upon tracing numerous deeds back to the original root of title so that ownership could be established beyond doubt (a system which still operates in the UK).

Perpetual and Term Leases

Grazing is the primary land use on some 8,000 leased holdings of varying sizes. Of these, there are nearly 1600 term leases for pastoral purposes, the pioneer tenures, covering some 93 million ha or just over half the area of the State. They have an average size of 57,000 ha and generally occur in the remote areas.

Perpetual leases do not expire so have a level of security equivalent to that of freehold. However, they cannot be held by corporations. Term leases may be issued for up to 50 years or, where the purpose is a ‘significant development’ or timber plantation, for 100 years. Leases for business

and commercial purposes are normally for 30 years. Renewal of term leases of course is possible and is normal, unless a higher form of land use appears to be desirable.

The Department does not intervene in use of leased land provided that the land is used for the purpose for which it has been leased and the conditions of the lease are observed. Subject to native title, lessees enjoy sole occupation. Conditions of occupation include a general duty of care for the land and a requirement to obtain a permit for clearing trees. Leases can be bought and sold by private transaction, although the Minister's consent to transfer is required.

The leaseholder's use and enjoyment of land is subject to certain limitations. They must pay rent, they may use the land for only those purposes specified in the lease and on expiry of the term (in the case of term leases) the rights to another term may not be automatic. In common with other landholders, they are obliged to pay rates to the local government and are subject to regulatory controls such as statutory planning.

Road

Land may be dedicated as a road. A road for the purposes of land administration is an area of land dedicated for public passage. Whether a pavement is constructed on it and whether it is trafficable by pedestrians or vehicles is irrelevant to its tenure. Roads have a long tradition in common law and provide legal access to allotments in addition to through passage.

Reserve

Land can be reserved in the form of National or Conservation Parks under the *Nature Conservation Act*, State forest under the *Forestry Act* or reserve under the *Land Act* for any of a number of purposes. There are some 22,000 **State reserves** set aside under the *Land Act* for public purposes. Once gazetted, such reserves may be placed under the control of trustees, who can include State departments, local governments, groups of interested people or individuals.

Unallocated State Land

Unallocated State land (USL) is the residual State land which is vacant and over which no interests have been granted.

Native Title

In June 1992, the High Court ruled in the ‘Mabo’ decision that “the Meriam people are entitled as against the whole world to possession, occupation, use and enjoyment of [most of] the land of the Murray Islands in the Torres Strait.” In reaching this conclusion, the majority of the Court held that the common law of Australia recognises a form of native title to the land.

The common law provides that the sovereign State governments could extinguish native title by valid exercise of their sovereign power. This could be by:

- legislation;
- granting a tenure (such as private freehold) which is inconsistent with the continued existence of native title; and
- using the land in a manner inconsistent with the continued existence of native title.

Whether native title does or does not survive on a given parcel is therefore a question of fact, not of policy or discretion by governments, and depends upon two main considerations:

- whether there has been a lawful extinguishment of that title; and
- whether the relevant Aboriginal or Islander people have maintained a continuous connection with the land.

Late in 1993, the Australian and Queensland Governments gave a legislative response to the Mabo decision by passing the Commonwealth *Native Title Act 1993* and the *Native Title (Queensland) Act 1993*. The objects of the legislation are to:

- validate past acts which may otherwise be invalid due to the existence of native title;
- set the standards for future dealings with land where native title exists;
- recognise and protect native title and provide for its co-existence with land management systems; and
- establish a mechanism for determining claims to native title and for compensation payments where native title has been extinguished or impaired by past acts.

After the passage of the *Racial Discrimination Act* which came into force on 31 Oct. 1975, it became illegal throughout Australia to treat Aborigines or any other race in a discriminatory way. This means that governments could not and cannot arbitrarily expropriate land held under native title, just as they cannot expropriate freehold or leasehold land without paying fair compensation. However, the native title legislation validates titles issued after that date until 31 December 1993.

Regulatory mechanisms

Regulatory mechanisms do not allocate any resource, but place restrictions upon the method by which the resource is exploited or the way in which it is enjoyed. Examples include:

- pollution limits for discharges to water;
- hygiene standards for harvesting of game meats;
- vegetation protection ordinances (a kind of local law, formerly "by-law") by local governments over bushland; and
- statutory planning schemes and State planning policies.

As society has become more complex and environmental dysfunction more obvious, there has been a tendency to increase the weight of regulatory controls.

Regulatory mechanisms come into operation to fetter whatever property rights have been allocated. In other words, the form and conditions of tenure specify at the outset the rights of the landholder and *withhold* those which remain in the State's control; regulatory controls moderate the landholder's rights by *withdrawing* those which would otherwise be associated with the respective form of tenure.

Management mechanisms

Landholders - whether private persons, councils or State departments - have a right under common law to actively or otherwise *manage* the properties under their control. Fences need to be aligned, trees planted, buildings sited, footpaths or roads designed, pastures maintained, paint colours chosen. The proprietorial decision to allocate the land and the regulatory controls

together lay down a broad framework within which the landholder is free to utilise the property. Put in other words, the right of private landholders to manage their property derives from common law, constrained by common law obligations to neighbours and the community; by regulatory restrictions; and by the terms under which they hold the land from the ultimate owner.

Mechanisms by which intentions for management are expressed include *property management plans* and trusteeship. On reserved land, the Minister may appoint a trustee subject to conditions which may include a condition that the trustees abide by a management plan. A trustee has a duty of care for the trust land.

How many permits are required?

A person seeking to use or develop land requires permission under *all* relevant mechanisms. The absence of authorisation under a single one may be fatal to the proposal. In other words, the limit on the extent of development which can be permitted is set by the most restrictive instrument.

Valuation mechanisms

'Valuation' is the process of determining the value of a property. 'Market value', the most common basis for valuation, is the estimated amount for which a property should exchange on the date of valuation between a willing buyer and a willing seller, each acting knowledgeably, prudently and without compulsion.

Unimproved values are updated annually by the Department and are provided to local governments to enable accurate comparisons to be made between different properties so that rating may be equitable. The aim of this process is to have available a schedule of values that relates to the market while it maintains relativity between individual assessable properties. A name used for these estimates is 'relativity values' or 'statutory values'.

Highest and best use

A fundamental principle of valuation is that the market values land for its *highest and best use*, being the most economically advantageous use to which the property may lawfully be put. However, *highest* and *best* can sometimes be mutually exclusive and what is lawful may not represent the *most appropriate use*. The valuer must have regard to any applicable statutory restrictions upon land use, including planning schemes and any encumbrances upon the title, such as conservation agreements or easements. The valuer must take into account the relative permanence of such restrictions. Under the new planning legislation the development potential of some properties is uncertain as proposed uses are to be evaluated according to performance criteria and no use will be prohibited. This may affect values.

Covenant-type restrictions such as conservation agreements may reduce the value of a property, where clearly development potential is foregone and the property is ripe for development. But sometimes, as in bushland residential zones, installation of a conservation agreement will *increase* the value of a property, as it will cater for a class of buyer which appreciates conservation land with the recognition of a secure instrument of protection.

Valuation cannot be used as a planning system and, with the following two major exceptions, statutory values produced for rating purposes must reflect highest and best use:

- where a property is used for a purpose which would now not be permitted, known as a 'non-conforming' use, such as a long-established factory in a residential area, the value will reflect the current use; and
- a concession is made for land used exclusively for a single dwelling or for farming. The existence of multiple allotments is disregarded, even though they would normally mean that there was significant unrealised development potential. Also, any potential for subdivision or for other higher use is to be disregarded.

Rating mechanisms

Councils set a rate annually as a sufficient number of cents per dollar of the unimproved capital values of the land in their areas in order to cover their budgeted expenditure. The quantum of rates which each landholder is required to pay is, therefore, a matter for the council. The statutory values simply indicate the *relative* values across all properties. Rates may increase or decrease even though there has been no change to unimproved land values.

All land is rateable other than Commonwealth and State land occupied by a governmental authority, certain Aboriginal and Torres Strait Islander lands and land exempt under a regulation (as described below). Whether the land is leasehold or freehold is irrelevant.

Variations on rates

Councils can offer relief in three different ways:

- by exemption under a regulation (S.553 *Local Government Act*). Regulations are promulgated by the State and could exempt a class of land or could enable local governments to do so. This power is used to exempt churches, recreation and sporting bodies, charities and hospitals. A regulation could also, for example, exempt land subject to a covenant or subject to a conservation agreement under the *Nature Conservation Act*. It is unlikely that a regulation would be used to exempt particular parcels of land;
- through a remission of rates (S.627ff). Circumstances which might justify a remission include 'the preservation, restoration or maintenance of structures or places of cultural, environmental, historic, heritage or scientific significance to the local government's area'. Remissions are given on *application* by the owner *at the discretion* of the local government. The process would need to be repeated each year; and
- under a differential rating scheme for a class of properties, defined in any way at all (S.559ff). Suitable criteria could be land use, location, area or range of value. For example, councils commonly strike a lower 'rural rate' for all properties zoned rural. 'Nature conservation' could be a category. Councils may strike a separate rate for all properties in a 'benefited area' where some costly infrastructure has been constructed.

Councils are reluctant to use this power to achieve planning objectives. This is because it is difficult to confine concessions to specific deserving properties. A council which strikes a low rate for either an individual landholder or a very small number of individual landholders opens itself to accusations of patronage and the possibility of challenge. But if it offers a concession to all landholders in, say, the whole rural zone, it captures those properties which don't deserve the concession as well as those which do.

The two primary essential requirements of any scheme to use rating to encourage wise land use are specificity and year-after-year security. Both aspects are problematic, but they can both be achieved where a differential rate is granted to properties which are subject to a covenant-type instrument such as a conservation or heritage agreement. This would be more logical and less costly to councils than a general differential rate as it targets those landowners who have knowingly and willingly given up development rights for the long term in the community interest.

A property used for the business of farming is entitled to a concession on land value under S.17 of the *Valuation of Land Act*. This feeds through into rates. A farmer with a covenant-type agreement leading to a targeted concession but also subject to a broad-based rural differential rate could, in effect, receive a triple concession.

A rebate of rates foregone on account of catchment management considerations is available from the Department of Natural Resources. This rebate is not claimable by individual landholders, but only by councils which introduce an appropriate differential rate and by only those councils which are implementing actions in accordance with an endorsed catchment strategy. There is no specific statutory power for this.

The Department of Environment may pay rebates on rates or other incentives to landholders who undertake conservation measures on their properties.

Conclusion

A wide range of mechanisms is available to manage natural resources. It is recommended that those who wish to improve the management of land become familiar with the range of existing useful mechanisms. Then they can choose in each case one or more mechanisms which are appropriate to the circumstances and the inclinations of the landholding person or authority. It is then necessary to follow through with the administrative actions necessary to apply them.

Nature Refuge Agreements, Weed Removal, and Eco-tourism

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Belgamba is a 537 ha property of open eucalypt forest with pockets of dry rainforest on an undulating plateau south of Rockhampton. We shall discuss our experiences with Nature Refuge Agreements on both Belgamba and a 7 ha block of rainforest and palm grove on the Capricorn Coast hinterland. Which branches of government are helpful and which are yet to be enlightened?

Management of our Nature Refuges includes weed removal, coming to terms with fire, and replanting of scrub areas. This brings up the issues of chemical treatment for some weeds but not others, controlled burns to help prevent wildfire, and the use of ATCV and Wwoofers as possible sources of labour.

Running a bush retreat holiday cottage is a source of income, but does ecotourism pay when there is more “eco” than “tourism”?

1. Belgamba

Background

Not far south of Rockhampton in Central Queensland there is a minor plateau with elevations between 350 and 500 metres formed by the junction of the Dee and Razorback Ranges.

This plateau and its steep surrounding slopes contain a tract of remnant native vegetation comprising open eucalypt forest and woodlands with significant pockets of dry rainforest. These stand in contrast to the cleared coastal plains to the east and north, the drier rocky hills of Mount Morgan to the west, and the mountain forest country to the south which is still subject to clearing.

Our property *Belgamba* (537 ha) covers most of this plateau top while the gorge country on the northern escarpment is held as Bouldercombe Gorge Resource Reserve (345 ha). On the southern escarpment is a magnificent block of dry rainforest presently held as Unallocated State Land (more on that later!). Belgamba is at the headwaters of the Dee River flowing to the west through Mount Morgan; Crocodile, Gavial and Plumtree Creeks flowing north; and Station Creek flowing south.

The geology is diverse comprising of Middle Devonian Tuffs and Upper Permian Granodiorites. Soils are very shallow, stony and skeletal with exposed rock. There is some accumulation of good soil in the Dee River riparian zone.

History

Prior to our ownership Belgamba had been run unsuccessfully as a cattle property. Inappropriate land management practices which included overgrazing, bulldozing and annual burning during summer, left a legacy of lantana infestation throughout the property, some rubber vine, modified vegetation, and severe degradation in some portions of the Dee River. However, despite the damage caused by previous owners, the basic structure of much of the forest remains.

Flora and Fauna

Belgamba contains a diversity of native flora with at least one hundred and eighty-four (184) plant species; including the vulnerable *Cycas megacarpa*, the rare species *Hernandia bivalvis* and two further species at or near their northern limit. (*Acacia podalyriifolia* and *Bouchardatia neurococca*). It contains at least five readily identifiable plant communities representative of the region. Three of these are:-

- *Livistona decipiens* palm forest**.** Mixed with *Allocasuarina torulosa, Casuarina cunninghamiana, Corymbia intermedia, Ficus opposita, Lophostemon suaveolens, Mallotus philippensis.* This type is restricted to gullies in the upper Gavial Creek catchment and the upper Dee River gorge.
- *Eucalyptus tereticornis, E. acmenoides* woodland with Riverine closed forest (rainforest). Rainforest Gullies in the upper catchment of the Dee River.
- Semi-evergreen Vine Thicket - Dry rainforest. Localised in small areas offering some form of fire protection such as rocky outcrops and steep gullies in the upper catchment of Gavial Creek, the Dee River, and Rocky Gully. A floristically rich community with the main species being *Baloghia inophylla, Bouchardatia neurococca, Cryptocarya hypospodia, Flagellaria indica, Glochidion lobocarpum, Maclura cochinchinensis, Microsorum punctatum, Neolitsea brassii, Olea paniculata, Ripogonum* sp., *Smilax australis.*

Belgamba supports a diverse fauna assemblage of at least 91 recorded species including the vulnerable glossy black cockatoo (*Calyptorhynchus lathami*) and the now uncommon yellow-bellied glider (*Petaurus australis*) and brush tailed rock wallaby (*Petrogale herberti*).

Our plan for Belgamba

We bought Belgamba with the following aims in mind:

- rehabilitating degraded areas on the property;
- management on National Park principles;
- permanent protection; and
- community education.

Land rehabilitation

Fencing and complete destocking

Our neighbour was quite put out that he could not continue with the free agistment that he had enjoyed for many years. We then saw a resurgence of sandpaper figs and native hibiscus, and learnt to recognise that freshly pruned tips of the sandpaper fig indicated that not all the wayward scrubber cattle had been removed. We also learnt that it is possible to build a fence in this country without dozing a swathe through the forest. Treelines can be built with minimal manual brushcutting.

Removal of lantana and rubber vine

The rubber vine is now under control since it only occurred in local discreet areas. Primary clearing of lantana was 95% complete by the end of 1992. This involved 8.5 weeks of Australian Trust for Conservation Volunteers (ATCV) teams, 6 months of a paid labourer, and several thousand hours by us. Financial assistance was provided by Greening Australia and Save the Bush Grants Scheme to partially cover both the overheads for ATCV and the labourer's wages. Secondary clearing was completed by the end of 1994 requiring many hundreds of hours. Careful secondary removal ensured that subsequent regrowth is very limited and easily controlled. We have learnt that it is only worth getting an ATCV team if there is a thick infestation of primary lantana to clear. Follow up removal of lantana regrowth is more efficiently done by us.

Tree planting

There are areas within the Dee River where bulldozing damage has been so severe, that natural regeneration has not occurred soon enough to prevent erosion. In addition we have found that the most fertile areas, once cleared of lantana, produce a prolific growth of tall dense grasses which suppress natural regeneration of native scrub species and are a major fire risk. (Any scrub species which manage to struggle up can be quickly incinerated by the intense heat of a grass fire.) A program of tree planting has commenced to restore the riparian strip. Recently ATCV obtained Natural Heritage Trust (NHT) funding to provide a team of volunteers for two weeks to assist with tree planting. Several thousand trees have been planted, a mix of *Casuarina cunninghamiana* and local dry-rainforest species, and further away from the riparian area *Allocasuarina torulosa* and suitable Eucalypt/Corymbia species. In the long term we intend to restore dry rainforest to those areas of the Dee River where it previously occurred (about 2km in length).

On-going land management (encouragement of natural regeneration)

Weed patrols

We conduct an ongoing program of annual lantana patrols during winter.

Guinea grass (*Panicum maximum*) is a problem and we spent the winters of ‘95 and ‘96 pulling out clumps of guinea grass by hand being nice pure environmentalists and not using poison. The result was 100% regrowth within six months. Our efforts were a total waste of

time. Since then we have used *Roundup* with excellent results. It needs 2 or 3 treatments over about a year and results in permanent eradication. We cannot find an alternative. The use of *Roundup* for Guinea grass is not detrimental to regrowing native species as the first spray of *Roundup* is absorbed by the dense canopy of Guinea grass and does not penetrate any lower.

There is an infestation of "Mother of Millions" on a rocky outcrop that could become a problem if we don't get to it soon with a WWOOFer (Willing Worker On Organic Farms) or two.

Feral animal control

Cane toads in large numbers inhabited the dams and caused the deaths of many pythons. We progressively killed them over several years and their occurrence now is quite uncommon. This seems to have resulted in the return of a variety of different frog species to the dams.

In the last 3 years feral pigs have appeared and have been eating young palm shoots. We have tried shooting, trapping, and even contracting young rambos with dogs and knives. The terrain was too difficult for the rambos and they never came back in spite of us offering a cash bounty on top of their payment from the pig meat buyer.

Initial fire management

The distribution of vegetation types in this area is largely controlled by the frequency and intensity of fires. The regenerating dry rainforest areas which were previously suppressed by lantana will only be able expand to the limit of their previous range so long as fire is excluded. The majority of the property is open forest and needs an appropriate fire regime to both maintain the natural diversity and reduce the intensity of wildfires when they occur. Although we had done some controlled burns in 1993 we were not really prepared for what was to follow.

Changing our initial plans

Coming to terms with fire

As you might remember 1994 was the year of terrible bushfires in eastern Australia. Unfortunately we did not escape and in October of that year a wildfire from a nearby property burnt through the whole of Belgamba. It took 3 days to burn through the whole property. It was a very hot fire in most places and a lot of damage was done both to mature trees in the open forest (large ironbarks were particularly vulnerable) and to small regenerating patches of vine scrub. Large areas of scrub form a natural firebreak but are burnt in at the edges.

Since then we have developed and implemented a fire management plan which has two main aims:

- controlled burning on a mosaic pattern of areas of the open forest on a semi-random basis; and
- total exclusion of fire from specific areas surrounding regenerating dry rainforest.

The implementation of the controlled burning regime requires a good system of firebreaks. A network of 4WD tracks mainly running along ridgelines was put in by mining exploration companies and these are maintained by us as they form very useful firebreaks for the purpose of controlled burns. Treatment of these tracks to make them effective firebreaks has been a learning process for us. Other landholders "clean up" their firebreaks annually by giving them a scrape with a bulldozer. We tried slashing but the level of grass was still too great. We have since found the only effective method is to use the herbicide *Roundup***.** It may be objectionable to some people to be using poison but it is the only way to be effective in our fire management.

These tracks also give access for National Parks staff to the elevated parts of Bouldercombe Gorge Reserve. There are no firebreaks between this Reserve and Belgamba so the fire management of both areas must be integrated. We have had great assistance from NPWS in the conduct of joint controlled burns on both areas. Their contribution to us in the form of assistance with labour for controlled burns is justified on two grounds: Firstly we are managing a gazetted Nature Refuge which benefits the broader community, and secondly our fire management on Belgamba helps reduce wildfires on the adjoining Bouldercombe Gorge Reserve. Our contribution is in the meticulous preparation of firebreaks starting many months beforehand so that controlled fires remain controlled on the day.

Tim Flannery and the aborigines are right; we too have learnt to fight fire with fire; but in this case it is a method for protecting the regenerating patches of dry rainforest.

Permanent protection

Declaration of Belgamba as a Nature Refuge

Negotiations with the Queensland Government started in November 1992 and resulted in the signing of a Conservation Agreement by the Minister for Environment in November 1996, and gazettal on 4 April 1997. There was initial unfounded concern by the Department of Environment and Heritage (DEH) that as Belgamba is leasehold land, we would not succeed in our application because of rejection by Forestry. This fear held up the process unnecessarily.

There may be a belief that having a Nature Refuge automatically leads to rate relief. This is not so. Despite the fact that people who voluntarily reserve their land are benefiting the community as a whole, there is no government policy on rate reduction. Individual councils may offer some assistance in the future but this is the arm of government that can least afford any reduction in rate revenue.

Future plans

The long term aim is to incorporate most of Belgamba into the existing Bouldercombe Gorge Reserve. The status of the whole area will hopefully be upgraded to National Park once mining interests are shown to be futile. In addition the land described as portion 20 parish of Plews is a 217 hectare block adjoining Belgamba to the south. It contains an untouched area of about 90ha of dry rainforest and was surrendered as a grazing lease in 1978 on condition that it be turned into a reserve. It is the first of 10 sites listed in the WWF report *Conservation of Vineforests in South-East Queensland* May 1996. A subsequent report by the Department

of Natural Resources (DNR) - Rockhampton in January 1998 recommended permanent protection of portion 20. (*Lot 20 Plan LN587 Parish of Plews Land Use Assessment* Draft 16/1/1998). Both DNR and DEH appear to agree on the need for its reservation but nothing has eventuated. We hope that WWF will keep up the lobbying effort.

Community education

Ecotourism

We started our ecotourism venture in 1992. We have a comfortable and roomy cottage for up to six people; 10km of walking tracks to lookouts, etc; and pleasant but not spectacular natural scenery. We started this operation in the full knowledge that we would not make a full income from it. We were right. After six years we now know that operators must decide between “eco” and “tourism”. If you wish to make money on an ecotourism venture you must be more focussed on tourism than we have been.

Community groups

We welcome community groups to come and enjoy the surroundings and share ideas with us. However there are different “Communities”. The community of like minded people such as SGAP, Field Nats, Bushwalkers, etc. are always welcome. Then there is the “Local Community”. Not only have we have experienced open hostility from some in the neighborhood to what we are doing; but also an assessment of the current land management practices in the local district indicates a situation which could be most generously described as gross ignorance. The probability of forming an effective Landcare Group in our district is about zero.

Lessons learnt (and other incidents)

We have had a number of dramas since we bought Belgamba.

Very soon after we arrived some prospectors staked a mining claim in the back corner of (the then proposed) Bouldercombe Gorge Resource Reserve not far from our boundary. We lodged an objection on the grounds of noise from their mining activity and attended a three day Mining Warden's Court hearing. What we learned from this was that our objection based on “lifestyle” (ie. we liked the peace and quiet of where we lived) had no legal standing whatsoever. On the other hand had we been operating Belgamba as an ecotourism business at the time, we would have had a legal case for our objection to be heard. We, along with all the other objectors, had believed that our cause was just and that “right” should prevail over what was a ridiculous mining claim. However, the barrister for the miners was very effective in demolishing all our arguments.

In 1993 a neighbour bulldozed trees on our land on our eastern boundary in order to build a fence. We tried negotiating for a week but it was not until we had a supreme court injunction that we got the bulldozer to stop. It took another two years to settle the case in our favour. At this stage we were operating Belgamba as a business which gave us enough standing for the neighbour to compensate us for our legal costs.

The general lesson is that just buying an environmentally important block of land is not sufficient to "save" it. It will face continuing pressures from threatening forces forever, and on-going management is a big responsibility. The wildfire incident mentioned earlier reinforces this principle. In spite of feeling morally superior to all our overgrazing neighbours, October 1994 made us realise that we had failed the very environment we had hoped to protect.

2. Archontophoenix Grove

3 km northwest of Yeppoon on the Capricorn Coast is a 7 hectare block of remnant vegetation which includes a dense stand of tall palms, *Archontophoenix alexandrae*. This occupies about a third of the block with the remainder covered in rainforest which has spread into the understorey of *Eucalyptus tereticornis* previously open forest. All adjacent land has been cleared for pineapple plantations and grazing, and is now subject to subdivision for residential lots. So while it is isolated there is only a short gap to the heavily wooded Mt Barmoya.

Our strategy for this land was to:
1. purchase the land to save it from imminent subdivision;
2. remove the lantana and other weeds;
3. obtain permanent protection;
4. have community education; and
5. sell the land.

1, 2, and 3 have happened. In spite of initial doubts by DEH that the block might be too small for a Nature Refuge, with the help of Steve Elson and Steve Barry the declaration of the Nature Refuge was much quicker than for Belgamba. We started in March 1996, signed the Conservation Agreement in October 1997 and it was gazetted in May 1998.

4. Community education is not too easy because we do not live there. We did approach a local high school to offer them the use of the block for their environmental education program but there was no interest shown.

5. Once we finish a loop walking track the block will be on the market.

Three interesting things can said about DNR in relation to this block:

- This land was previously a "Camping and Water Reserve" and should never have been freeholded.
- When I queried DNR about a surveying anomaly on the plan, I was advised to "**get a bulldozer in to clear all the fencelines first** then we could engage a surveyor to re-survey it".
- We had the Nature Refuge declared in the full knowledge that it would **reduce** not increase the market "value" of the land; as the Conservation Agreement is an **encumbrance** permanently registered on title. However DNR seems to have no policy on the valuing of Nature Refuges. At present it is still valued for its prime real estate subdivision potential. A reduction in this "value" which is then used for rates calculation, is the only way that we can get some relief from council rates.

3. Conclusion

The first time I flew in to Rockhampton from the south, the steep eastern escarpment of the Dee Range and the dark areas of rainforest tucked up in the back corner of the Upper Ulam Valley reminded me of the Scenic Rim south of Brisbane. I was intrigued by the scenery and called it Rockhampton's Scenic Rim. In 1978, soon after coming to Rockhampton, we were both involved in the formation of the Capricornia Bushwalkers Club. Many of our early walks were from Bouldercombe Falls, through Belgamba and in the mountains of the nearby Dee Range. The dark patch of rainforest I saw from the plane turned out to be Portion 20. We always believed this forested plateau with its steep sides and scrub filled gorges should never have been used for grazing. We had no idea then that we would one day be in the fortunate position of being able do a little bit to help preserve it.

I suppose it shows that individuals can do something.

Cooperative Conservation Initiatives in Brisbane

Leo Ryan, Program Officer, Conservation Partnerships,
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The traditional mechanisms employed by government to protect ecological values are being increasingly recognised as insufficient to ensure meaningful conservation. Command *mechanisms (regulatory measures, planning restrictions, vegetation protection laws) and* control *mechanisms (public acquisition) are necessary but not sufficient to safeguard biodiversity. If they are supported by* cooperative *mechanisms offering incentives to landowners, the relevant government will have a more holistic and integrated conservation strategy that will enjoy greater levels of public support.*

This paper will address the two main forms of cooperative conservation mechanism offered to landowners by Brisbane City Council: Voluntary Conservation Agreements and Land for Wildlife.

1. Voluntary Conservation Agreements

Essential for a successful cooperative program is a mechanism by which landowners and local government can define the roles and responsibilities of their partnership. A VCA is a legally binding deed of agreement voluntarily entered by the landowner with Council. The essence of the contract is that the landowner nominates an area of the property to be a "conservation area" and promises to undertake management activities aimed at maintaining and enhancing the area's environmental values. A vegetation management plan is included as an annexure to the contract to specify the agreed management activities.

In return, Council provides an annual cash grant to assist the landowner with management. Council also provides free technical advice and information concerning environmental issues and organises training days for landowners.

Important features of the contract

- *Financial assistance*

  Financial assistance serves as an incentive to the landowner, rewards those who make a contribution to the environment and assists the owner to improve their property's ecological value. To ensure that the process is accountable, it is paid following a cooperative annual evaluation of the management goals for the preceding twelve month period. The evaluation visit is an opportunity for the partners to maintain contact and for the owner to seek any advice that may be required. The amount of financial assistance is calculated according to a formula in Council's VCA Policy. The formula refers to the percentage of the property subject to the VCA and the amount of general rates levied on the property. Maximum cash assistance is $1 500 per annum or 50% of the annual general rates, whichever is the lesser amount.

- *Rezoning option*

  It is important that the investment of public monies in regeneration works on private land is secured in some way. Covenants registered on the title are the highest form of security but are not currently available for general use by local governments in Queensland. The best available form of security is the Town Plan. Under the VCA policy, the landowner may request a rezoning of the conservation area to the Conservation Zone. This "Higher" VCA thus combines *management* goals with *planning* protection for the property. Subsequent owners take the land with notice of the Conservation zone and would be bound by it. Of the 19 existing VCAs, 14 are Higher agreements.

  A "General VCA" does not involve the rezoning of the conservation area. It is a management agreement only but the efforts of the landowner are secured by a Vegetation Protection Order.

- *Is it Possible to Secure the Investment Under IPA?*

  It is widely understood that, under the new *Integrated Planning Act (1997)*, it is no longer possible for a local authority to simply "prohibit" development. It may therefore seem that the ability of Council to secure the land's environmental values (and the investment of public monies in vegetation management activities on that land) is compromised. However, it is still possible to use a planning scheme to achieve these goals.

  BCC is currently developing a new IPA-consistent City Plan. Zones have been replaced by "areas" and a Conservation Area will be included. Critical to the performance of an IPA-consistent planning scheme is the effective expression of "desired environmental outcomes". DEOs specified for BCC's Conservation Area are based on retention of natural features and functions and will require any development to be a low impact nature-based activity. Lands currently enjoying the benefit of the Conservation Zone will be transferred to the Conservation Area.

  Higher VCAs negotiated after commencement of the Plan can be similarly accommodated. Council will undertake periodical review of the Plan and perform Council-initiated amendments to the planning scheme.

- *Duration*

  The preferred duration of the agreement is 99 years although this too is open to negotiation. It was necessary to select an arbitrary period of duration as an agreement "in perpetuity" is a legal fiction.

Eligible landholder groups

Council's VCA policy specifies that an owner may participate in the program if:
- the land has a high conservation significance due to inherent environmental values;
- the land has a strategic function (e.g. potential to serve as a corridor or buffer to a core habitat area); or
- participation would enable the owner to play a leadership role in promoting improved

environmental management in the local community.

These criteria ensure that owners of strategically located properties may participate in the program regardless of the properties' present environmental condition provided they have a strong desire to carry out rehabilitation.

Negotiations with landowners

It is highly advantageous if the VCA is presented to the landowner as a negotiable document. This demonstrates the government is committed to cooperation and will increase the likelihood of reaching a set of words acceptable to the landowner. The optimum arrangement is for the government to use a standard draft agreement as a starting point for negotiations. It is desirable that officers responsible for negotiating with landowners have a clear understanding of how far they may deviate from the standard. Experience with 19 finalised VCAs in Brisbane has demonstrated that landowners have requested minimal variations.

Success of Program

19 agreements have been finalised since commencement of the program in June 1996. The total conservation area of these properties is approximately 113 hectares. 14 of the owners chose a Higher VCA and under these agreements 79 of the 113 hectares have been rezoned to the Conservation Zone. The estimated worth of these lands is approximately $4.5 million if valued by reference to the average purchase price in Council's acquisition program.

Lord Mayor Jim Soorley and landholders Eric Vickerman and Nancy Cramond sign the first VCA in Brisbane in August 1996.

10 agreements are protecting dry sub-tropical rainforest in the hills to the west of Brisbane. "Eden Rainforest" is the largest remaining remnant of the Pullenvale Scrub; an area of Araucarian notophyll vine forest, that formerly covered a large extent of Brisbane's western suburbs. Some time ago this four hectare site was subdivided into one hectare lots. The site is of regional significance and surveys by Queensland Herbarium and University of Queensland botanists revealed over 150 species of native flora. Native Jute (*Corchorus cunninghamii*)

was considered extinct until rediscovered at this site. Three of the four current landowners have signed VCAs to protect and extend the remnant. Negotiations with the fourth landowner are currently underway. Building location envelopes have been excluded from the conservation areas. One owner chose a Higher agreement and the other two opted for General agreements at this stage. The option exists for them to upgrade later if they wish.

Native Jute (*Corchorus cunninghamii*) was considered extinct until rediscovered at the "Eden Rainforest VCA site.

Several other species listed under the *Nature Conservation Act 1992 (Qld)* are now protected on VCA sites. These include, Grease Nut (*Hernandia bivalvis*) Hairy Hazelwood (*Simplocus harroldii*) and the Powerful Owl (*Ninox strenua*).

The program has won a number of awards including the Local Government Association of Queensland Award for Environmental Management Excellence and was a finalist at the National Banksia Environmental Awards. Many local governments in Queensland and beyond have made enquiries about the program and several are in the process of implementing their own VCA programs. These include Ipswich, Gold Coast, Noosa and Maroochy in South-East Queensland and Cairns, Cardwell and Johnstone in North Queensland.

The support of community groups has contributed significantly to the program's success. Community groups were consulted and saw merit in the program, for both the environment and landowners. Several agreements have been concluded with landowners who were introduced to the program by a local community group. The Australian Trust for Conservation Volunteers has been hired by some landowners to assist with management efforts. ATCV provides a cost-effective source of labour and has also organised some working bees free of charge for VCA participants. The presence of the Conservation Zone on most properties encourages volunteers by providing some security for their efforts.

2. Land For Wildlife

Land For Wildlife (LFW) is a National voluntary program which encourages improved habitat management on private and community owned lands. It has been endorsed as best practice, cost-effective, off-park conservation by ANZECC and is also supported by WWF.

This program also operates by forming agreements with landowners. The major difference to the VCA is that a LFW agreement is not legally binding and does not affect the legal status of the property in any way. All LFW agreements automatically terminate upon sale of the property. Because there is no security for the investment of public monies on LFW properties, financial assistance is not paid to participants. Landowners do receive information, advice and training concerning ways to improve habitat quality and quantity, benefits to landowners of habitat retention, wildlife that will utilise the habitat, other forms of assistance available under other programs and so on. The quarterly LFW newsletter is provided free to participants and is a highly regarded publication. Participants also receive the trademark LFW sign to identify their property and provide community recognition.

Another difference is that entry requirements are not as strict. A property may participate in LFW if the assessing officer is satisfied:

- the property is managed in a way which pursues the enhancement of native biota or attempts to integrate conservation with other land management objectives; and
- the landowner is making an effort to provide natural habitat of significant nature conservation value.

The “no rejection” policy means that properties not meeting the criteria are admitted to the program on a “working towards registration” basis. Owners are entered onto the mailing list and receive benefits of all benefits of membership apart from the sign. In order to preserve the good reputation of the program, the property is finally registered and the sign presented when the habitat reaches the requisite standard.

LFW origins

LFW is the most important and successful “off-reserve” conservation program in Australia. It commenced as an initiative of the Bird Observers’ Club in Victoria in 1981 and was later adopted and supported by the Victorian government. The Department of Natural Resources and Environment (DNRE) now runs LFW and has over 4 500 properties registered. Most participating properties are working farms but many schools, golf courses, local government parks and even cemeteries have registered. Despite the fact that the LFW agreement is not binding, records from Victoria show that approximately 92% of properties that have ever been registered are still registered. This extraordinary level of success is even more remarkable given that registration automatically lapses whenever a property is sold.

With the benefit of guidance and support from the Victorian DNRE, State governments in Western Australia, South Australia and Tasmania have recently commenced LFW programs. A National protocol is in place to ensure consistency in service standards and other facets of program delivery.

LFW (Queensland)

In South East Queensland, a group of nine local governments including BCC received a grant from the Commonwealth's Natural Heritage Trust to implement LFW. A Steering Committee has been formed consisting of representatives from each Council. The project coordinator (Malcolm Petrie) is based at Ipswich City Council and four extension officers have recently commenced work with landowners throughout the SEQ region. An official public launch was held at a working farm in Brisbane in July and attracted considerable media attention. An application for the second year's funding is currently before the NHT assessment panel. Beaudesert Shire Council recently committed to the program bringing the number of participating Councils to 10. Other Councils will be invited to join LFW (SEQ) as the program expands through the region.

Since becoming operational approximately four months ago, LFW (SEQ) has received 196 applications. 127 properties have been assessed and 49 are already registered with another 16 currently being processed.

3. Summary

These programs are a cost-effective means by which a local government can achieve cooperation with landowners and real, onground results. By offering mechanisms ranging from the non-binding LFW, through a binding General VCA and up to a Higher VCA involving a rezoning, the Council provides options to suit the requirements of individual landowners. This versatility is reflected in the range of landowners currently participating in the programs. They include a real estate agent, a property developer, a nurse, a fashion designer, a professor of psychology, an accountant, the Christian Brothers and an engineer who was formerly employed by the United States Defence program to design, build, and install thermonuclear warheads. We are hoping that BCC's cooperative conservation programs will initiate a chain reaction of a different nature amongst the landowners of Brisbane.

Voluntary Conservation Agreements - A Landholder's Point of View

Nancy Cramond, 216 Scrub Road, Belmont, Q, 4152.

"… portions 299 and 302 containing 90 acres. A large part of this area, probably about 50 acres, has been cleared and mostly stumped, and the bulk of this cleared land, a good deal of it now overgrown with lantanas, is splendid Scrub and Stony Scrub Soil. A small watercourse, apparently supplied from Springs, runs across part of portion 302, nearly all the best land being in this block. There is an old mill building and the remains of an orchard. The remainder of the land in these two portions is stony forest. I value the 90 acres as follows:

Scrub, say about 50 acres at £50 per acre.
The balance at £20 per acre. …"

Valuer: Gilbert LANG
29 January 1889

A part of this property's Scrub Soils remain intact in the Brisbane Metropolitan area and are now subject to Conservation Zoning.

Changing family values and employment meant that what would have been repeatedly cleared for cultivation has been allowed to regenerate by default and now design since the depression years.

A Voluntary Conservation Agreement to protect this scrub in conjunction with the Brisbane City Council has been invaluable to the psychological and in some way financial support of current participating family members.

Trends promoting sale of bush for real estate pressured owners relentlessly until very recently in the 1990's when a light at the end of the tunnel was seen in the changing attitude of local government towards bushland protection and acquisition.

I will discuss briefly the economic and social realities, problems and solutions, and advantages and disadvantages, of VCA's from this urban landowner's point of view.

Voluntary Conservation Agreements - A landholder's point of view

According to notes from the herbarium, Z*ieria furfuracea* subsp. *nov*., which we have always called 'the smelly plant', was presumed extinct. It is however alive and well and if you image its smell with Hovea, Wattle Flowers, Damp Leaf Mould and Lantana you have some idea of our gully at home.

I am pleased that Geoff Edwards and Leo Ryan have explained what a VCA is, so this lets me off the hook. More information can be found on page 8 of the August 1998 issue of *Bush* magazine (Elias 1998).

Now to explain why the presentation of a VCA seemed the best direction for us to proceed. Our property is under conservation zoning and protected at the highest level currently possible under this scheme.

History

The "Stony Scrub Soils" mentioned in the preamble were logged last century and my father speaks of a large red cedar trunk now blanketed in lantana. The paddock of 45 acres that we live on contains a small remnant of dry vine scrub changing to dryer scrub of Box, Iron Bark, Tallowood and Spotted Gum on the ridge. My Grandfather is noted to have removed the larger Box and Blue Gum stumps with explosives when cultivating in the 1920's. In the depression cultivation ceased and the land was left to itself. It grew blady grass and Black Wattle and began to regenerate by default. Weeds have also grown.

Grampy planted a small slash pine forest in the 60's (about 50) as this was the fashion then but a mistake. Thankfully they did not grow well and did not spread. Mum and Dad then planted about 1000 Hoop Pines mid 1970's which have thrived. (There was still an original one in the creek as well as Flooded Gum). One year we lost half of these to the overzealous metropolitan fire brigade who simply weren't interested in protecting bush.

My parents knowledge had been gained through observation of what was there and also due to a long contact with the National Parks Association and as early members of the Society for Growing Australian Plants (SGAP). My knowledge and interest has occurred by osmosis over the years by being taken to meetings and slide shows in cold halls on hard seats and I am now well aware of the intrinsic value of our patch of the Belmont Scrubs.

Since the planting in the 1970's our main activity has been to keep fire breaks clean and sending developers packing whilst never knowing what would be a sustainable future.

In 1974 my grandfather died which meant we had considerable death duties to pay. Thankfully "Joh" decided to abolish these and when in 1977 my mother died accidentally, we at least did not lose our bush home as well.

For approximately the next 10 years or so that it took us to get our act together after these losses, the weeds continued to grow, and in recent years have proliferated in sections. I believe it was probably my Great Great Grandmother, a member of the Acclimatisation Society, who was responsible for introducing the weeds which now plague us (namely, Ochna, Cats Claw Creeper, Jacaranda and the like).

We can never underestimate the loss of an individual like Mum, who, wherever she went on her paddock ramblings, nipped out a weed here and a weed there. Since this consistent behaviour stopped, the weeds have flourished.

Our other activity since the 70's has been observation. Koalas have reappeared. Grampy said they were shot out in the 1930's but I suspect they have moved over by other land clearings. Mum never saw them. Basically our bush concerns had little direction.

In the early 1990's nibbles of interest came from the Brisbane City Council (BCC) to the effect that if we wrote to Council suggesting our interest in some sort of conservation scheme

that it may eventuate. In 1996 we signed the first VCA's in Brisbane which was still very scary because it involved a complete shift in current values, but we knew then and are sure now that it was the right thing to do. Others have since followed.

Now we have a future to look forward to, a light at the end of the tunnel, a plan emerging and plenty of work to do.

Now to discuss realities:

Economic

It is very expensive to pay the ever increasing costs of urban bushland with burgeoning adjacent property values, land taxes, etc., and putting up with developers taunts.

Work has to be flexible and Dad has had a small business at home for 30 odd years, so he could be on site, one of the reasons being fire. I have chosen casual jobs for the last 10 years mainly so I could say "I'm off" if something happened at home. Employers are not very sympathetic to people taking time off for things not involving medical certificates, so it makes work rather insecure in the current economic climate. I don't worry about this, but make it work for me. It also allows much needed brain space.

VCA effect

This offered not only public recognition but also recognised some of the costs involved and has provided some much needed funds which would otherwise not have been available to buy equipment and such like.

The VCA and conservation zoning have also significantly decreased the marketable value of the land, and because of these restrictions, have kept the land sharks and speculators away.

Social

No economic values can be separated from the social. I have had some work peers and "friends" say, "… haven't you sold that place yet? It must be worth a fortune. How much is it worth?" They aren't around for long as I have taken to using their comments as markers of their sense of value. This also affects personal relationship. It is very important to marry the right person as someone not born to the restrictions of this lifestyle can rapidly become disenchanted. It also sorts out where you stand with life, values and the universe in relation to significant others.

A property can also become an albatross, and as much as you are tied to it you need to get away and lead a balanced existence with other interests, otherwise you can become narrow and too focussed and lose perspective.

Aging and disability are important considerations as is being able to recognise individual limitations and working within these.

VCA impacts on social issues

These include an increase in publicity which I hadn't really thought about but which has generally been positive.

It stimulated local interest and we were very soon approached by Wayne Cameron and Sheryl Keates and later John Evans of the S.C.R.U.B. Group (Save Care for & Regenerate Urban Bushland). Their support has been considerable and on-going being both emotional and hands-on.

These wonderful people also have a very motivating effect and we have formed some great friendships and now have a considerable source of contacts. This has in turn given us a much more buoyant outlook for the futures.

VCA problems and solutions to date

Although we were aware to some degree what lived in our bush due to dad's knowhow and his early contacts with field trips involving S.G.A.P. and Herbarium bods, we needed to do current surveys for our own, and others', information.

Apart from the koalas, echidnas, wallabies, gliders, snakes and many birds which we knew of and which I diarise sightings of on a daily basis, my special thanks go to Glen Leiper, Dr. John Moss and other field nats., Graham McDonald, amongst others, for assisting in producing some excellent vegetation lists. We also thank the museum staff who have identified various things. Geoff Monteith has only recently done an invertebrate collection. (He found *Cephalodesmius quadridens (Armiger)* – a Dung Beetle which mates for life and raises 6 young!). We also take serial photos and I have begun a series of Botanical illustrations titled "The Fruits of Belmont Hill".

The one rare and illusive thing I cannot find is a "round tuit". If anyone has any spare please let me know.

Aging and person power restrictions

Dad is in his 80's. I am female and light bodied. My partner and I work and my brothers live off site. We have had to accept our obvious limitations and if help is offered learn to channel it into the most productive areas. I know that in the past I perhaps failed to utilise the excellent work of A.T.C.V. people due to my own lack of available energies and planning.

We do accept help from the wonderful S.C.R.U.B. volunteers who are particularly committed and consistent in their support (particularly the likes of John Evans without whom we would have achieved little).

Motivation

We often need this when it is all too much so it is very valuable to get on the phone and have a chat to some of our closest work volunteers. I have found them endlessly pleasant, approachable, and thoroughly good value.

We are also involved with the Brisbane City Council Bushcare Network and visit and work on other sites and admire other's achievements. I am particularly conscious of burnout and will continue to be aware of its pitfalls.

Weeds

These are the stuff of nightmares! (and I have had many). I also acknowledge openly to all in the room who can help that particularly Cat's Claw Creeper is getting out of control and that we need all the help we can get. Otherwise we will have the first VCA in the southern hemisphere protecting it.

Dad has taken weeds and experimentation on in a big way. He has invented various Heath Robinson type gadgets of varying success including terminator, which I don't get on with for multiple reasons and his excellent lantana levers which are much lighter and user friendly.

Fences

We need to stop invasion from outside, particularly by 4WD drivers and trail bikers, so we need to tap into the City Council's overall management plan of the whole area.

Fires

This is a similar case with fires. BCC now has an excellent bush fire fighting unit who have been most cooperative with us. Glyphosate is a boon and much more user friendly that shovels and rakes when keeping fire breaks open. VCA funds have helped to pay for it and for better equipment.

I also have to consider whether to mosaic burn or not, and my preference is not to.

Balance

I continue to try to balance work, play and bush care, sometimes less than successfully. The VCA has forced me to become involved in a local bush care group of which I am President, the Group being formed due to the rapid and often inappropriate clearing of nearby scrub. External worries about what is going to be destroyed next is a constant drain on both my time and emotional resources.

I cannot separate myself from these concerns as our area is part of a catchment for a tributary of Bulimba Creek which also involves these other areas.

Finance

VCA assistance is essential but my concerns are for on-going support in the future and the long term remains something of a mystery with work and possible funding.

Summary

There are distinct advantages and disadvantages to a VCA. Most advantages have been the incredible recognition and subsequent support locally and generally. No longer need we feel so isolated in an area which is characterised by grinding dozers, plastic lawns, and wall to wall property value groupies.

The networking is colossal and we have been able to provide various overseas visitors with their only glimpse of a koala in the wild and some very big trees. This also applies to some local Brisbaneites. It gives us hope and an answer or other option to our wildest dreams. Disadvantages relate to increased popularity and an increased involvement which reduces our time on pressing property issues.

Conclusion

We are an island no longer in the human networking sense but I urge Council to keep up those catchment links and take our catchment worries away or very soon we will be a bushland zoo. For me this was absolutely the right thing to do and a natural progression for our property.

Thank you.

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Private Landholder Conservation in the Helidon Hills

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The Sustainable Management of the Helidon Hills Project is a Local Government initiative that is seeking to protect one of South-East Queensland's largest and most significant bushland areas. The Helidon Hills has very high nature conservation, cultural heritage, and scenic values, yet is being negatively impacted by economic activities such as Helidon Sandstone mining and timber harvesting, and also by a range of infrastructure related activities. The project has pioneered a different approach to nature conservation on private land - an approach where the aspirations of private landholders can be met at the same time as nature conservation objectives. This has been achieved by giving landholders a valid and genuine involvement in the process from day one, and by the development of innovative solutions including new ecologically and economically sustainable rural enterprises and a proposed Vegetation Management Trust.

Introduction

The area known as the Helidon Hills is a large contiguous geological and ecological unit of land located stretching accross the north of the Lockyer Valley, approximately 100 kilometres west of Brisbane. Covering 33,500 ha (335 km^2), 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, and also has a small area of leasehold land.

The predominant underlying geology is Helidon Sandstone, which is exposed over much of the area. It has formed a steep and rugged upland landscape of dissected hills, gorges, clifflines, and waterfalls, scenery that is not unlike more well known Central Queensland sandstone areas such as Carnarvon Gorge and Blackdown Tableland. A transect from the south to the north of the Helidon Hills sees a progressive increase in altitude from the fertile lowland alluvial creek flats of Lockyer Creek and its tributaries, though the upland Helidon Sandstones, to the top of the adjoining Great Dividing Range. The volcanic soils of the Great Dividing Range extend into the Helidon Sandstone in the northern part of the Helidon Hills, and there are also small outcrops of basalt, granite, rhyolite andesite and fine textured sediments within the Helidon Sandstone.

The Helidon Hills is mostly continuous native bushland, and is one of only a few large bushland areas left in South-East Queensland. Eucalypt forest and woodland is the dominant vegetation community, with gully rainforest in sheltered spring fed creeks and gully lines. A large number of rare and threatened flora and fauna species are present, with most of the threatened flora species found in the diverse shrubby understorey that extends through much of the area. The area also has high cultural heritage significance, with a comparatively large number of Aboriginal and European heritage sites present.

Competing against these natural and cultural values are a range of impacting land uses. The dominant economic pursuits in the area are Helidon Sandstone mining, timber harvesting, explosives manufacture, and farming. There are also infrastructure-related impacts, including a high-voltage powerline easement, an existing gas pipeline and another soon to be constructed, the proposed realignment of the main western railway line, and the extraction of gravel for use on roads.

Helidon Sandstone has been mined for over 100 years, and has been used to construct some of Queensland's finest historic and contemporary buildings. In recent times, new overseas export markets have provided a significant boost to the Helidon Sandstone mining industry, which now employs over 100 people.

Timber harvesting has also been carried out for over 100 years but, unlike the Helidon Sandstone industry, has declined significantly in this time. Numerous sawmills once dotted the area and much of the freehold land was owned by timber companies, but timber has been harvested at a much faster rate than it could regrow in the shallow, infertile soils over the Helidon Sandstone. This has seen the number of mills decline and the timber companies sell off most of their once extensive land holdings. However, the timber industry still has a strong interest in the northern part of the Helidon Hills, where better soils and higher rainfall support areas of the sought after mill timber blackbutt (*Eucalyptus pilularis*), which is regrowing at a fast enough rate for harvesting to be economically viable.

The Helidon Explosives Magazine, established as a wartime munitions repository, is one of the largest such storage facilities in Australia. Its presence has attracted two explosives factories and a fireworks factory.

Because of the shallow, infertile soils through much of the area, farming activities are limited and vegetation clearance has thus been minimal. The exceptions are very light cattle grazing throughout the area, fruit growing and cattle grazing on the fertile lowland creek flats, and cattle grazing on volcanic soil outliers in the higher altitudes.

Recognising the very high significance of the Helidon Hills and the many threats to the area, Gatton Shire Council worked with its regional Local Government organisation, WESROC (Western Subregional Organisation of Councils) to secure Natural Heritage Trust (NHT) funding to carry out a sustainable management project.

Creating a sustainable future for the Helidon Hills

How can we create a sustainable future for the Helidon Hills? Dr. Peter Ellyard, a keynote speaker at the 1997 Queensland Landcare Conference, alerts to the inadequacy of current approaches to sustainability (Landcare Queensland, 1997):

> To me a sustainable society is one where everything works forever. Now, we're a fair way from that, but that's not a bad option to have. Let's imagine how we can make things so they'll work for longer and longer and ultimately forever. To do that, you see, most people work in the manager's way, they try to stop unsustainability, they try to do something which makes it less unsustainable. See the difference? That's what I call the problem centred manager's view. Designing towards sustainability is different. It's like

> thinking about health care. Health care is actually a euphemism for what I call the illth industry. It's not about health, it's about the treatment of illness, with doctors and hospitals and pharmacies and nurses, is it not? And that's what I call the problem centred approach to health, which takes 96.4% of our, quote, "health budget" which is about illth. The journey towards health is about nutrition, stress management, exercise, good relationships and a pollution free environment. It's got nothing to do with doctors and that gets a piddling small amount, and if you happen to be a health bureaucrat in Australia - and they're all managers - and you have two proposals on your desk, one for a set of CAT scanners in the hospitals and one for a nutrition programs in the schools, which will get funded in Australia?

The Commonwealth Government Industry Commission agrees that our approach has been to manage unsustainability rather than create sustainability (Industry Commission, 1997):

> The central problem is that Australian governments have yet to put in place a comprehensive, integrated and far-sighted way of promoting the ecologically sustainable management of natural resources in agriculture. On top of this, there are flaws in the design and execution of what has been done.
>
> The first response has been to **regulate the resource owners or managers**. Unfortunately, much of this regulation has been ad hoc and too frequently the only response. The number of rules is large and growing, while the design of many is flawed - they prescribe the means to be used rather than the objectives to be achieved. Generally the design of the rules has had only limited input from those that have to work with them.

The Sustainable Management of the Helidon Hills Project could have taken the typical "problem-centred managers view", and just sought to develop regulations for the management of competing land uses in an attempt to make these land-uses "less unsustainable". The Project has, however, been very different. The National Research and Development Program on Rehabilitation, Management and Conservation of Remnant Vegetation supports the view that simple regulations will not be effective (Binning & Young, 1997):

> The degradation of ecosystems processes in the agricultural zone is the result of a particular suite of ecological, economic, social and institutional circumstances. These must be understood before effective policies and programs to combat degradation can be established.

The Helidon Hills has a fragile and highly significant ecology. If this is not properly understood then incorrect decisions will be made with potentially devastating consequences. A large number of the area's native plants and animals are already on their way to extinction.

Two-thirds of the Helidon Hills is in private ownership, with the economic and social circumstances of the many private landholders directly affecting their land management decisions. As well as landholders, the livelihoods of others in the broader community are also derived from economic activities in the Helidon Hills. If these social and economic circumstances are not properly understood, then people could have their lives wrecked by the loss of their livelihood or the tearing apart of their social networks. And their economic

hardship could also force them to destroy natural areas that they had in fact been wanting to save.

The issues facing the Helidon Hills fall into the areas of responsibility and interest of a myriad of government bodies and non-government organisations. These complex institutional circumstances must be understood if effective and cooperative decision-making is to be achieved.

In order to properly understand the suite of ecological, economic, social and institutional circumstances of the Helidon Hills, the WESROC Sustainable Management of the Helidon Hills Project has:

- Adopted a non-prescriptive approach to management planning, which has allowed the full range of issues to be identified and provided the latitude for the creation of innovative solutions.
- Sought to give landholders and the community genuine involvement from day one through extensive public consultation, involving public meetings, newsletters with "Have Your Say" feedback forms, and personal meetings with as many landholders and community groups and individuals as possible.
- Moved towards giving landholders and the community ownership of project outcomes.
- Created innovative and cooperative win-win solutions to the complex and competing issues, rather than playing one side of an issue off against the other in a win-lose battle.
- Identified information gaps and needs gaps, and is working with government bodies and non-government organisations to fill these gaps.

The results of this approach are very different. Unlike typical management plans, the Helidon Hills Management Plan is not full of regulations and pre-conceived decisions. Rather, it provides a framework and ongoing process for achieving sustainable management that is sensitive to the diverse circumstances of the area.

Landholders' rights

When the project was originally conceived, "Landholders' rights" was not identified as an issue that would need to be addressed. However, it was very strongly expressed through the public consultation. Serious rural economic decline, frustration over loss of services, and anger against decision making that has no regard for the economic and social circumstances of landholders means that the issue of landholders' rights must become part of the planning for not only the Helidon Hills, but also most of the rest of rural and regional Australia.

The Commonwealth Industry Commission finds (Industry Commission, 1997):

> Many environmental problems are due to conflicts between individuals about what they see as their rights. Some landholders feel they have the right to clear their land as and when they see fit. Those who live downstream feel they have a right to potable water. If enough landholders clear their land, they lower the quality of water in the lower catchment.
>
> The fact that the legal basis of some of these rights may be debatable does not change the underlying issue. Regardless of whether the rights have any basis in law, the

economic, environmental and social conflicts are very real. One of the roles of government is to help resolve such conflicts in socially advantageous ways.

In typical management planning exercises, government bodies will get involved in a heated philosophical debate with landholders about whether or not the landholders have various rights. This win-lose approach is, to say the least, counter productive. If the conservation of a private property results in a landholder losing their livelihood, then for the landholder there is a very real conflict between conservation on the one hand and economic stability on the other, regardless of whether the landholder has any legal "right" to make an income from their property.

Rather than engage in unproductive battles with landholders, governments have a responsibility to resolve the conflicts between environmental protection and the economic and social needs of landholders 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. Such innovation has been the foundation of the WESROC Sustainable Management of the Helidon Hills project, evidenced by the proposed conservation measures and proposed development of new ecologically and economically sustainable enterprises.

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. The future success of the project will depend on being able to progress landholder ownership to the point where landholders are given the greatest possible responsibility for the implementation of project actions. This is being achieved during 1999 through:

- The establishment of a landholder-based management body.
- Landholder-based working groups dealing with specific issues.
- Facilitating a rapid transition of project control from WESROC to the landholders' group.

Nature conservation values

The Helidon Hills is recognised as an area of very high nature conservation significance:

- The Helidon Hills is one of the largest areas of mostly continuous bushland left in South-East Queensland.
- Variations in topography and geology within the Helidon Hills have contributed to the presence of a great diversity of Eucalypt forest communities.
- The Helidon Hills has a distinctive flora and a high diversity, with over 300 vascular plant species present.
- A large number of rare and threatened flora and fauna species are present in the Helidon Hills (species listed on, or pending listing on, the *Queensland Nature Conservation Act 1992*).
- The Helidon Hills through to Crows Nest area has a high level of endemism, that is, a large number of species that are found only in this area.
- A large number of flora species normally found in coastal sandstone and Wallum vegetation communities and a large number of flora species normally found in sandstone vegetation communities further inland are present in the Helidon Hills.

The natural values of the Helidon Hills area have attracted interest for over 100 years. In 1887 the well known botanist F. M. Bailey led a walk to the Helidon waterfalls. A fascinating account of the journey by one of the participants describes the lush vegetation below one of the falls (Toowoomba Field Naturalists Club Inc., 1987):

> Following the narrow track by the creek, the gully widened into an oval basin, over the distant edge of which the water fell in a clear, narrow stream, breaking into drops on the rocky pool below. The ledge over which the water falls is 50-60 ft. high, but the cliffs hemming in the creek are at least 100 ft. higher. The rocks are soft, friable, sandy shale, splitting into layers, and showing numerous impressions of fossil leaves. The rock is cut away below by the spray, and it is possible to walk under the fall, protected [by] the overhanging ridge. An abundance of moisture has carpeted the face of the cliff with beautiful and delicate ferns and mosses…Among the mosses was the rare and lately-named *Distichophyllum baileyanum*. Surrounding the pool were clumps of the graceful palm *Ptychosperma cunninghamii*…

Rare and threatened species include the endangered Red Goshawk *Erythrotriorchis radiatus*, Australia's rarest bird of prey. Several plant species are found only in the Helidon Hills and nearby areas. *Paspalidium grandispiculatum*, which is a tall grass, is only found in the Helidon Hills. *Grevillea quadricauda* is found only in the Helidon Hills and at nearby Flagstone Creek. *Phebalium obtusifolium* and *Eucalyptus taurina* are found only in the Helidon Hills and at Crows Nest. *Caustis blakei* subsp. *macrantha* is found only in the Helidon Hills and at Perseverance Dam. A newly identified species, *Bertya* sp. (Helidon Hills G. Leiper AQ 457013), is only found in the Helidon Hills.

One species originally found in the Helidon Hills has already become extinct. This is the Paradise Parrot, which was originally recorded from Paradise Creek in the White Mountain State Forest (SF 564).

The nature conservation values of the Helidon Hills area are now widely recognised. The South-East Queensland Regional Framework for Growth Management (RFGM) has recommended that a new National Park be established in the Helidon Hills, and that an enlarged National Park be investigated at Ravensbourne on the northern edge of the Helidon Hills (Department of Local Government and Planning, 1998). The Gatton Shire Planning Scheme also recognises the need to protect the natural values of the area.

Nature conservation on private land

Approximately two-thirds of the Helidon Hills is private freehold land. The traditional way of achieving nature conservation on private land has been to acquire the land through purchase, and then gazette it as a National Park or Conservation Park. However, this approach presents several problems:

- Acquisition is very expensive. The cost of acquiring the more than 21171 ha of private freehold land in the Helidon Hills would be at least $30 million.
- Long-term management becomes an added burden to already inadequately resourced government agencies. Existing conservation reserves in the Lockyer Valley, although only small in area compared to the overall area of high conservation value land in the Lockyer, are already undermanaged. For example, the Dwyer's Scrub Conservation Park,

where the endangered vineforest vegetation community has become infested with the exotic weed madeira vine (*Anredera cordifolia*).

- When freehold land is purchased and gazetted as National Park or Conservation Park, Local Government rates can no longer be levied on the property, but services such as roads still need to be provided. The Local Government that covers most of the Helidon Hills area, Gatton Shire Council, has a relatively large area of significant remnant bushland. If even a small proportion of bushland was acquired for reserve purposes there would be a significant loss of rates for Council but still a requirement to maintain access roads and other services to these areas. This would put an unfair burden on the remaining ratepayers in the Shire, who would face either rate rises or a reduction in services.

Aside from these problems, many landholders would not want to sell their properties anyway. The views expressed through the public consultation show that landholders overwhelmingly value the natural attributes of the Helidon Hills, and want steps taken to protect those attributes. Just as strongly evident has been a desire by landholders to retain ownership of their land. Three main reasons for this have been found:

- The properties of many of the longer term landholders have been in the same family for several generations, meaning that the property has become an important part of the family heritage and thus an important part of the heritage of the whole area.
- Many of the newer landholders have purchased their property with the specific intention of securing and protecting land with nature conservation values. There are a large number of these landholders in the area, primarily as a result of timber companies selling off their once extensive land holdings.
- Many landholders need to derive their livelihood from economic pursuits on their properties. This applies to both the longer term and newer landholders.

Any plans for private land acquisition in the area would be likely to result in a community backlash, an added burden to already stretched government agencies, and the loss of people who are already willingly conserving the natural values of their properties.

A much more workable and cost effective way of achieving conservation on private land is to keep the existing private landholders, and:

- Assist them to establish new ecologically and economically sustainable economic pursuits on their properties, or assist them to carry out existing pursuits sustainably.
- Enter into management agreements with them, whereby financial and/or material assistance is provided in return for conservation.

This is the “win-win” approach, with benefits for both conservation and the landholder and the community.

As well as strong interest in the sustainable management of existing economic pursuits - grazing, timber harvesting, fruit growing, and sandstone mining - the project consultation revealed a very strong landholder interest in the development of new ecologically and economically sustainable economic pursuits:

- Environmental tourism, capitalising on the very high scenic values of the Helidon Hills and the close proximity to large population centres.
- Cultivation of Helidon Hills native flora, capitalising in particular on the spectacular range of native wildflower and foliage plants.

Environmental tourism

There is currently very little tourism development in the Helidon Hills, the single exception being a privately operated campground at Murphy's Creek on the western side of the area. The campground backs on to SF 564 White Mountain, which has large areas of spectacular wildflower understorey. The Helidon Hills is also used for some recreational activities such as bird-watching, wildflower walks, bushwalking, horse-riding, rock climbing and orienteering. However, participation in these activities tends to be restricted to those attached to clubs and others "in the know".

The Helidon Hills is in an area with significant potential for further development. It is close to the major urban areas of South-East Queensland, and offers unique experiences in terms of flora and fauna, landforms, and heritage. It has impressive gorges, clifflines, waterfalls, and views, scenery that is not unlike more well known Central Queensland sandstone areas such as Carnarvon Gorge and Blackdown Tableland.

Several landholders are strongy interested in capitalising on the natural values of their properties through the establishment of tourism enterprises. However, there was an overwhelming view expressed through the public consultation that development be low impact in terms of the natural and social environments. This indicates that the most appropriate form of tourism for the Helidon Hills would be ecotourism. Tourism is the fastest growing sector of the Australian economy, and ecotourism is the fastest growing component of tourism. Ecotourism also returns more to local economies than many other forms of tourism, with recent research showing that most visitors are tertiary educated professionals with incomes in excess of $60,000 per year, and that 79% of visitors have an average spend-per-day of more than $100. Ecotourism also has an extremely low impact on the natural and social environment.

A significant impediment landholders interested in ecotourism face is the up-front cost associated with ecotourism as opposed to traditional land-uses such as grazing and timber harvesting. Landholders who want to engage in grazing or timber harvesting can generally go right ahead and do it. However, a landholder wanting to engage in ecotourism is confronted not only with infrastructure costs but also with an approval process involving the costs of application fees, an EIS, a management plan, and probably more. These extra costs add up to an impediment of around $5,000 to $10,000.

Other impediments include a public perception of the Lockyer Valley as an agricultural area rather than an area with large tracts of scenic bushland, and the lack of National Parks in the area which acts as drawcards for visitors seeking environmental experiences. An Environmental Tourism Working Group has been formed to advance the development of ecotourism in the area, including solutions to these and other impediments, with the group to shortly seek funding to prepare an environmental tourism strategy. Strong interest from other parts of the Lockyer Valley has seen the group extend to a whole-of-Lockyer focus.

Native plant enterprises

Jean McRuvie, formerly of the Queensland Department of Primary Industries, relates an article from the financial review (Rural Industries Research and Development Corporation, 1997):

> On the 3rd April 1996, the Financial Review published an article looking at the success that farmers were achieving in less traditional agriculture compared with the problems being experienced in most farming industries. The article pointed out that these industries are still in the minority but their success is likely to have a major impact on the whole of the agricultural industry.
>
> *…success stories of new farmers who are adopting new methods and enjoying high returns from less traditional agriculture such as aquaculture, horticulture - particularly fruit and vegetables - and cut flowers…*
>
> The article also pointed out that these new industries are vital if Australian agriculture is going to survive.

This project has revealed strong landholder support for the establishment of new ecologically and economically sustainable farming enterprises that capitalise on the native flora of the Helidon Hills, in particular the impressive native wildflowers and native foliage.

Australian native flowers and foliage were once extensively harvested from the bush, but a transition to cultivation is now occurring because bush harvesting produces an inferior quality product as well as having a negative environmental impact. Native wildflowers, in particular riceflowers, Geraldton wax, and kangaroo paw, are already being successfully commercially grown as cut flower crops in the Lockyer Valley. Within the Helidon Hills, there are areas of previously cleared land that could be used for the growing of income-producing local native plant crops. Similarly, there are large cleared areas in other upland parts of the Lockyer, with farmers keen to move from the poor economic returns of grazing on their relatively small properties to alternative enterprises such as native wildflowers.

Jean McRuvie points out that export native flowers can offer far greater income potential than some traditional agricultural export (Rural Industries Research and Development Corporation, 1997):

> The industry also suffers from a poor profile, being seen as a 'hobby' type industry and not an industry to be taken seriously like grain or cattle. In this regard an interesting statistic that should be taken into account is that:
>
> '*THE JAPANESE SPEND MORE ON FLOWERS THAN THEY DO ON BEEF*' (Jeff Moon, Queensland Horticultural Export Council, July 1995).

The growing of Australian native flowers offers significant economic opportunities, but Australians have been surprisingly slow to recognise these opportunities and capitalise on them. Other countries have been much quicker to recognise the potential of our native flora

than we have. For example, Israel now exports four times the value of Australian native cut flowers as Australia.

The Helidon Hills and other areas within the Lockyer Valley feature a spectacular array of native wildflower plants, foliage plants, and essential oil plants. Many of these plants have commercial potential and could be used to create new income and employment generating industries in an economically depressed area. The primary obstacle to realising this potential is the lack of funding availability for "up-front" research. In Australia, funding is typically only made available after private individuals have brought species into cultivation through their own considerable efforts and expense. Australia makes little or no funding available for the exploration and domestication stages, whereas Israel actually funds teams of people to go out and find suitable species and bring them into cultivation. This is why countries such as Israel have stolen the lead on Australia.

A Native Plant Enterprises Working Group has been formed, and is developing and advancing solutions to the funding issue. As was the case with the Environmental Tourism Working Group, interest from other parts of the Lockyer Valley has seen the Native Plant Enterprises Working Group expand to a whole of Lockyer focus.

Incentive-based conservation

Incentive-based conservation programs that that benefit both conservation and the needs of landholders and the community have been underway in other states for some time, and in the past few years programs have also commenced in Queensland, including several in South-East Queensland. Brisbane City Council assists landholders to manage natural vegetation through its Voluntary Conservation Agreement (VCA) scheme. In return for landholders entering into the agreement, the landholders receive direct financial assistance of up to $1,500 per year. In Logan City, landholders who have their land rezoned to the Residential Conservation Zone receive benefits including a rates concession of up to 50%. Cooloola Shire Council offers rate rebates of up to $1,000 per year for land that is protected through a Conservation Agreement with Council.

In South Australia, rate relief and compensation are given to landholders in return for entering into "Heritage Agreements". The compensation is for the economic opportunities that the landholder foregoes by permanently setting aside an area for conservation. Australia's longest running cooperative conservation programs have been run by the Victorian "Trust for Nature", which was established in 1972. Programs run by the Victorian Trust for Nature include "Land for Wildlife", a very successful program initiated in 1981 to establish non-binding voluntary agreements with landholders to provide wildlife habitat on their properties, and the "Land Protection Incentive Scheme", which provides financial support to individual landholders to undertake work on land and soil degradation. The Trust for Nature receives government funding and also substantial funding from donations and bequests.

It is possible for Councils like Brisbane, Logan, and Cooloola to provide rate rebates and financial assistance because they have large numbers of ratepayers compared with relatively small areas of remnant vegetation. However, for the Councils in the Helidon Hills project area, the situation is the reverse. It would be very difficult for Councils like Gatton or Esk to provide rate rebates to some landholders without placing an undue strain on other ratepayers.

Additionally, the social and economic circumstances of landholders vary dramatically across South-East Queensland. A rate rebate and further subdivision concessions might be of benefit to landholders in a predominantly urban area such as Logan, where most landholders will not be trying to make an income from their properties, and those few that are trying to make an income will be typically wanting to do it through subdivision. However, many landholders in the Helidon Hills derive, or will derive, their livelihoods directly from economic pursuits on their properties. Rate rebates in return for conservation will help, but a simple rate rebate alone is unlikely to be given even vague consideration by a landholder who is earning their primary income from, for example, timber harvesting.

A solution lies in Policy Opportunity No. 8 in the Environment Australia publication *Motivating People: Using Management Agreements to Conserve Remnant Vegetation*, which recommends the establishment of Vegetation Management Trusts with large once-off funding allocations (Binning & Young, 1997). Copies of *Motivating People: Using Management Agreements to Conserve Remnant Vegetation* can be obtained from the Environment Australia Biodiversity Group, phone 02 6274 1111. A Vegetation Management Trust for the Helidon Hills should provide:

- Financial assistance to establish new ecologically and economically sustainable enterprises or to implement the sustainable management of existing pursuits.
- Direct compensation for any loss of income or potential loss of income caused by setting aside areas for conservation (as is done in South Australia).
- Rate rebates and/or assistance with the costs of managing for conservation (for example, assistance to control weeds and feral animals).
- Payments to landholders to manage areas of nearby public land, such as the two Helidon Hills State Forests.

A Natural Heritage Trust (NHT) funding application has been submitted for the establishment of a Vegetation Management Trust, to be titled the "Helidon Hills Landcape Trust", and other funding possibilities for the trust are also being pursued. The bottom line is that, unless some way can be found to provide effective long-term assistance to landholders, nature conservation objectives for the Helidon Hills will not be met. The Trust could be expanded to cover all of the area administered by the small rural South-East Queensland Councils of Gatton, Laidley, Esk, Boonah and Kilcoy.

Despite most landholders in the Helidon Hills wanting to retain ownership of their land, there are currently some properties listed for sale, and others will no doubt be listed for sale from time to time. Instead of purchasing these properties for reserve purposes, consideration should be given to establishing a "revolving fund" under a Vegetation Management Trust. Revolving Funds are another of the policy options described in *Motivating People: Using Management Agreements to Conserve Remnant Vegetation.* The revolving fund would be used for the purchase of key properties, the placement of conservation agreements on them, and then subsequent resale to a committed landholder. The number of landholders who have purchased land in the Helidon Hills area because they want to own land with conservation values shows that there would be a ready market for the resale of the properties. Because properties are bought and then resold, only a small amount of funding is required to establish the fund.

Conclusion

The WESROC Sustainable Management of the Helidon Hills project has pioneered a different approach to nature conservation on private land - an approach where the aspirations of private landholders can be met at the same time as nature conservation objectives. This can only be achieved by giving landholders a valid and genuine involvement in the process from day one.

The project also highlights the need for government attention to be focussed on:

- Overcoming impediments to the development of new ecologically and economically sustainable rural enterprises such as ecotourism and native wildflowers.
- The development of conservation incentive programs that take into account the low financial capacity of rural Councils and account for the income needs of rural landholders and the others in the community that derive their income from economic activities on private land in rural areas.

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Appendix A
Workshop Summary

Workshop Summary

Rather than the typical approach of concluding a conference with resolutions put forward by individuals that are then voted on by by all participants, *Rainforest Recovery for the New Millennium* was instead concluded with a series of workshops. Participants debated and discussed the rainforest conservation issues, problems and solutions that had been presented to them over the previous three days. The workshop groups then developed actions and identified who should be responsible for advancing them, including what conference participants themselves could do.

The workshop approach was consistent with the overall approach of the conference, which recognised that conservation success will only come from collabaration and cooperation between landholders, government bodies, scientists, and Landcare and conservation groups.

The actions advanced by the workshop groups are as listed below. The actions were endorsed by conference participants.

Group A	
Actions for Conference Participants	• Formation of a network/advisory group relating to rainforest recovery issues in South-East Queensland. • The creation of a network policy to target the media, through regular newsletters and press releases to television, radio and newspapers to raise public environmental awareness. • Promotion of the 'stewardship' concept of land and the encouragement of active participation of Traditional Owners in land management. • Encouragement of individuals to undertake training to raise levels of personal knowledge to attain some certification of accreditaion in rainforest regeneration.
Actions for State Government	• Legislation to declare madeira vine and cats claw creeper noxious weeds. • An immediate moratorium on clearing of rainforest remnants on private land and road reserves, incorporating incentive and legislative based strategies. • Integrated fire management planning between Local and State Government departments to protect rainforest remnants. • The establishment of a coordinated scientific definition of rainforest classification for purposes of management and forestry activities. • Development of an environmental curriculum for all levels of schooling.

Actions for Federal Government	• Support for new program for biological control of cats claw and madeira vine as the only permanent, clean method to manage these weeds. • Establishment of an environmental levy based on 1% of National gambling to support environmental policies and funding of research and community based projects. • Increased Commonwealth funding for research into rainforest invertebrates. • Federal development of a National human population policy to specifically reduce threats to rainforest ecosystems and biodiversity as a whole. • Recognition by Federal Government to accept that the duration of environmental projects be extended from three years to up to five years.

Group B	
Actions for Conference Participants	• Compile a network of environmental contacts (government, NGO, special interest including traditional owners, law) local and outside. • Talk to at least one person per day. • Speak up on contentious issues - silence is tacit approval. • Adopt a plot/remnant. • Lobby Local Government - remnants, weeds, species lists, covenants, bylaws, tree giveaways. • Offer services to schools, Scouts, community groups etc. • Measures to protect rainforest from fire. • Engage with environmental groups e.g. Landcare and coordinate work with catchment plans. • Organise topic meetings for interested people/agencies to resolve on-ground issues. • Run training workshops in sociology for groups and methods of establishment. • Adopt a landscape approach in planting and problem control e.g. from top of catchment.
Actions for Local and State Governments	• List environmental weed. • Tax incentives, grants. • Simplify process on grants, Nature Conservation Agreements. More public awareness of grants. • Tree clearing guidelines with moratorium until guidelines established. With flexibility. • Modification of Conservation Act to allow controlled collection and propagation of plants in National Parks and rare and threateneds (not for commercial use).

Actions for Federal Government	• List environmental weeds. • Tax rebates for environmental work, keeping forests. • Simplify grants e.g. NHT and greater public awareness. • Supply recurrent jobs to environmental areas. • All rainforest clearing to be banned with compensation in National interest.

Group C	
Actions for Conference Participants	• Image of 'Green' improved. • Media management training. • Establishment of a website/noticeboard re rainforest conservation with contacts and works being undertaken. • Establishment of industry association (Australian Environment Industry Association?) (possible colours green and gold) to more effectively target businesses and community and to appear less alternative to encourage the wider community to relate and participate in (embrace?) the changes to philosophy and lifestyle re conservation. This association could act as an interchange for information/contacts and to provide assistance to Landcare groups such as in filling out funding applications, and to interact with Cattleman's Union and Farmers Federation. • Language change (Green out). • Encourage 'weedbusters' - promote and strengthen. • Hold 'weedathon' – sponsor schoolkids for garbage bag of weeds, $X per weed. Weedathon sites on particular day to be Landcare/regen sites (as appropriate) with children allotted a prescribed area and weed to pull/remove. • Appropriate plantings encouraged - re RTA – Dept. Main roads revegetation projects of council rates giveaways. • Use positive direction of existing farmer knowledge as info exchange. • Build up trust with farmers. • Media campaign re weeds - Gardening Australia and gardening magazines. • Open 'Regen Trail' like antique trail.
Actions for State Government	• Ecological program to become part of standard curriculum (including regular field trips). • Adopt a scrub program. • Establish a State environmental weed list with regional sublist, which is to be dispalyed in nurseries for public view. Through Qld. Nurseryman's Association. Contravention of (ie selling of listed weeds) means de-accreditation.

Actions for State and Federal Governments	• Ongoing funding for research (not project based or finite time period based) for: ∗ Weeds - vines, canopy weeds, groundcovers. ∗ Propagation. ∗ Rainforest ecology. ∗ Threatened species. ∗ Rainforest processes. ∗ Sociological/human impact. • Incentives: ∗ To landholders. ∗ VCA/Rate relief. ∗ Tax concessions for weed removal.

Group D	
Actions for Local Government	• Formation of regional coordinating body using existing infrastructure (e.g. Local Government) to address and prioritise regional/local issues: ∗ Formalise networks. ∗ Coordinate on-ground works. ∗ Provide annual report to Local Government. ∗ Provide central information centre. • Compulsory tourism levy to fund an Environmental Trust Fund. • Continued funding of environmental education centres. • Long-term commitments to strategic plans (amendment following group discussion).
Actions for Local and State Governments	• Developer contributions to fund environmental reserves/ works to be included in the IPA legislation. • High level accreditation required for ecotourism operators for access to public lands (e.g. National Parks, State Forests, etc).
Actions for State Government	• Legislative change for land tax relief and covenants. • Legislation to prevent tree clearing of 'rare and threatened' species across tenures.
Actions for State and Federal Governments	• Ongoing project funding for environmental works subject to past performance.
Other Actions	1. Environmental weeds: • Prioritising weeds regionally, determining most weed threatened areas - as a basis for a plan of action. Use this for NHT instead of National Weed Strategy priorities. • Only allocate $ to projects that have long-term follow-up actions to prevent re-invasion. • Utilise public works programs to achieve weed control priorities, e.g. work-for-the-dole etc. • Require a secure research program to determine

	solutions for effective long-term weed control. • Draft a letter regarding environmental weeds to the Qld. nurserymen's and landscapers associations and the local authority (re to include in pest management plan). • Rod Welford to request DPI to tighten controls on introduced plant material. • Improve control for plant importations. 2. Encouraging appropriate land use: • DPI and DNR to investigate alternatives to industrial farming and promote success stories. • 'Nature conservation' to be recognised as a legitimate land use: ∗ Tax deductions to be available for expenditure on nature conservation. ∗ Land under nature conservation to be land tax exempt. ∗ Purchases for nature conservation work to be sales tax exempt. ∗ All above to be conditional on covenanted land. • Local Government should introduce incentives to landholders undertaking long-term protection of priority remnant vegetation. 3. Education: • WWF to approach celebrities re production of TV segments on rainforest conservation and related issues. • TV campaign for general public: ∗ 'Wanted' campaign. ∗ AIDS - type campaign. ∗ Using 'soaps'. • This sector to offer education in nature conservation issues to: ∗ Councillors. ∗ Engineers. ∗ Landscape architects. ∗ Politicians. • Networking via website. 4. Integrate Commonwealth and State rare and threatened classifications. Commonwealth register to list 'regional endangerment' (in addition to National endangerment). 5. Immediately include threatened Regional Ecosystems on Commonwealth listing.

Group E	
Actions for Conference Participants	• Self education e.g. weeds, legislation, local expertise. • Community education - festivals, nature trails, not-to-plant list and nursery cooperation, media. • Participation in local organised environmental awareness days. • Develop win/win cooperative approach to community relationships. • Networking of volunteers and VCA holders and like minds. • Develop networks/relationships with Councils regarding vegetation management e.g. roadsides.
Actions for State Government	Priority actions (starting with highest priority): 1. WWF to be funded for SEQ rainforest project - local networking of key rainforest people. 2. Fund research into biological control of madeira vine and cats claw. 3. Abolish market value for transfer of land between departments. 4. Fund permanent SWEEP teams. 5. RFA (Regional Forest Agreements and policies) - more community feedback. Other actions: • DNR to be able to use volunteers. • Quarantine laws to limit exotic plants. • Regionalise research. • Lobby DEH to monitor sale of rare and threatened plants. • Vegetation protection in IPA to be strictly monitored. • Research new potential economic products from rainforests.
Actions for Federal Government	• Simplify NHT funding process (forms) (Email?). • Utilize endangered ecosystems as a conservation strategy. • Continue reform of environmental legislation. • Be more responsible by lowering greenhouse gas emissions.

Additional recommendation: When considering invasive weeds as one of the most serious threats to Australian fauna and flora, all parties attending the conference recognise that biological control offers the only safe long-term strategy for weed management. Moreover, this meeting which includes scientists and community memebers, recommends that two exotic weeds, the madeira vine (*Anredera cordifolia*) and cats claw (*Macfadyena unguis-cati*) be priortised as targets for biological control and that all means be pursued by the Minister to support this work. (Recommendation was endorsed by vote of conference participants).

Appendix B
Conference Participants

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