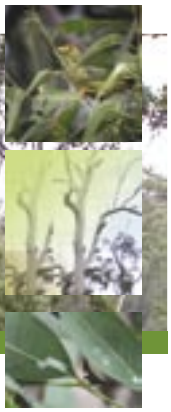
Bell miner Associated Dieback National Forum



Proceedings

Southern Cross University, Lismore, Australia
30 March to 1 April 2005

Natural Heritage Trust

FORESTS NSW

NORTH EAST FOREST ALLIANCE

East Coast Environment Council

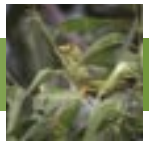
Southern Cross UNIVERSITY
A new way to think

Northern Rivers CMA

our environment it's a living thing

Department of Infrastructure, Planning and Natural Resources

Department of Environment and Conservation (NSW)



Disclaimer

The views expressed in this publication do not necessarily represent those of the NSW Department of Environment and Conservation, Forests NSW, NEFA, NCEC and other organisations involved. While every effort has been made to ensure that the information is accurate they have been generated from the personal input of the forum participants.

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About the Forum & the Workshop Process

The Bell miner Associated Dieback (BMAD) National Forum was convened to develop research directions and management options for inclusion in an adaptive management program for the prevention and control of Bell miner Associated Dieback.

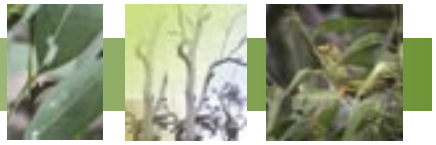
BMAD is of national significance as it is spreading though forest ecosystems on public and private lands from south-east Queensland to Victoria. These forests are regionally and nationally important for plant and animal conservation, tourism, water catchment management, and the production of honey and timber.

The National Forum brought together scientists, forest managers and community interests to:

- Examine BMAD affected forests and their healthy counterparts in the field;
- Consider likely causative and predisposing factors;
- Determine those factors most likely to be influenced by management;
- Identify knowledge gaps;
- Determine priority themes for research into BMAD causes and management; and
- Develop options for an adaptive management program for the prevention and control of BMAD.

The Forum workshop format was based on the Adaptive Environmental Assessment and Management Workshop methodology of the BC Forest Service (Nyberg 1999). This proved to be an effective means to develop the Forum recommendations. These recommendations will form the basis for developing a series of management trials on public and private lands to prevent and control BMAD.

Nyberg, B. 1999. An Introductory Guide to Adaptive Management for Project Leaders and Participants. BC Forest Service, Victoria, British Columbia, Canada. 22 pages.



Acknowledgments

The BMAD Working Group

The BMAD Working Group is a voluntary body with representatives from various State Government Departments, local landholders, academia and conservation groups.

Members of the Working group meet monthly to discuss and progress BMAD related issues and develop strategies to deal with BMAD. The BMAD National Forum was an initiative of this Working Group.

Members of the BMAD Working Group at the time of the National Forum were:

Mr Jim Morrison, Chair (current)	North Coast Environment Council
Ms M Woo Wei Richards	North East Forest Alliance
Mr Ron Billyard	Dept. of Environment & Conservation
Mr Stephen King	Dept. of Environment & Conservation
Mr Steve Rayson	Forests NSW, Dept. of Primary Industries
Dr Peter St Clair	Forests NSW, Dept. of Primary Industries
Mr Dave Dreher	Landholder
Mr Doland Nichols	Southern Cross University
Ms Lisa Wellman	Dept. of Environment & Conservation

Sponsors

The BMAD Working Group would like to acknowledge the **Natural Heritage Trust 2** Grant Program and the **Norman Wettenhall Foundation** without whose financial support this Forum would not have taken place. Thanks are also extended to **Southern Cross University** for their hospitality and provision of a most suitable venue.

Master of Ceremonies

The BMAD Working Group thanks **Mr Peter Cuming** for his valuable contribution as Master of Ceremonies and advice on group dynamics and faclitation.

Keynote and Contributing Speakers

The following speakers added insights during the National Forum:

Dr Bernard Bormann of the US Forest Service, Corvallis, Washington gave Keynote and Theme addresses providing insights into adaptive management of forest ecosystems in the Pacific Northwest, USA.

Dr Grant Wardell Johnson of the University of Queensland gave a Keynote Address summarising findings from the BMAD Science Report, a comprehensive literature review of BMAD.

Emeritus Professor Harry Recher provided insightful summaries of daily proceedings.

Mr John Hunter of the Department of Environment and Conservation (NSW) provided personal insights into BMAD in NE NSW. Acknowledgement is also given to Mr John Hunter of the Department of Environment and Conservation, who served as Chair of the BMAD Working Group until October 2004.

Acknowledgments

Organising Committee and Staff

The National Forum was organised by a Steering Committee consisting of:
Mr Jim Morrison, North Coast Environment Council Inc.
Mr Steve Rayson, Forests NSW
Mr Ron Billyard, Department of Environment and Conservation (NSW)
Ms Sue Elks, Department of Environment and Conservation (NSW)

Ms Merran Storrie undertook much of the organisation of the National Forum including bookings, travel arrangements, day-to-day operations and logistics.

Ms DeAnn Zwight (US Forest Service) provided assistance in scoping the National Forum, advising on the adaptive management workshop approach, and securing the participation of Dr Bernard Bormann.

Facilitation

Workshop Group Facilitation was managed by **Ms Sue Elks**.

Trained Group Facilitators were drawn from staff of the Department of Environment and Conservation and were:

Ms Adrienne Farago
Mr Aaron Harber
Mr Stephen Hull
Mr Lawrence Orel
Mr Andy Marshall
Mr Shane Robinson
Mr Andrew Steed
Ms Leonie Walsh

Field Inspection

The Field Inspection undertaken on Day 1 of the National Forum would not have been the success it became without the assistance of:
Staff of the DEC Parks and Willdife Division Kyogle Area office including **Ms Amanda Bryant, Mr Steve King, Mr Andy Fay, and Mr Mark Geyle**;
Mr Peter St Clair and staff of the Forests NSW Casino office;
Mr John Hunter of the DEC Parks and Wildlife Division office in Coffs Harbour;
Local landowners including **Ms Susan Somerville, Dr Wayne Somerville**, **Mr Hugh Nicholson, Ms Nan Nicholson**, and **Mr Bob O'Neill.**

Photography

Front cover and title photography by Jon Armstrong <jon@nildesperandum.tv>

Statement to Government

We are a national group of scientists, land managers, landholders, environmental consultants and community representatives drawn together to address the Australia-wide issue of Bell miner Associated Dieback (BMAD) in eucalypt forests.

We state without reservation that BMAD is a problem of national significance on an immense scale. It has vital consequences for timber production, forests resources and national parks, private lands, water catchments and water supply, biodiversity conservation and local and regional employment and community health.

We profess that the state of knowledge concerning initiation and continuance of dieback conditions and processes is at present exceedingly poor. The extent of the problem and the probability of its spread are unknown.

We alert Federal and State Governments to the existence of this form of dieback and the uncertainty we, the community of delegates at the March 2005 BMAD National Forum, share about how best to tackle the problem.

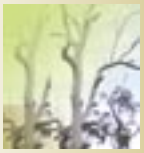
We ask, indeed implore, Federal and State governments to support scientists, research institutions, land management agencies and forest owners, including those of public forests, with funding, personnel and policy and legislative support to enable the complex factors causing and sustaining dieback to be discovered and for control and prevention options to be explored and applied.

We, the undersigned, respectfully request your immediate attention to the enormous threat of Bell miner Associated Dieback in Australia's eucalypt forests.

Signed
Delegates of the Bell miner Associated Dieback National Forum
30 March to 1 April 2005
Southern Cross University, Lismore, Australia

Program

Day 1:	**Wednesday 30 March 2005**
9.00am - 4.30pm	**Field Trip**
6.00pm	**Registration Desk Opens at Zest Restaurant**
6.30 for 7.00pm	SESSION 1 - **Official Opening - Zest Restaurant, SCU** • *Welcome to Country,* **Aunty Irene Harrington**, Bundjalung Elder • *Welcome* by **Jim Morrison**, BMAD Working Group Chairperson • *Background to BMAD*, **John Hunter**, DEC Ecologist & former Chair of the BMAD Working Group • *Forum Introduction*, **Peter Cuming**
Day 2:	**Thursday 31 March 2005**
8.00am	**Registration Desk Opens - Entrance Foyer Lecture Theatre Y2.05, Southern Cross University**
8.30 - 10.00am	SESSION 2 - **Outlining the Issues** • **Learning Through Adaptive Management - Dr Bernard T Bormann, USDA Forest Service** • **Outcomes of the BMAD Literature Review - Dr Grant Wardell-Johnson, University of Queensland**
10.00 - 10.15am	Morning tea
10.15 - 12.15pm	SESSION 3 - **Workshop Session - Defining Management Objectives, Key Indicators & Management Actions**
12.15 - 1.00pm	**Lunch**
1.00 - 2.45pm	SESSION 4 - **Workshop Session - Deriving Management Linkages**
2.45 - 3.00pm	**Afternoon tea**
3.00 - 4.30pm	SESSION 5 - **Workshop Session - Evaluating Management Linkages**
4.30 - 5.00pm	SESSION 6 - **Consolidating Outcomes & Setting Direction for Day 3** • **Emeritus Professor Harry Recher**
6.30 for 7.00pm	**Gourmet BBQ Dinner - Invercauld House**
Day 3:	**Friday 1 April 2005**
8.00am	**Registration Desk Opens - Entrance Foyer Lecture Theatre Y2.05, Southern Cross University**
8.30 - 10.00am	SESSION 7 - **Designing Management Options** • Adaptive Management in Practice - **Dr Bernard T Bormann, USDA Forest Service**
10.00 - 10.15am	**Morning tea**
10.15 - 12.15pm	SESSION 8 - **Workshop Session - Developing Plausible Management Options & Predicting Outcomes**
12.15 - 1.00pm	**Lunch**
1.00 - 2.30pm	SESSION 9 - **Identifying the Uncertainties**
2.30 - 3.00pm	SESSION 10 - **Synthesis & Management Directions** • **Emeritus Professor Harry Recher**



Bell miner Associated Dieback National Forum 2005

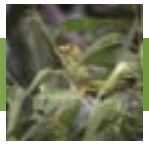
Session 1
Official Opening

Welcome to Country, Aunty Irene Harrington, Bundjalung Elder

Welcome by Jim Morrison, BMAD Working Group Chairperson

Background to BMAD, John Hunter, DEC Ecologist & former Chair of the BMAD Working Group

Forum Introduction, Peter Cuming



Session 1 - Official Opening

Welcome to Country, Aunty Irene Harrington, Bundjalung Elder

Irene Harrington, Bundjalung Elder from the Widjabul tribe of Lismore, welcomed forum delegates to her Country. Aunty Irene emphasised the relationship of Bundjalung people to the land and forests and the importance of proper management of the environment.

Welcome by Jim Morrison, BMAD Working Group Chairperson

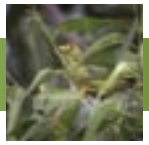
The BMAD Working Group acknowledges the Indigenous community of this country where the Forum took place, the Bundjalung people. We thank Irene Harrington, Bundjalung Elder from the Widjabul tribe of Lismore, who welcomed Forum Delegates to her Country.

The BMAD Working Group would also like to express particular gratitude to all Delegates for their valuable contribution at the National Forum. The recommendations detailed in these proceedings are a direct result of their input during the workshops.

We would also like to publicly acknowledge the contribution made by Emeritus Professor Harry Recher who volunteered his time and expertise before, during and after the National Forum. His experience and insight has been extremely valuable.

Also, thank you to Dr Bernard T Bormann from the United States Department of Agriculture Forest Service for travelling to Australia as our International Keynote Speaker and providing his experience in Adaptive Management.

Lastly, our appreciation of Dr Grant Wardell-Johnson and Ms Jasmyn Lynch's work on the BMAD Independent Scientific Literature Review, which is a preliminary review of eucalypt dieback, associated with Bell miner habitat in north-eastern NSW.



Session 1 - Official Opening

Background to BMAD, John Hunter, DEC Ecologist & former Chair of the BMAD Working Group

Mine is a tale of lost innocence. When I was a kid I saw a forest of leafy trees. Today I look at the forests and see dead stems. When I was young the gentle tinkle of bellbirds in a moist scrubby gully was one of the most delightful sounds I knew. Today that sound distresses me and tells of forests falling to dieback.

Dieback is the progressive dying back from the tips of twigs or branches in a tree crown which often affects primary and secondary growth; is often caused by a variety of causal agents that affect the tree's physiological processes, acting either singly or in combination; and if the cause or disorder persists, it may lead to death of the tree.

All forms of dieback share the non-specific symptoms of progressive dying back of the primary crown units and development of epicormic shoots. If the replacement epicormic shoots remain vigorous the tree will recover. However, if these shoots are subsequently affected, the tree must use its starch reserves to refoliate. Tree death occurs when starch reserves are reduced to the level below that required for growth processes in the absence of photosynthetic tissue. Dieback affects many species of trees and consequently affects hundreds of dependant animals and plants.

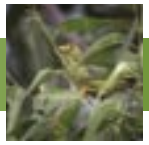
Dieback in Australian eucalypt forests has been reported since the mid 1800s. A range of dieback agents has been identified as being responsible for dieback in Australia since then. In NSW most attention since the 1940s has focused on rural, rather than forest, dieback.

Bell miner associated dieback (BMAD) is a particular form of eucalypt forest dieback. It refers to the association of dieback of various species of eucalypts with the presence of populations of a native bird, the Bell Miner or Bellbird, and severe infestations of psyllids.

The Bellbird is a predominantly insectivorous honeyeater; psyllids and lerps (sugary coatings that psyllid nymphs produce to protect themselves) make up a large proportion of their diet. The bird is a cooperative breeder and lives in colonies. Each colony contains smaller breeding groups consisting of a monogamous breeding pair and non-breeding individuals. The bellbird is very aggressive and defends its eggs, young and its food sources, including the psyllids and their lerps

The poet Henry Kendall wrote eloquently about Bellbird habitat in "Bell Birds". The characteristic habitat of the Bellbird at the time of European settlement was the most fertile wet sclerophyll forest - tall open forest in gullies. This forest frequently adjoined rainforest, had a complex mesic understorey and was close to a creek.

Isolated patches of crown dieback and tree death in moist regrowth eucalypt forest, generally where Bellbirds were present, have been reported since the early 1900s. This dieback was most common in stands of Sydney Blue Gum (Eucalyptus saligna) on moist sites with a dense mesophyllic understorey. Reports from field workers of increasing size of affected areas and the development of dieback symptoms in previously unaffected areas led to establishment of a research program by the Research Division of State Forests of NSW in the early 1990s. Work undertaken included a survey of affected sites in central and northern NSW in 1992. This group continues to undertake research related to the dieback. The Research Division with Department of Environment and Conservation and CSIRO as partners is currently undertaking a project investigating the use of remote sensing to effectively and efficiently map forest health, including the extent and severity of BMAD.



Session 1 - Official Opening

The extent of BMAD is limited by the distribution of the Bell Miner, that is, near-coastal areas of eastern Australia from about Gympie to west of Melbourne. However, the birds appear to be moving into previously unoccupied habitats and the extent of BMAD has increased significantly. The birds are reported to be well established in some suburbs of Melbourne, to have recently moved further west to Geelong and to be multiplying in eastern Victoria (Low 2002). Outbreaks of BMAD are currently known from southern coastal NSW and in southeastern Queensland from areas such as Brisbane Forest Park and Cunninghams Gap.

There are numerous affected areas in northeastern NSW. These include the Toonumbar/Richmond Range area, Koreelah NP, Donaldson SF, Border Ranges NP, Barool NP, Nimboi-Bindery NP, Gladstone SF, New England NP, Gumbaynggir SCA, Oxley Wild Rivers NP, Kumbatine NP, Werrikimbe NP, Cottan-Bimbang NP, Mummel Gulf NP, Copeland Tops SCA, Glenrock SCA and the Watagan Mountains. This list is not complete and new outbreaks are being reported frequently.

Not only is there an increased incidence of dieback associated with bellbirds, but the range of eucalypt species and forest types affected has also expanded. No longer is this form of dieback confined to the moist, fertile sites with mesic understories that Kendall so aptly described as the habitat of the bellbird and where the dieback was reported in the past. It still affects those areas, but is now increasingly being recorded from eucalypt forests on midslopes and ridgetops, forest types that generally have grassy understories.

It is easy to blame the bellbirds for the problem. This is a mistake. The birds are responding to the presence of a food supply – psyllids and their lerps – and a forest structure that allows them to monopolise that food supply and exclude other species that might reduce psyllid numbers. The factor or factors that bring about the initial increase in psyllids are not agreed upon.

Therefore, the BMAD Working Group is confronted by a problem that is not only widespread in escarpment and coastal forests, and increasing in extent, but is also without a clear cause or solution. The group understands that doing nothing until the factors contributing to the dieback are identified and the complex web of feedback loops is deciphered is not an option – the forests are dying every minute. Dieback, like a mortgage, does not take holidays.

Activities undertaken or sponsored by the group include:

- trialing different methods of controlling Lantana and regenerating forest on affected sites.
- surveying local landholders regarding the extent of BMAD.
- sponsoring helicopter based mapping of BMAD in the Richmond Range area.
- nominating BMAD as a Key Threatening Process under the Threatened Species Conservation Act.
- participating in a colloquium on eucalypt forest decline held by the NSW Forest Health Advisory Committee.
- sponsoring digital multi-spectral mapping of forest health. (IMAGE OF SPECTRAL MAP).
- commissioning a literature review.
- undertaking a risk analysis.
- initiating a Communication Strategy, and
- organising the current forum.

Session 1 - Official Opening

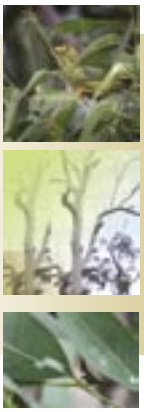
The BMAD Working Group is composed of a diverse range of people, people who under other circumstances could be expected to be adversaries. However, they realise that the dieback affecting our forests is a problem whose solution demands cooperation from all interested people. Similarly, you people, the group of people that we have invited to help tackle this problem, hold diverse views, views that are often at odds with those held by other participants. I ask that we all are humble enough to recognise that none of us alone has the answers to the problems we confront. We need to draw on the diversity present to plan our attack on this common problem.

While we are dealing with BMAD as a single issue, we should recognise that it is but one of a number of similar issues. BMAD is only one indicator of the rift that has developed between our land management practices and the tolerances of native species and ecosystems. While there are those who feel that by concentrating on this form of eucalypt dieback we are ignoring linkages with other forms of dieback, I believe that BMAD can provide a means of focussing on aspects of a number of larger issues. In particular, BMAD raises questions about the impact of exotic species, the role of fire, the impact of disturbance and the effects of fragmentation on native ecosystems. The lessons we can learn from unravelling and managing this complex of inter-related factors will be invaluable in tackling other landscape-wide problems.

We are at an important point in time with regard to our relationship with Australia's natural ecosystems. I believe if we have the will we can make a difference and restore much that is threatened with destruction. We are currently dealing with an intriguing problem, one that has a much-loved native bird playing a prominent role. The bellbird is of course not to blame; it is simply exploiting the opportunities that we provide, something that native species have been doing for millenia. However, if we do not change our ways, the bellbird, that icon of those special moist and fertile sites in this arid continent, may come to be regarded as an icon of our culture's contempt for native forests. I hope one day to be able to listen to the call of the bellbird with the same innocent awe that I did as a child. Our children's children deserve that experience. Meanwhile, the wake-up call has sounded, the bells toll. We can do something about it.

Forum Introduction, Peter Cuming

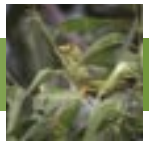
Mr Peter Cuming (BMAD National Forum Master of Ceremonies) conducted an awareness raising and motivation session, introducing the Forum Workshop format and focussing delegates on the task ahead.



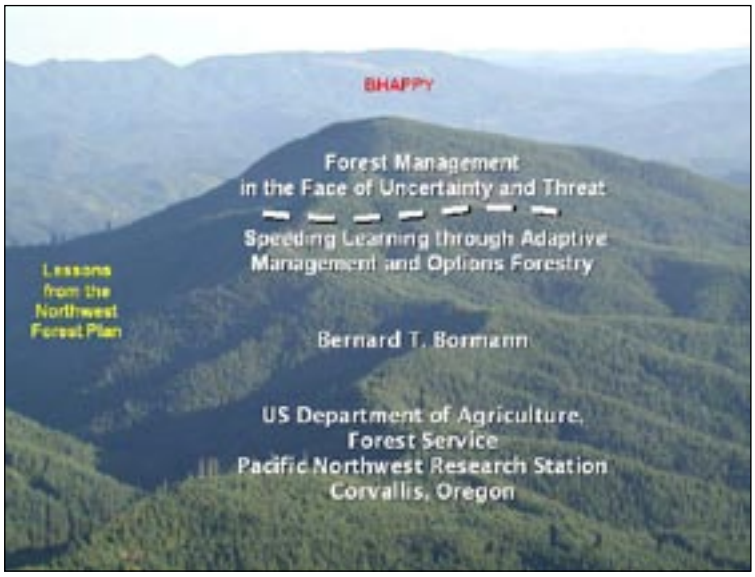
Session 2
Outlining the Issues

Learning Through Adaptive Management -
Dr Bernard T Bormann, USDA Forest Service

Outcomes of the BMAD Literature Review -
Dr Grant Wardell-Johnson, University of Queensland



Session 2 - Learning Through Adaptive Management - Dr Bernard T Bormann, USDA Forest Service



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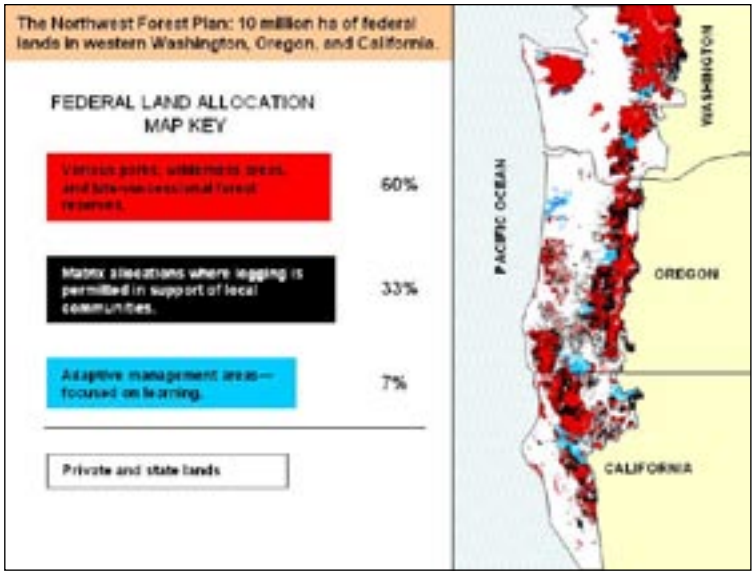

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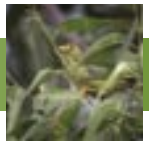

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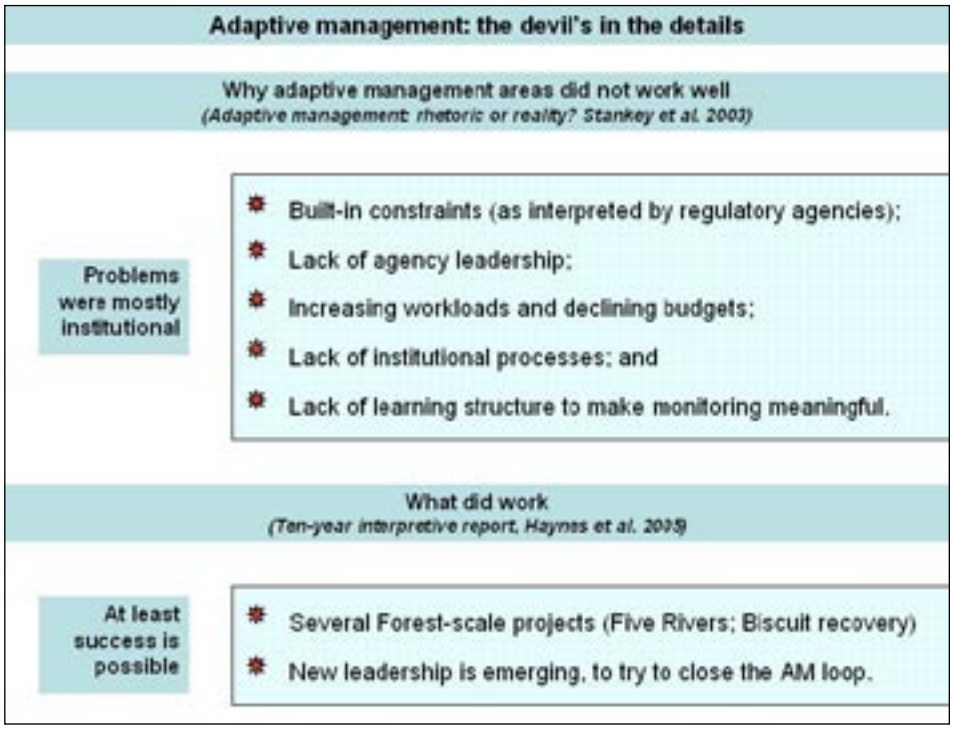

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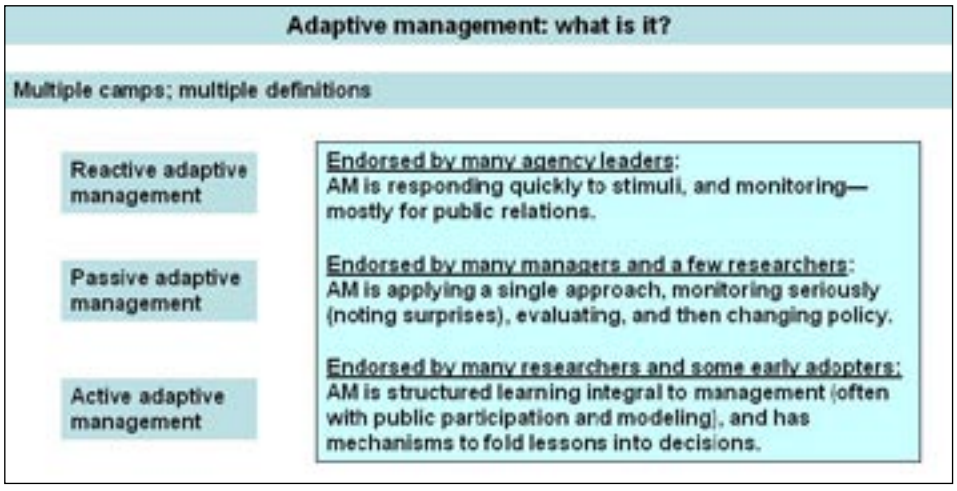

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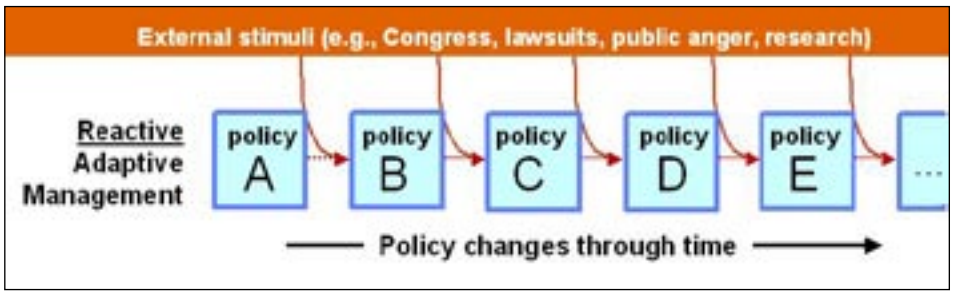

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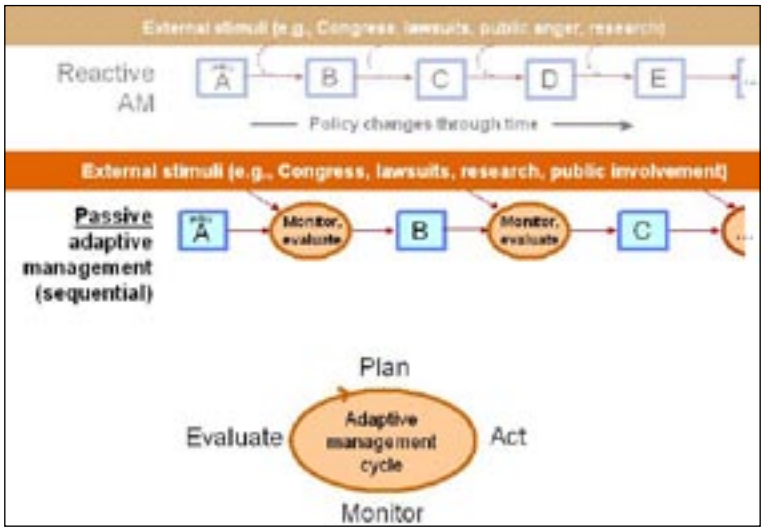
Session 2 - Learning Through Adaptive Management - Dr Bernard T Bormann, USDA Forest Service



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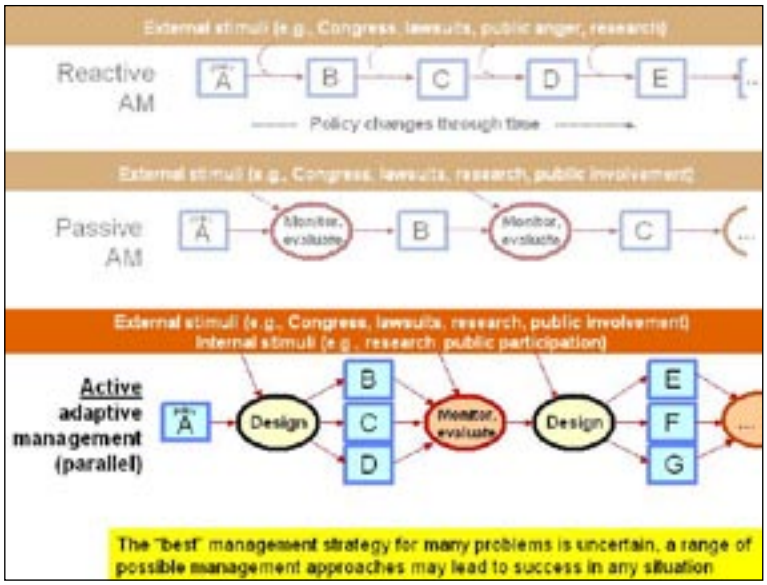

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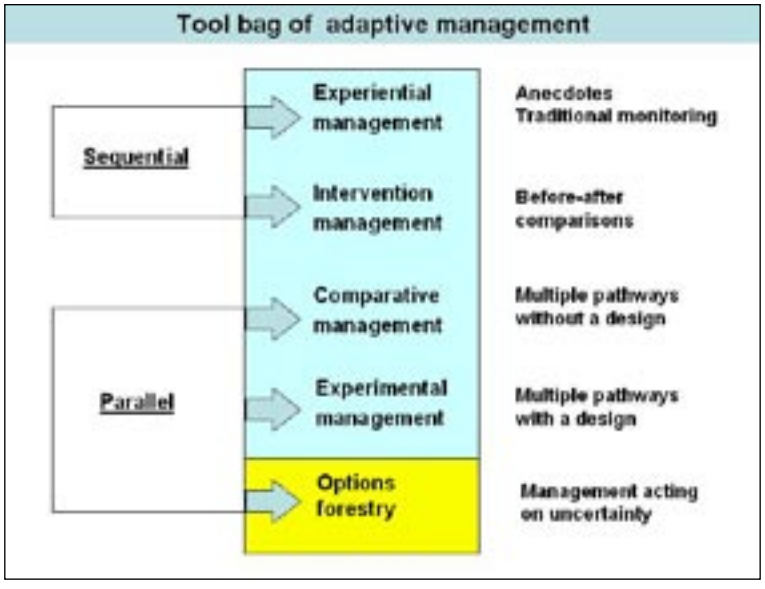

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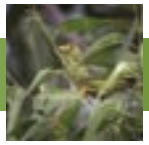

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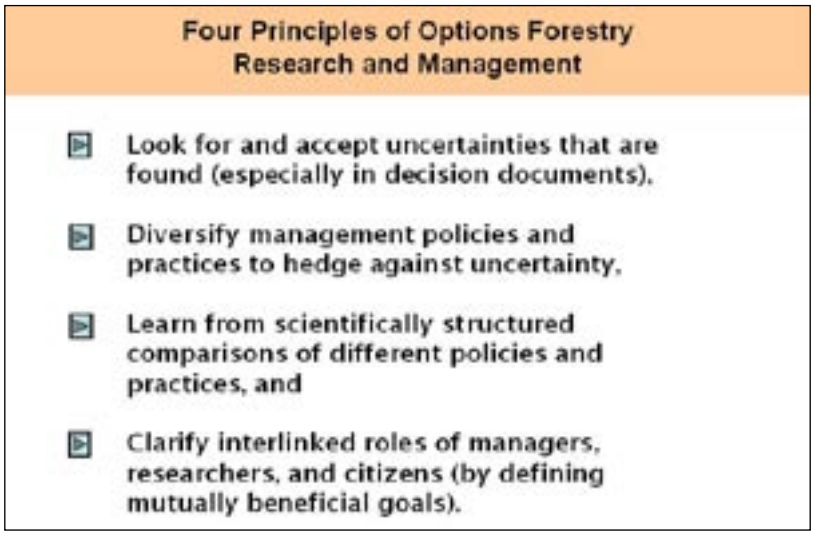

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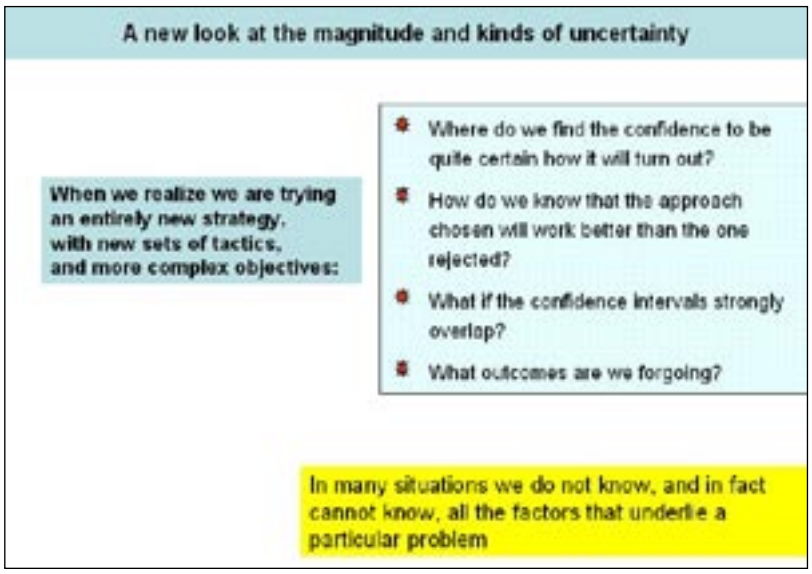

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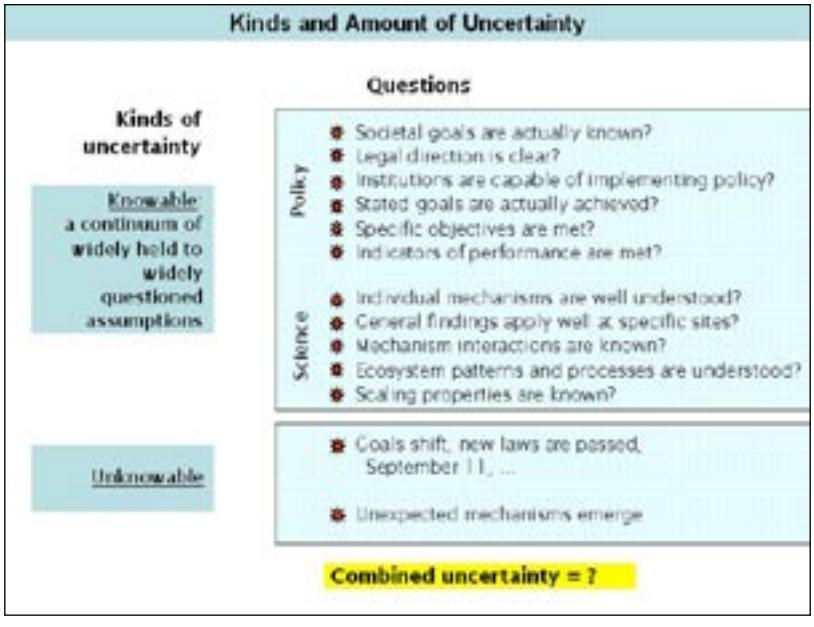

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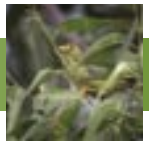

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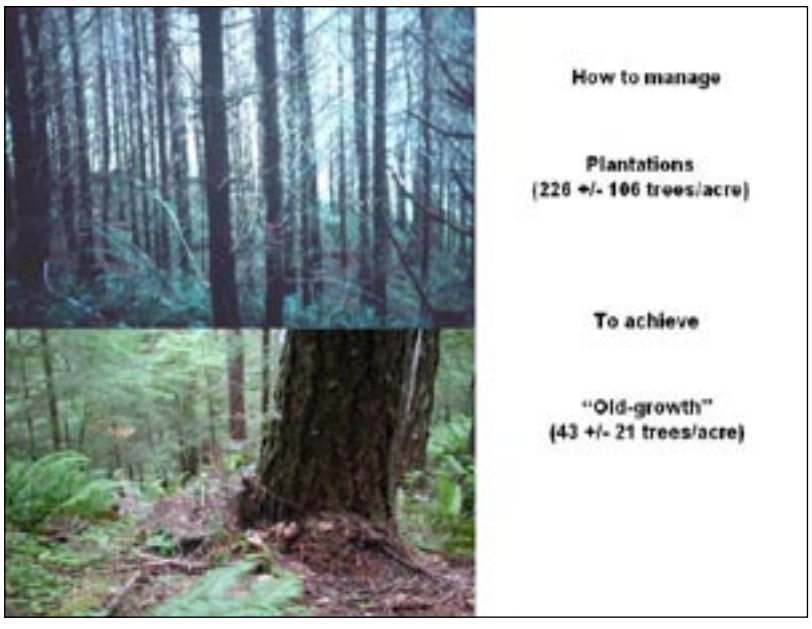

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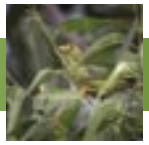

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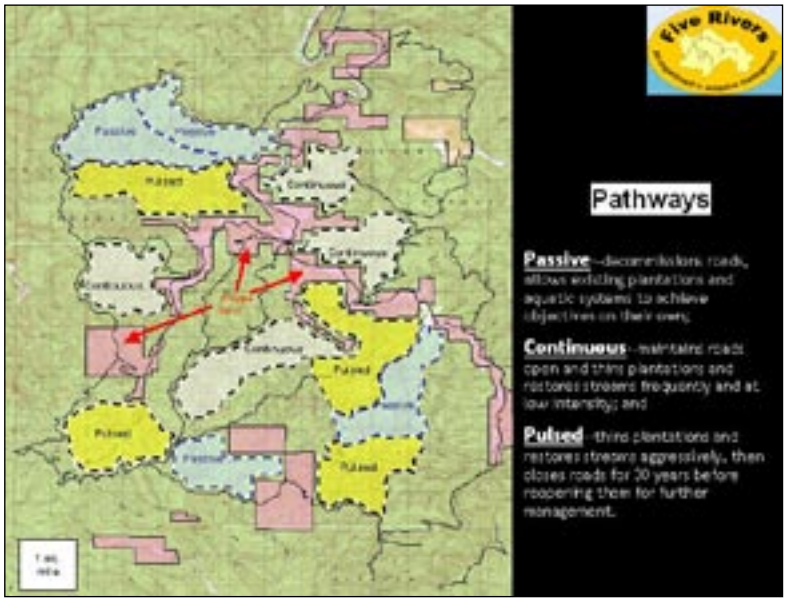

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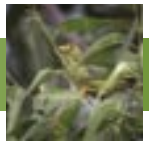

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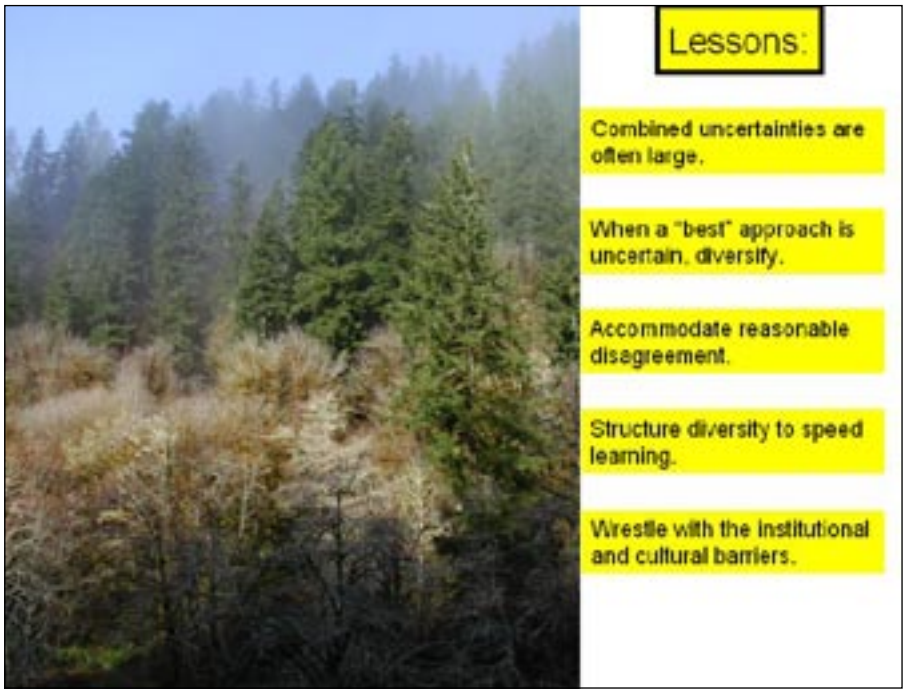

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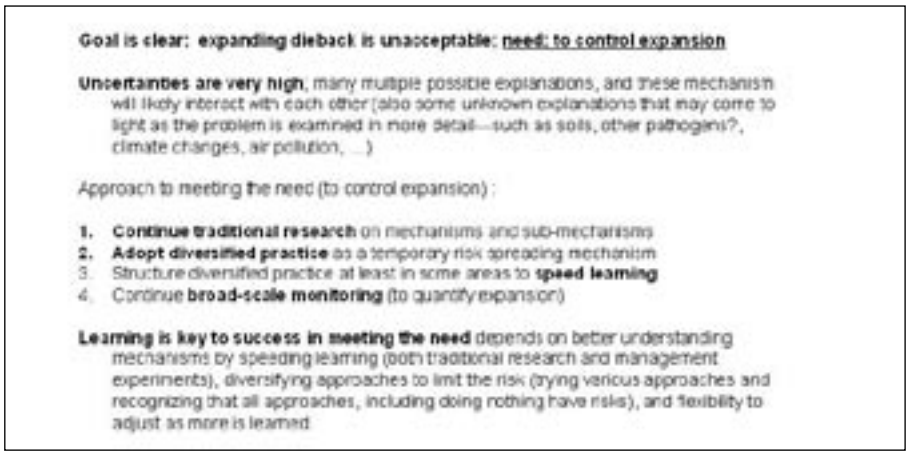

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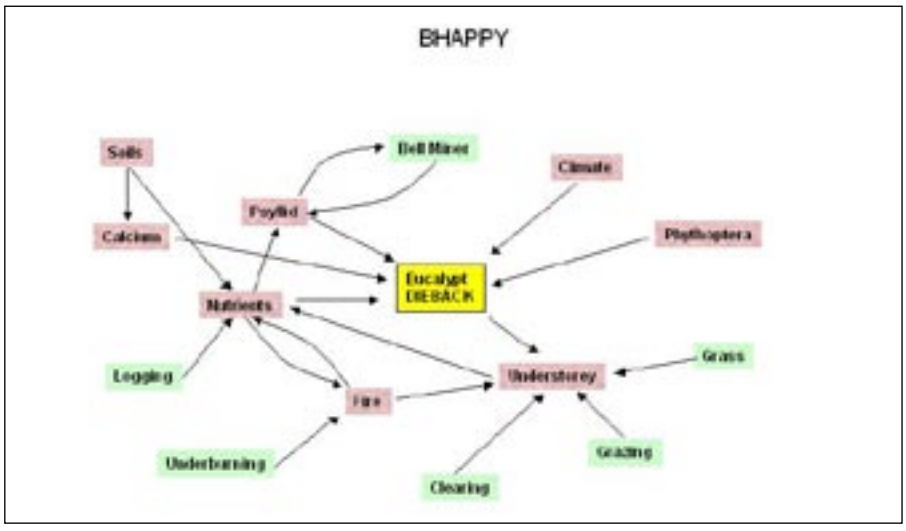

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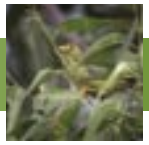

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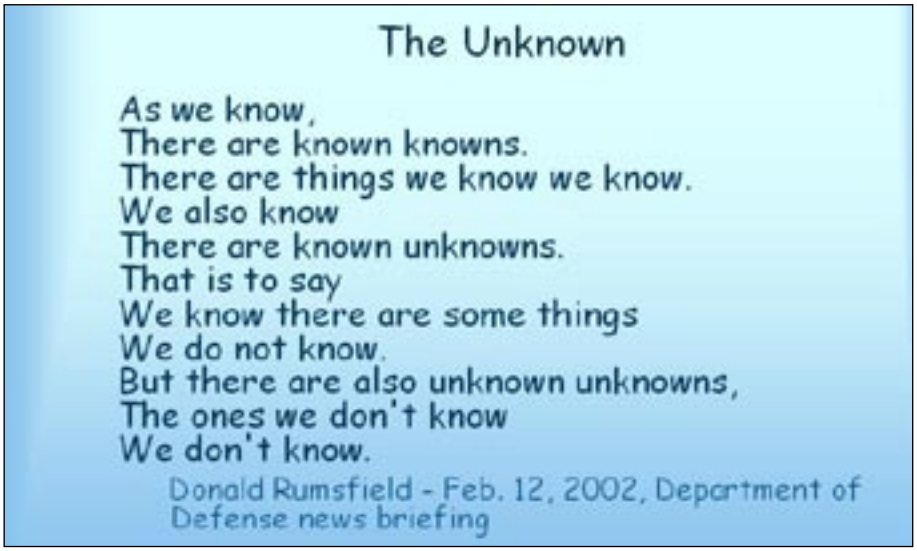
Slide 1



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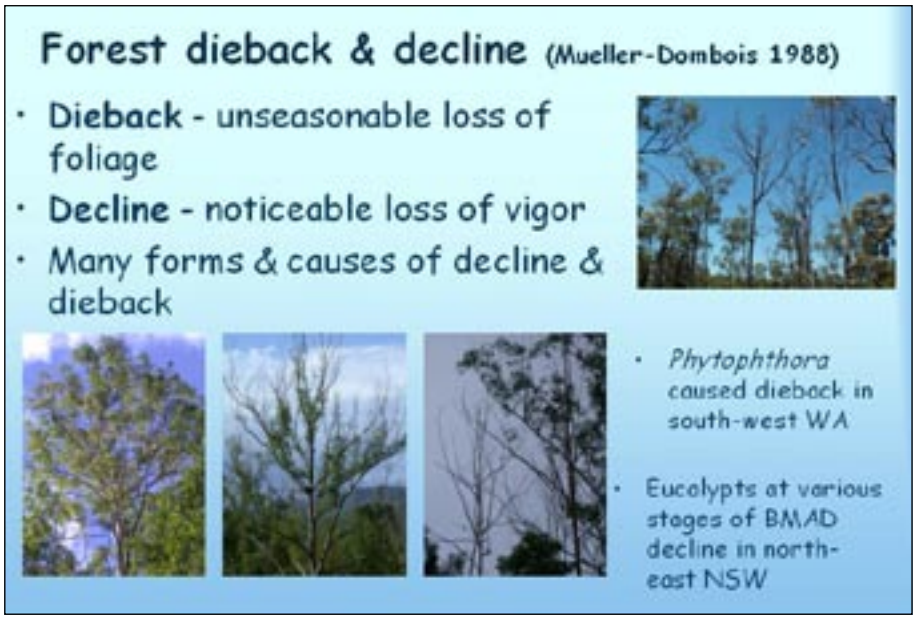

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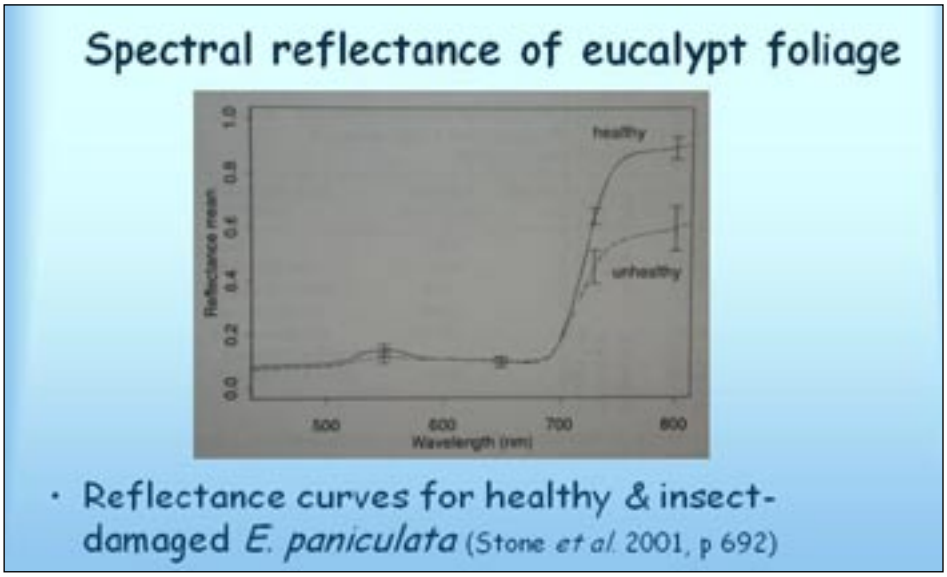

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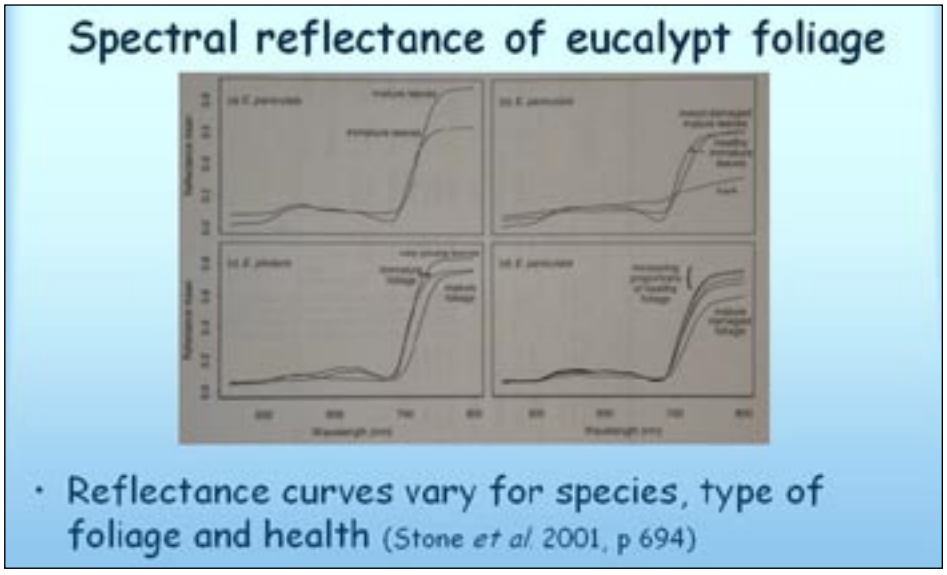

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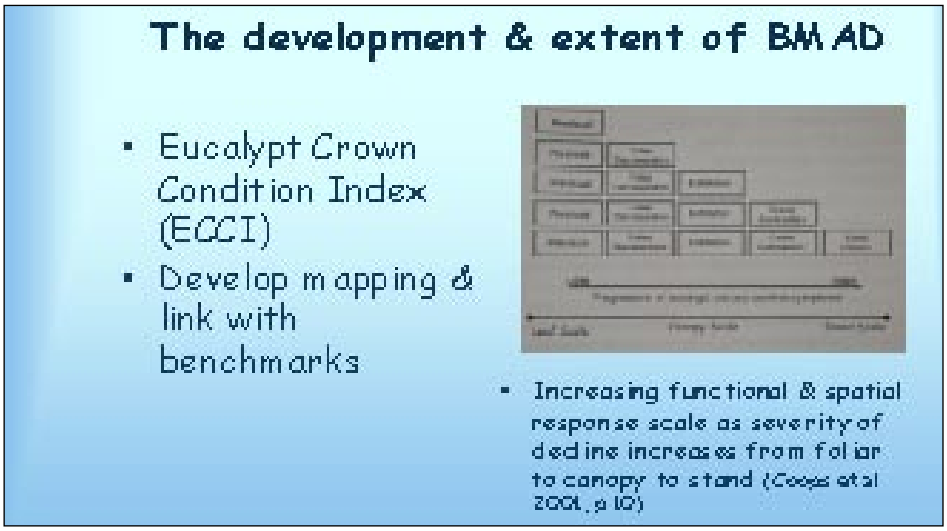

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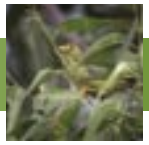

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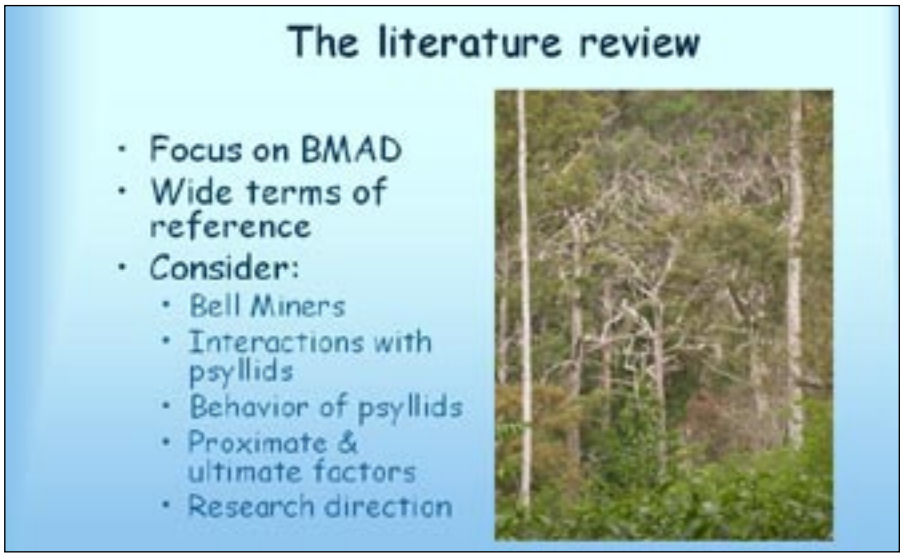

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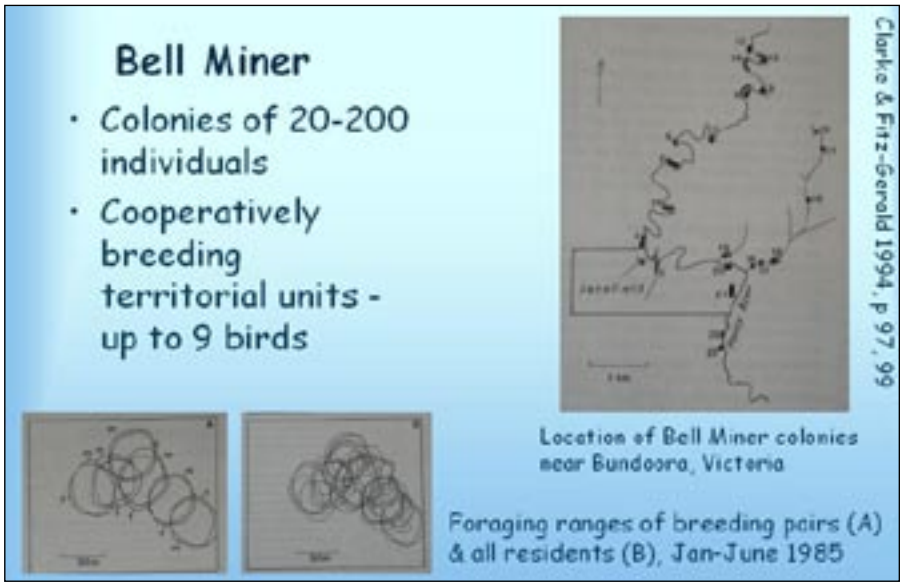

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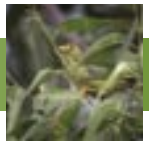

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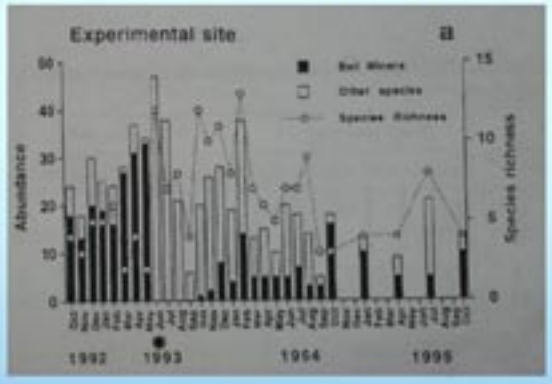
Bell Miners & other birds

- Aggressively defend territories
- Reduce overall avian species richness

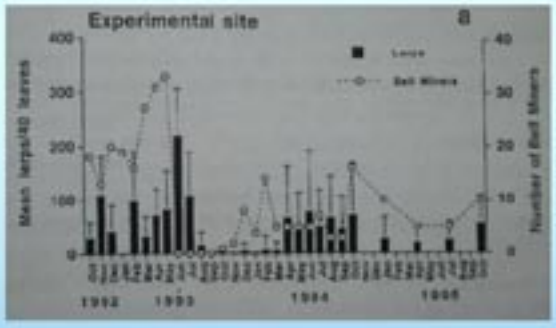


Changes in abundance & diversity in bird species following removal of Bell Miners (Clarke & Schedvin 1999, p 117)

Slide 11

Bell Miners & Psyllids

- Closely associated with psyllid outbreaks
- Not as effective at reducing psyllid outbreaks as displaced bird community

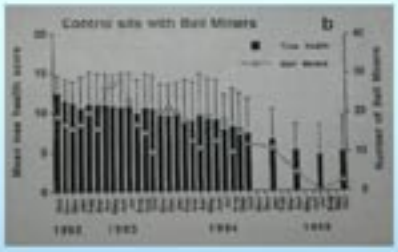


- Changes in abundance of psyllid lerps (*Glycaspis* sp.) and Bell Miners (Clarke & Schedvin 1999, p 117)

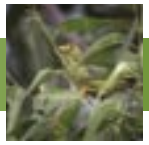
Slide 12

Bell Miners & tree health

- Tree health declines with persistent Bell Miner colonies
- Bell Miners can exacerbate forest dieback by increasing the impact of psyllid outbreaks



Changes in tree health & abundances of Bell Miners (Clarke & Schedvin 1999, p 117)



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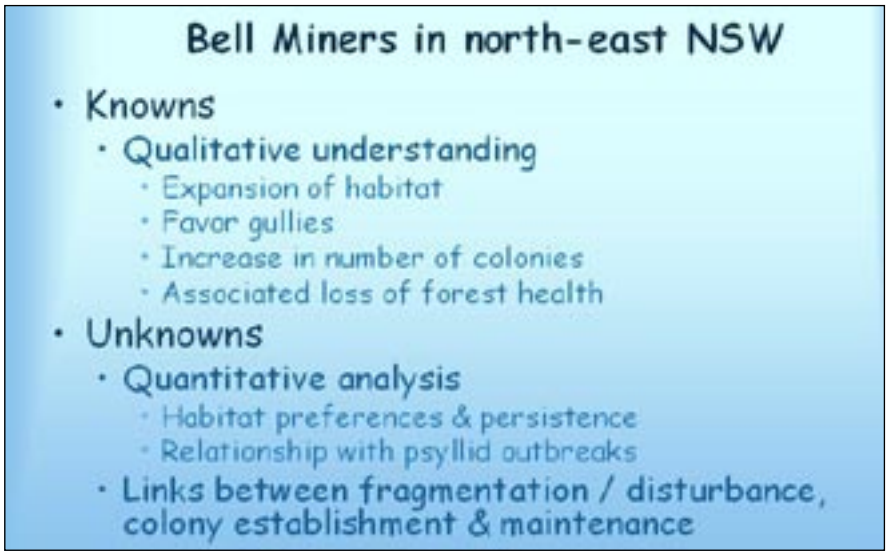

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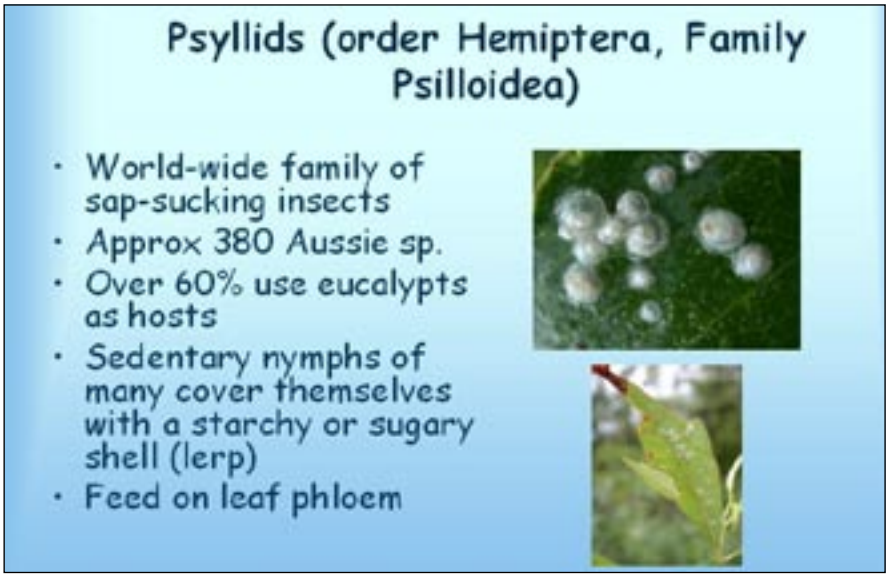

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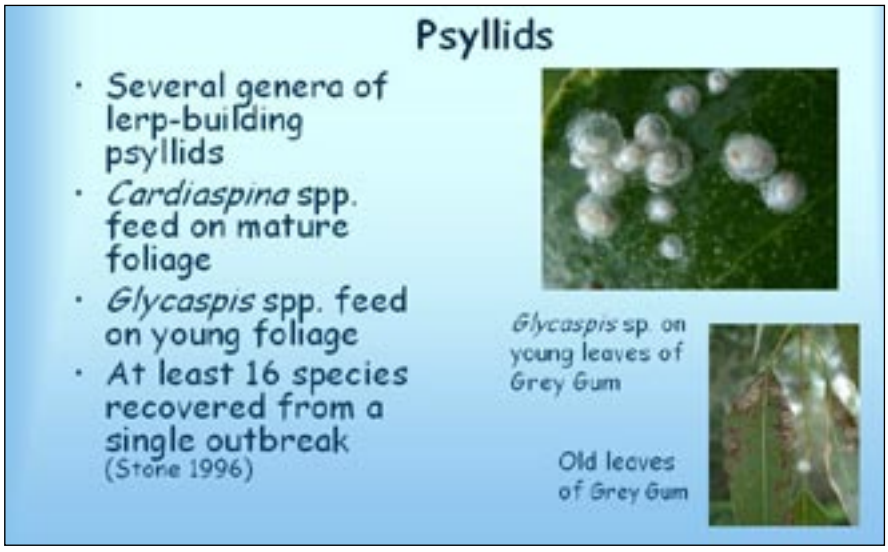

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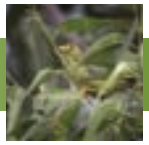

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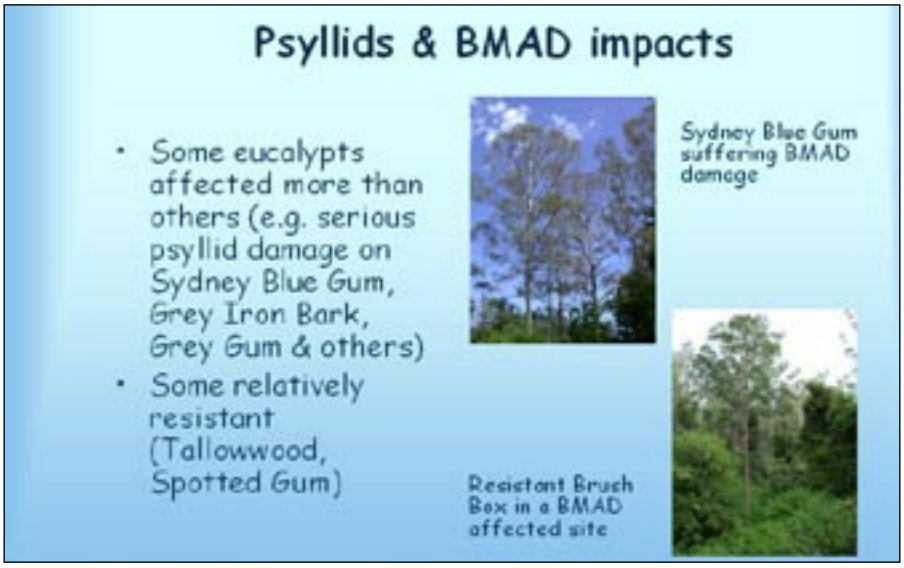

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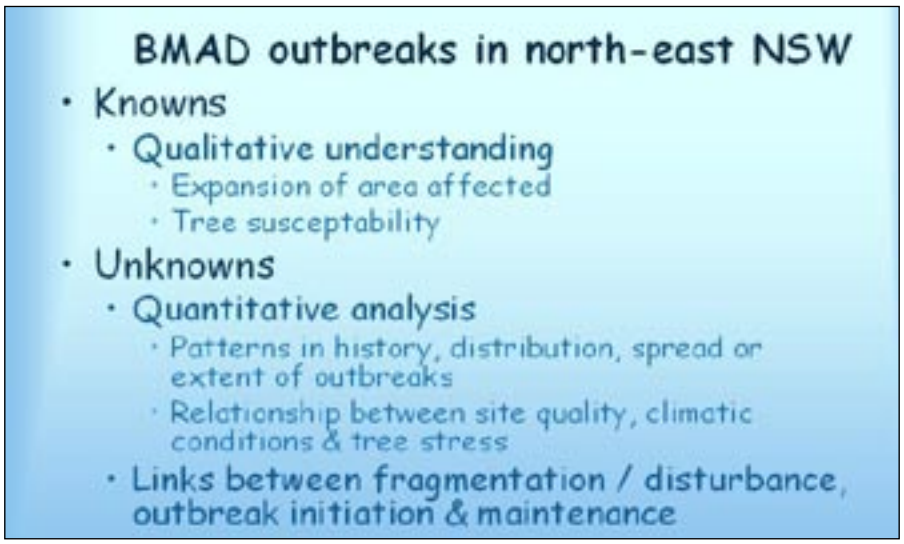

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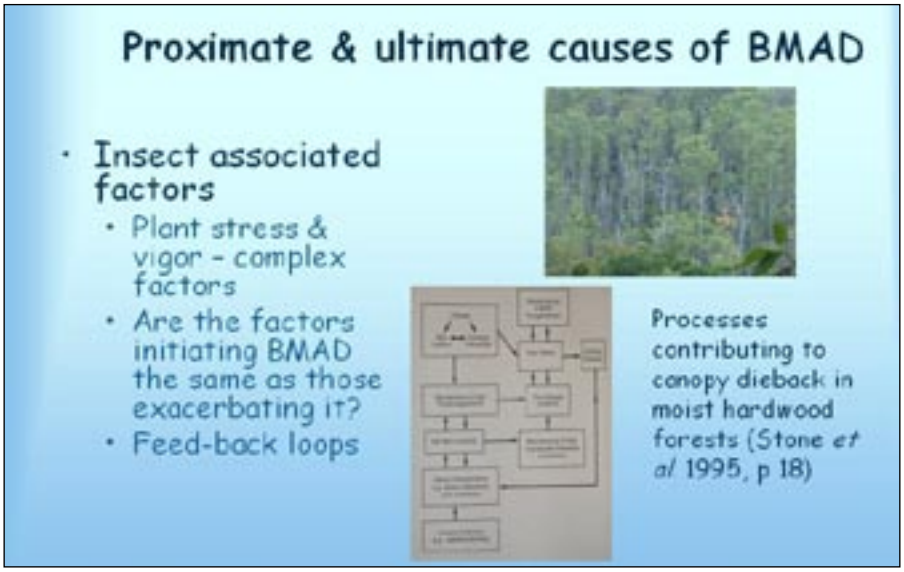

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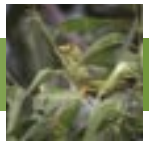

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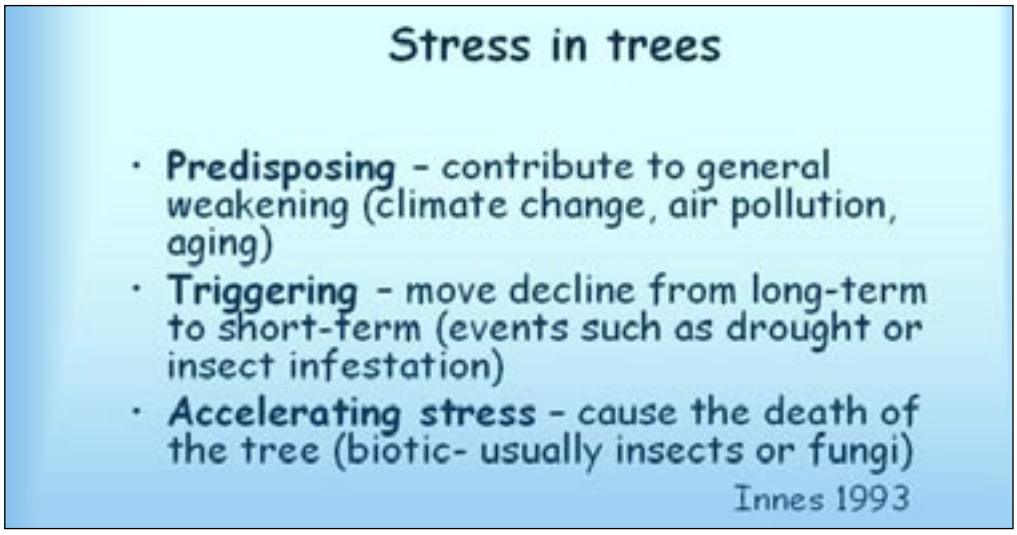

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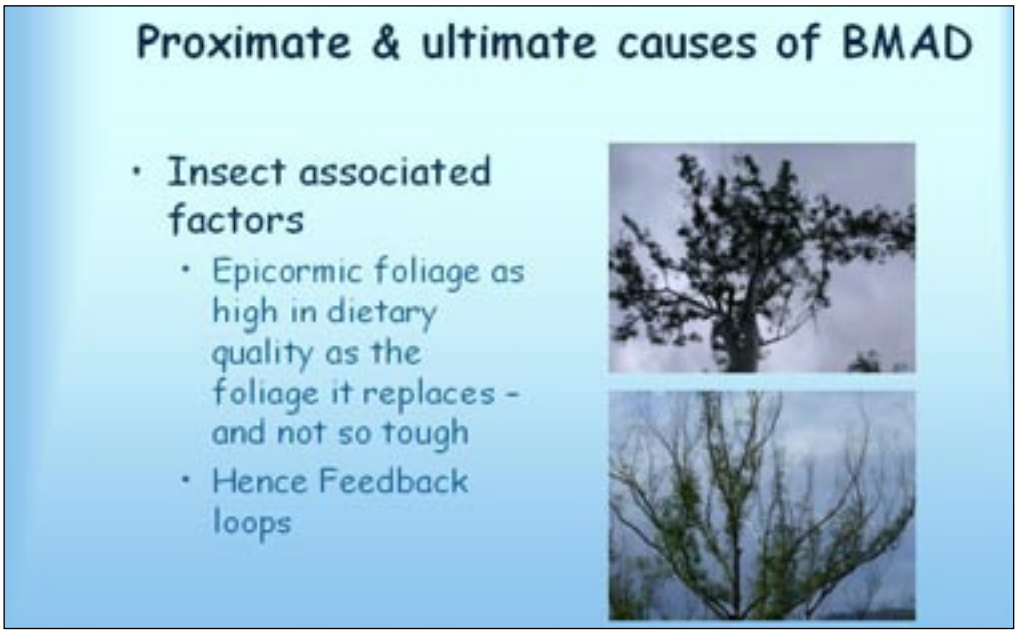

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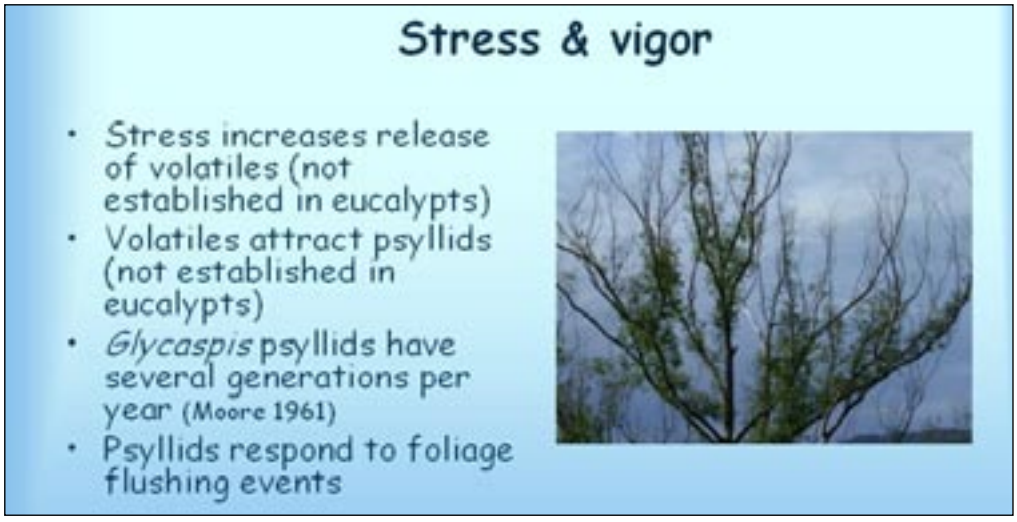

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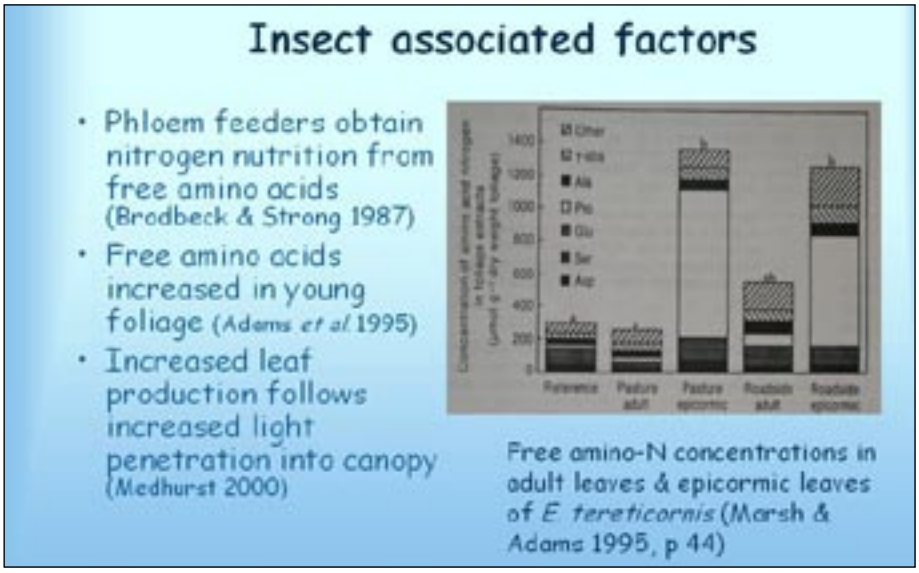

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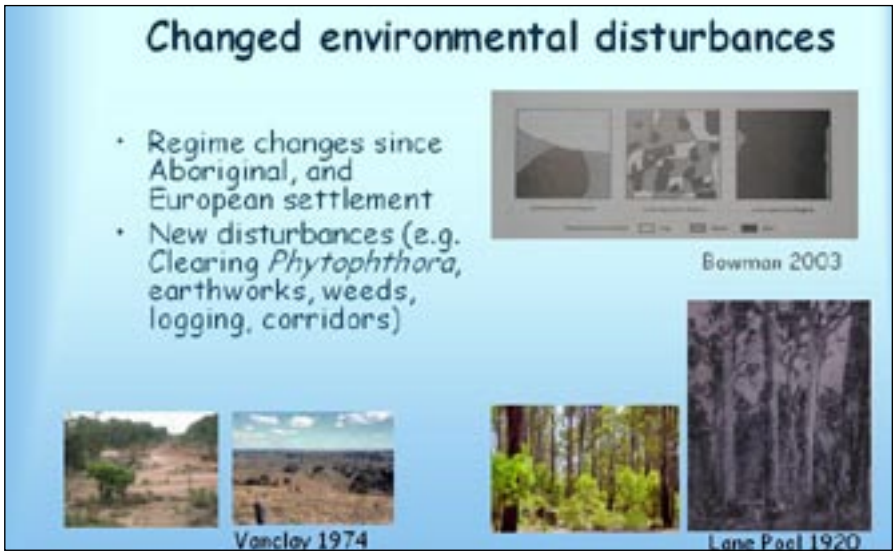

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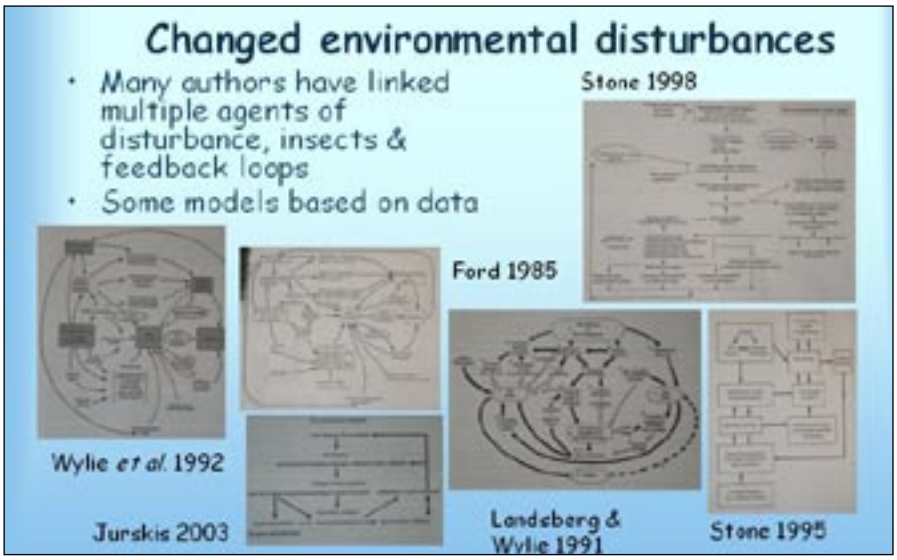

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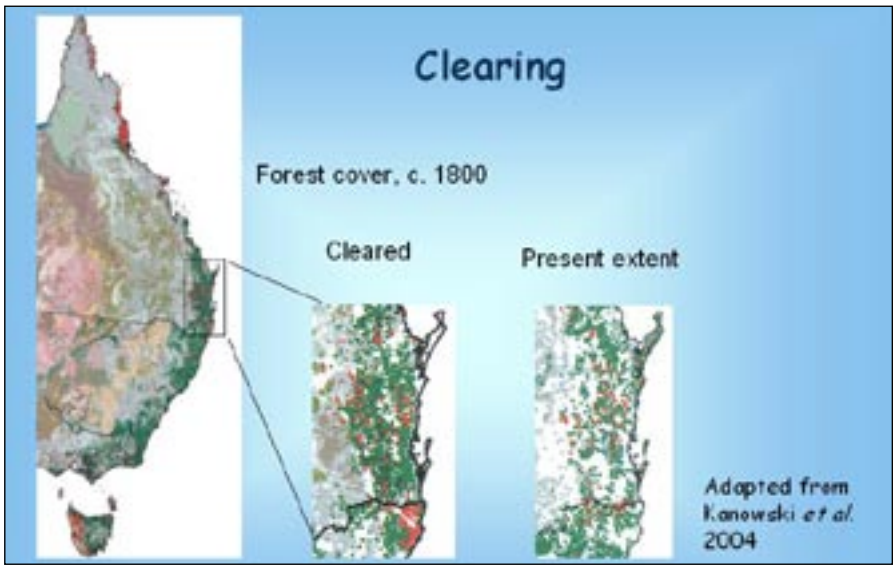

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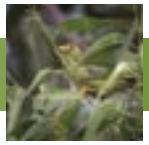

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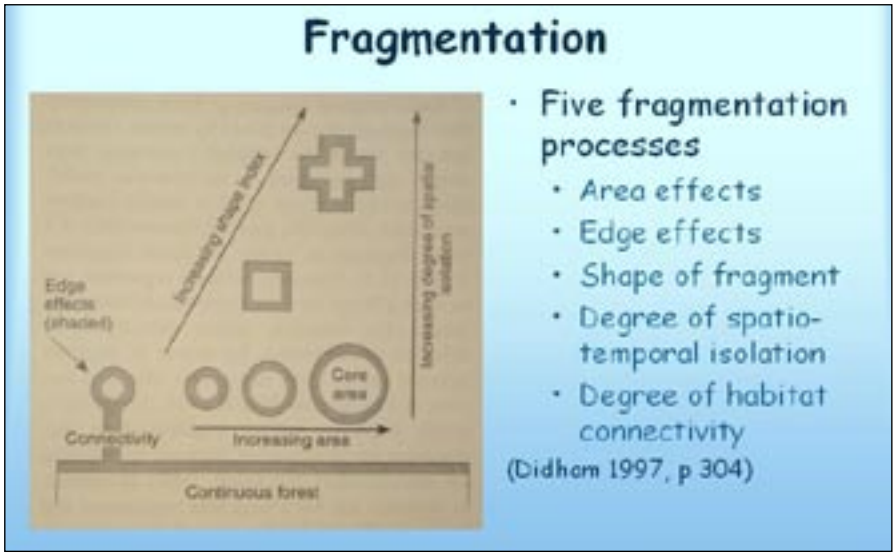

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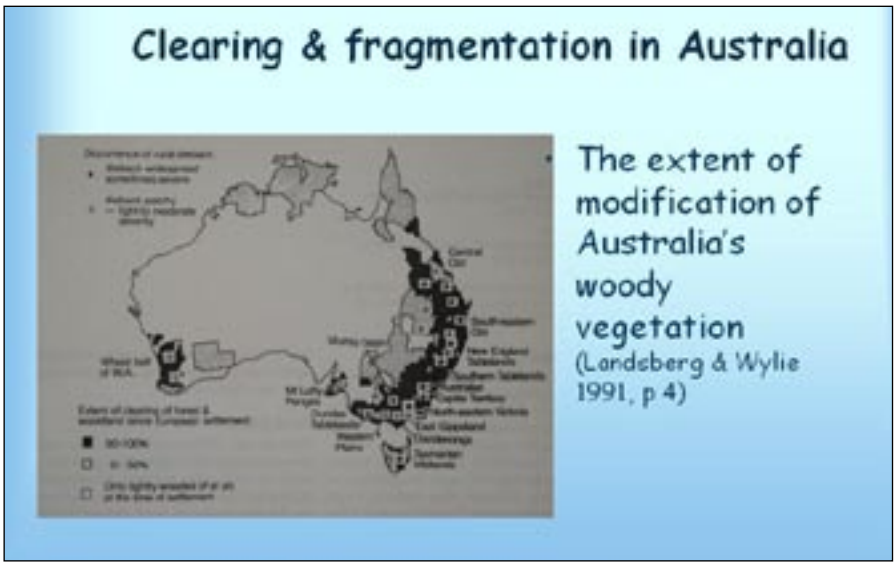

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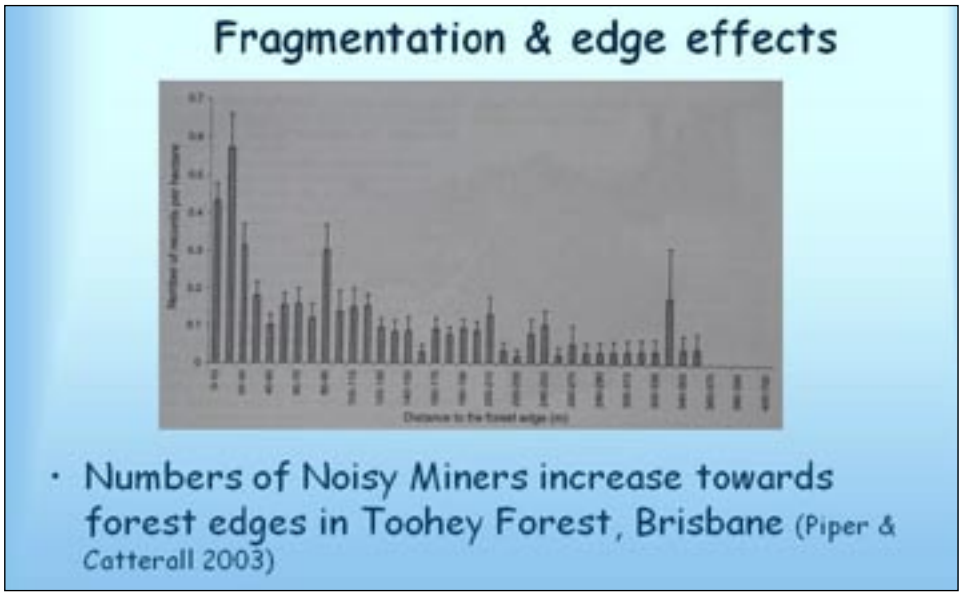

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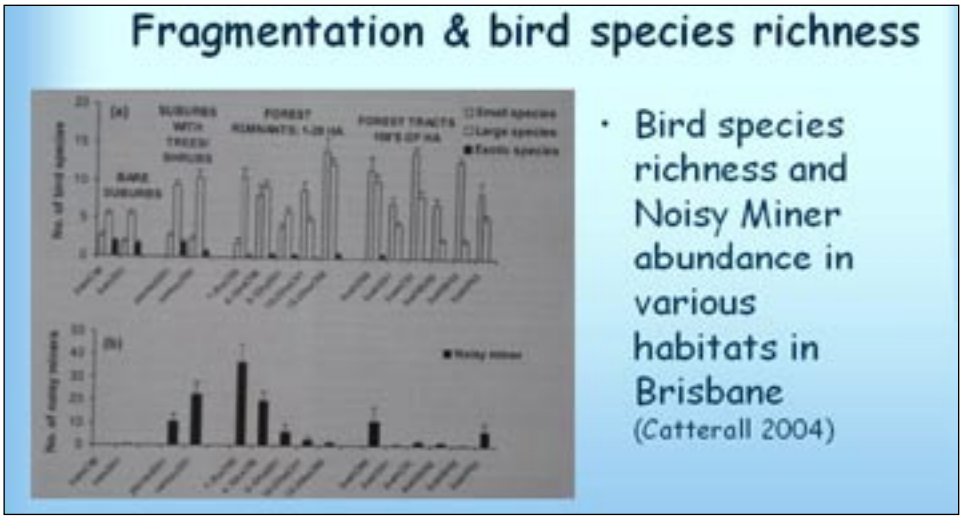

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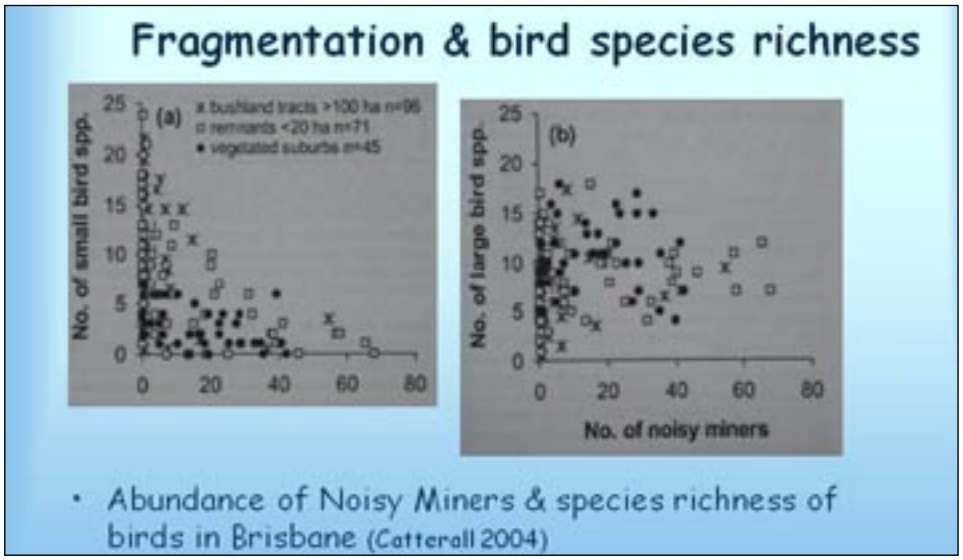

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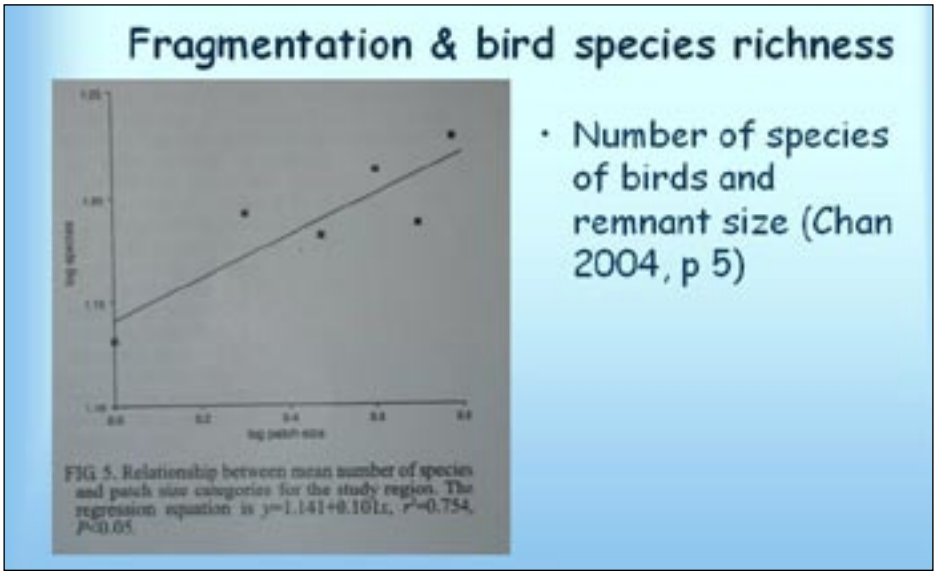

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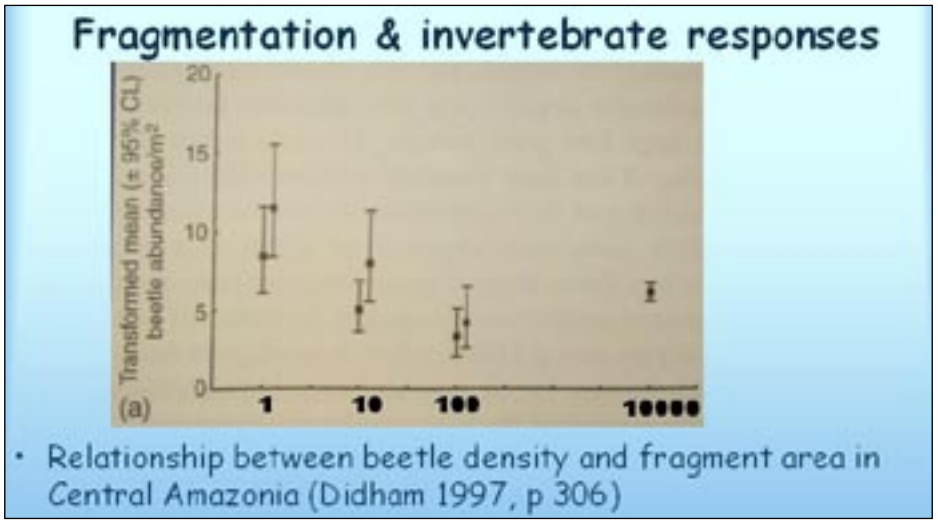

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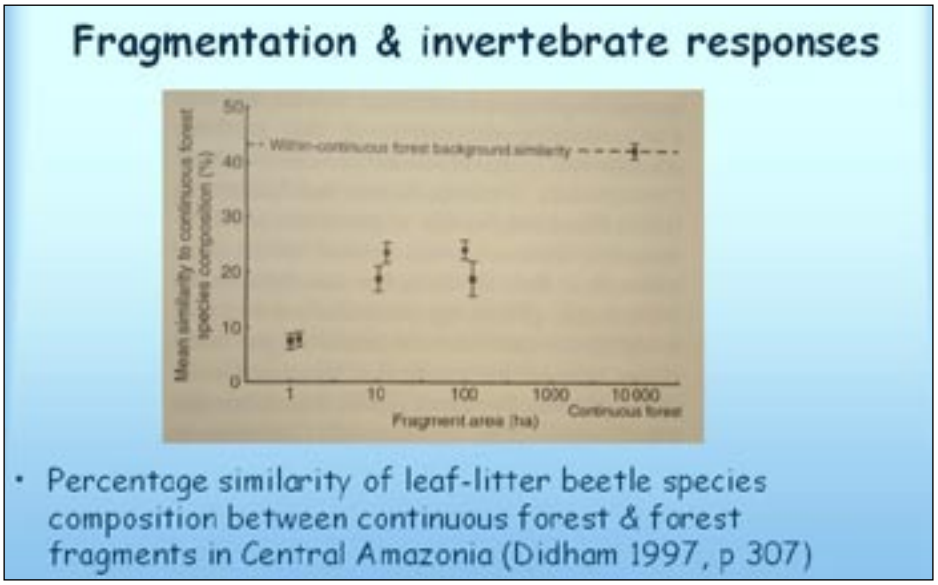

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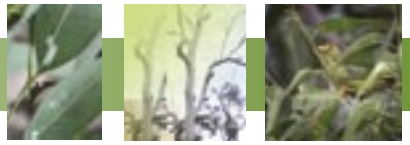

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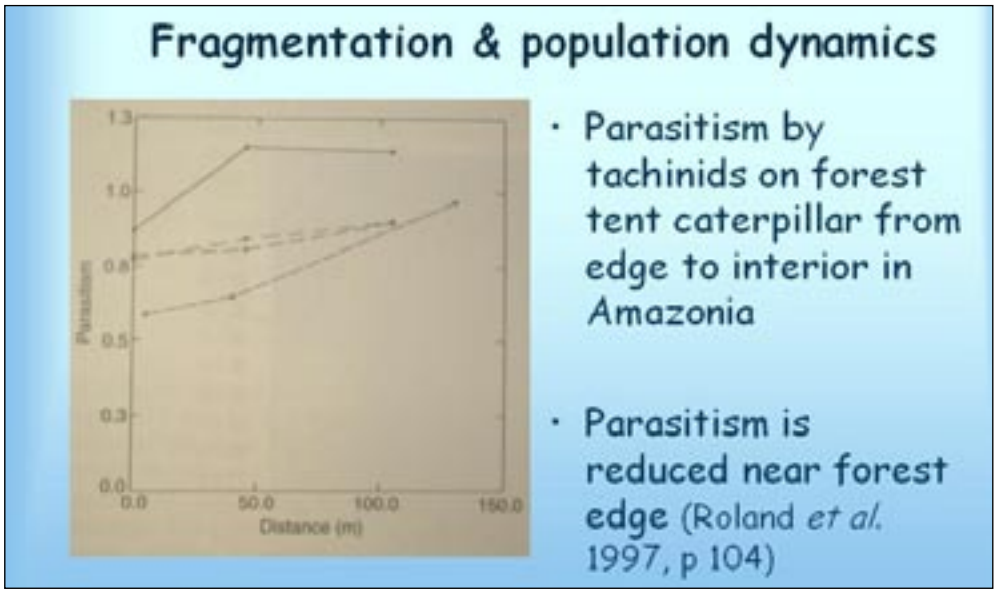

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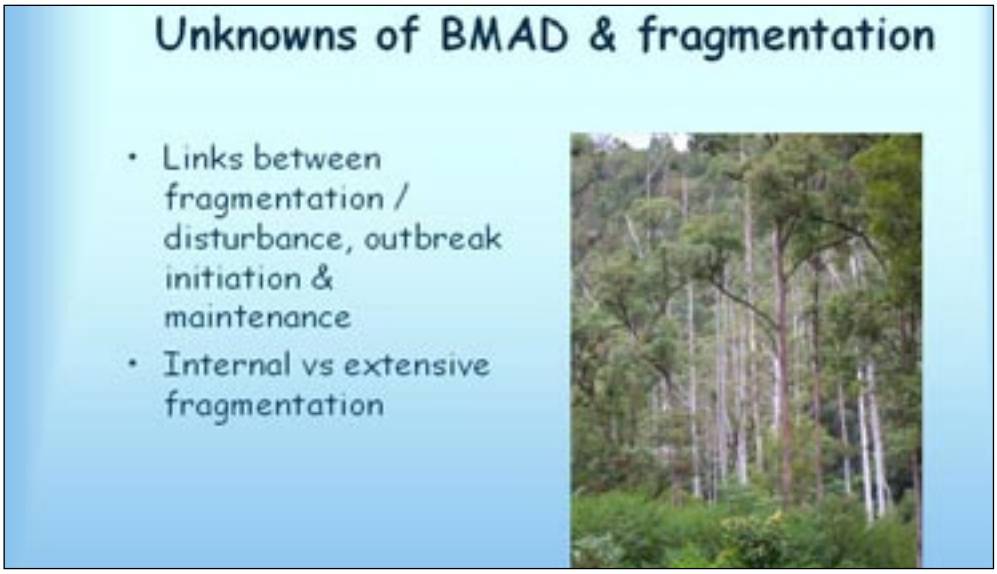

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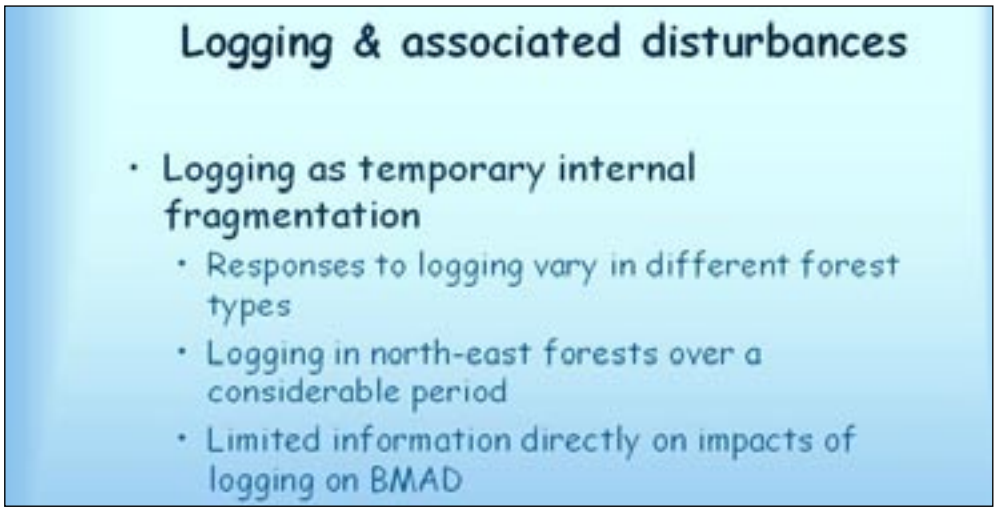

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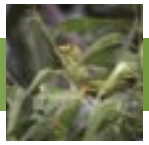

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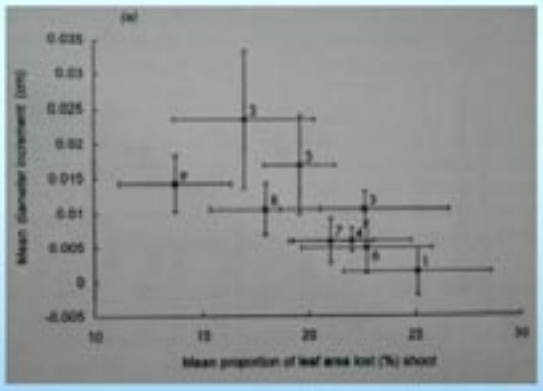
Insect herbivorey & decline of Black Box



- Diameter increment plotted against percentage of leaf area lost per shoot for *E. largiflorens* (Stone & Bacon 1995, p 559)

Slide 40

Logging & associated disturbances

- Scale (temporal & spatial), intensity, return times & forest type
  - Disturbs ground layer and soil
  - Opens overstorey (light)
  - Changes in forest structure
  - Convert to younger (more open) forest
  - Change hydrological relations
- Successional changes (e.g. structure)
- Silviculture as part of a solution

Slide 41

The Unknowns of logging & BMAD

- Psyllid outbreaks & changes in light intensity & leaf flushing
- The history of outbreaks
- Lack of research on logging impacts & BMAD (forest structure, floristics, bird composition, insect outbreaks, pathology)

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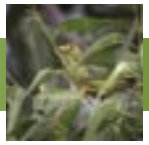

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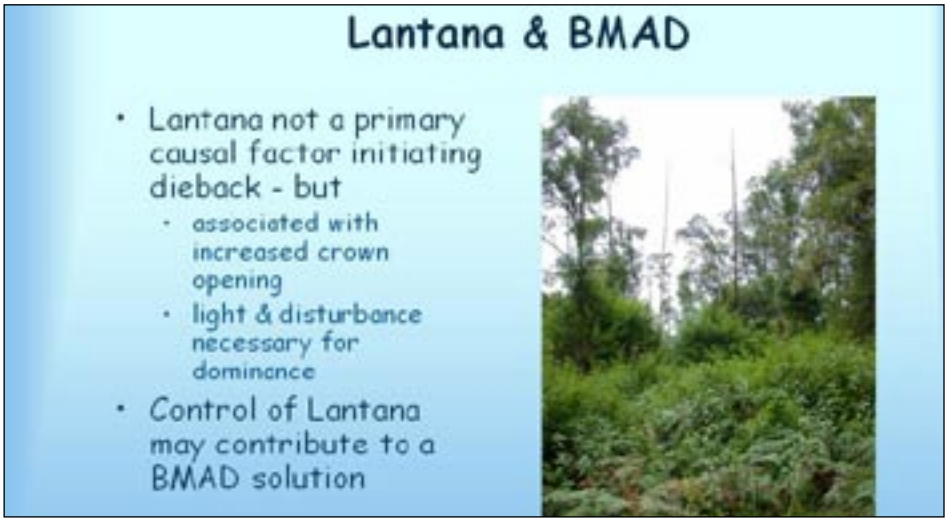

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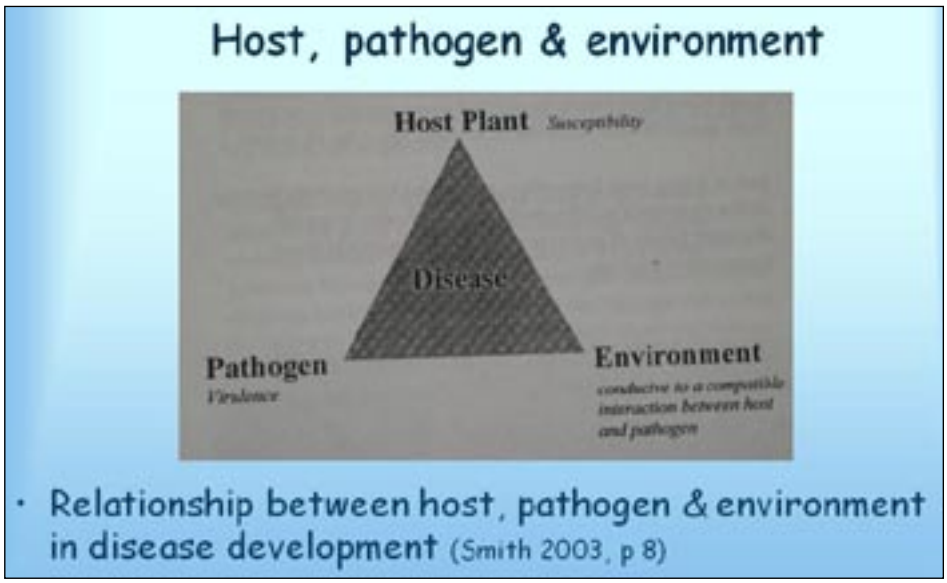

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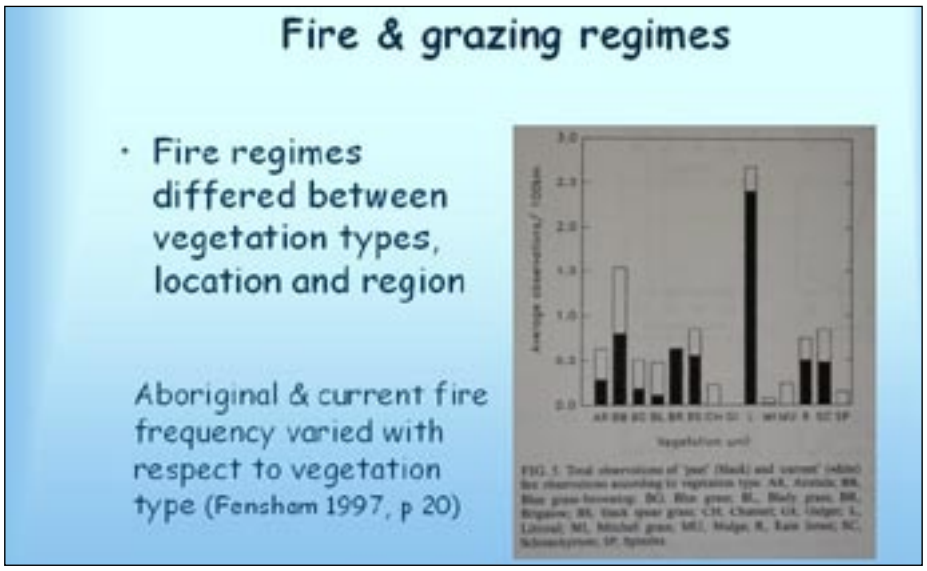

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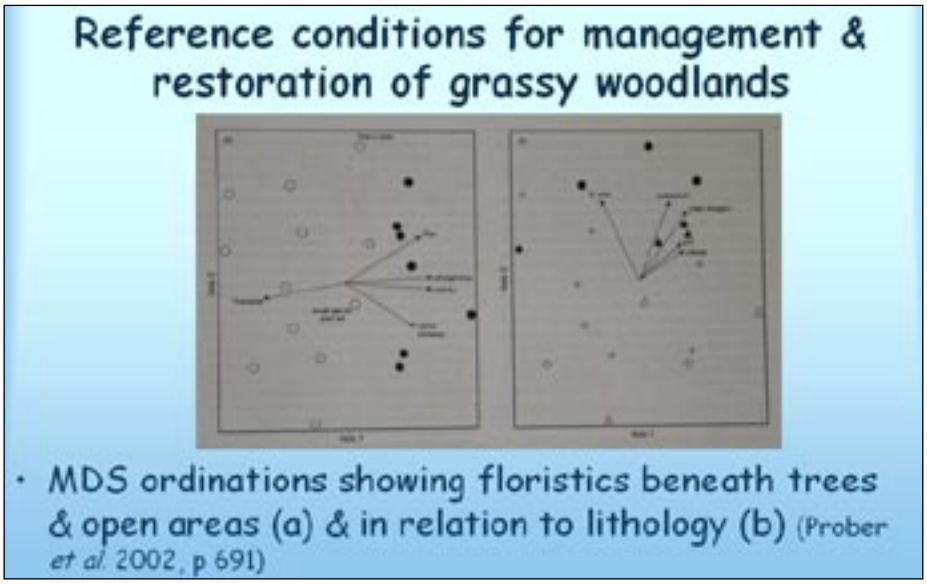

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Fire, nutrients & understorey

- Reduced fire incidence leads to increase in shrubs
- Dense shrubby understorey contributes to lower C/N ratio & nitrification
- More free amino acids result from nitrification
- Nitrification enhances desirability of eucalypt foliage to psyllids
- Frequent low-intensity fires associated with grassy understorey
- Produces litter of higher C/N ratio & reduced soil moisture

Slide 50

Fire & BMAD

- Fire amenable to landscape adaptive management trials
- Determine fire management objectives (what is desired)

Slide 51

Landscape adaptive management trials

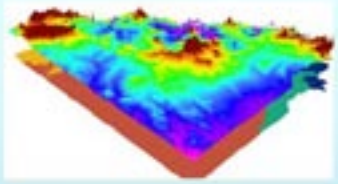
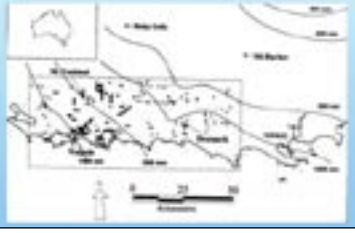
- 'Fire-induced habitat mosaics in south-west landscapes: The fire mosaic project' Burrows *et al.* 2003
- Management objective

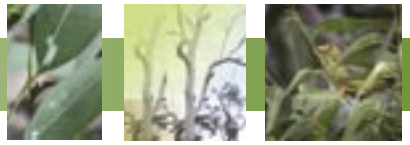
  'To use the frequent and planned introduction of fire into the landscape (patch burning) to create a fine-grained mosaic of interlocking patches of vegetation at different stages of post-fire development'

Slide 52

Research to support fire management objectives

- Monitoring & evaluation
  - Integrate quadrat-based; land class; and remote sensing data in a geographical information and decision support system
  - Resample quadrats 15 years since assessment to examine temporal change



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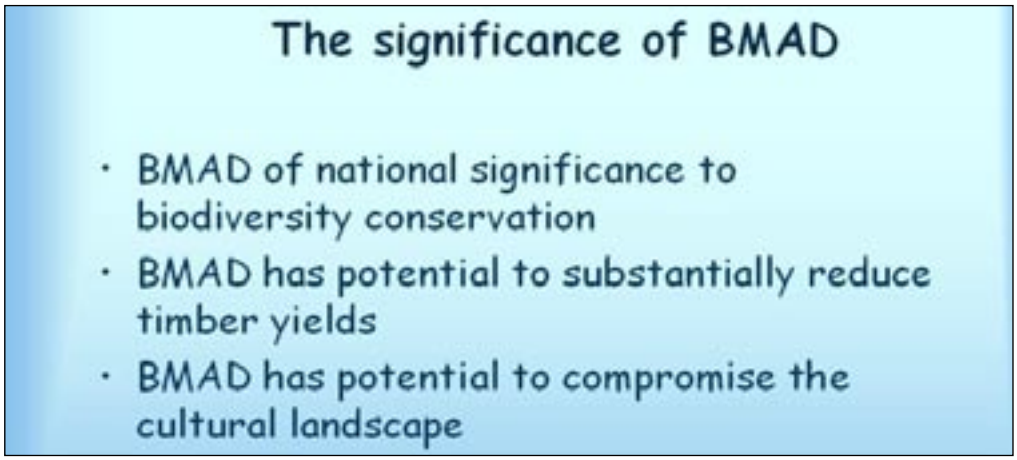

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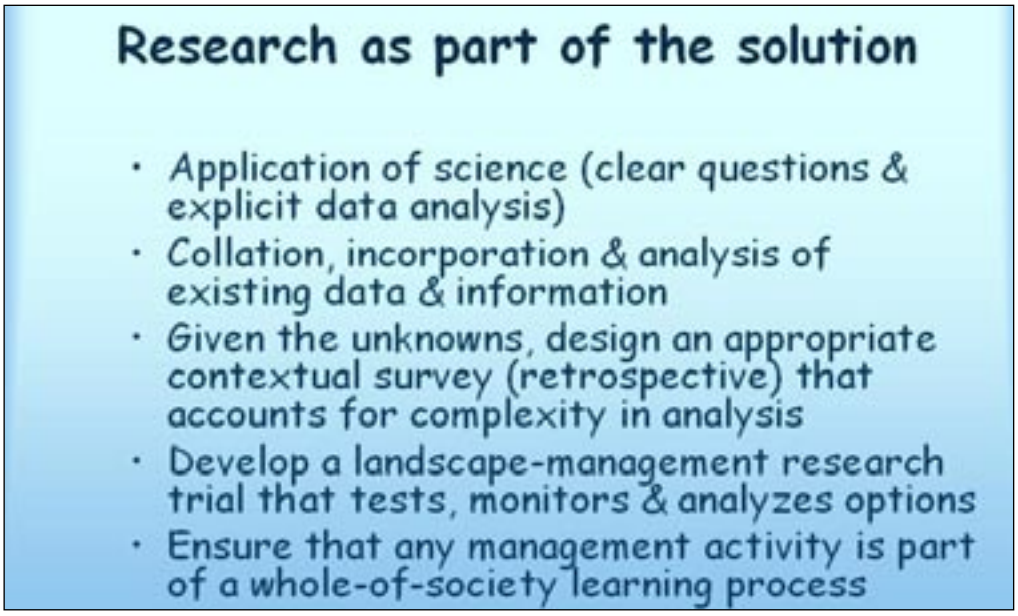

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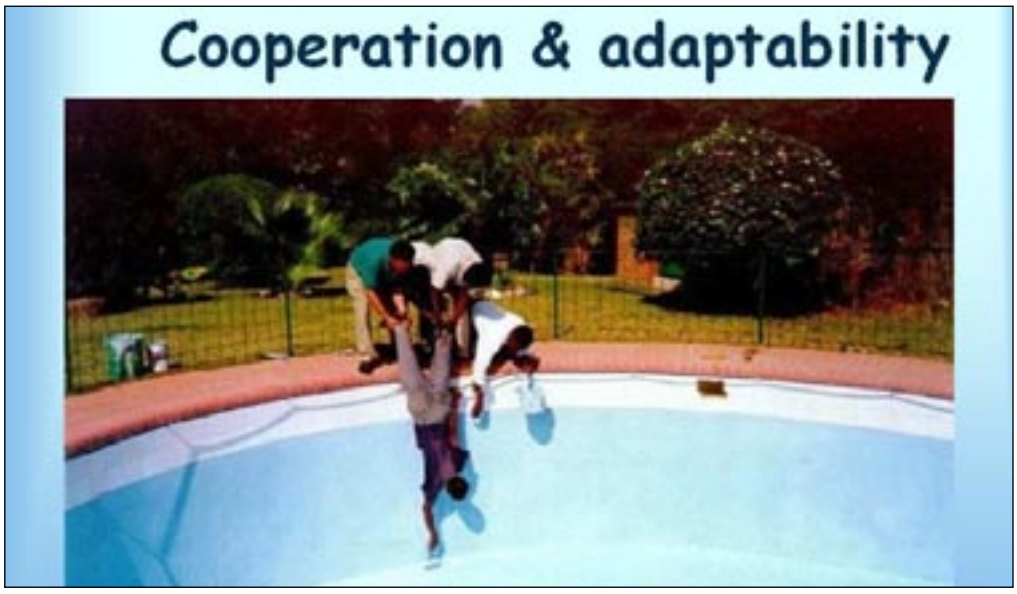

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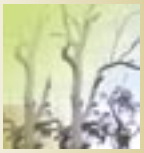
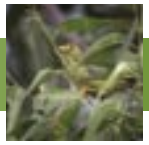


Bell miner Associated Dieback National Forum 2005

Session 3
Workshop Session

Defining Management Objectives,
Key Indicators and Management Actions



Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Workshop Process

Delegates were divided into 8 groups to answer the following questions. The results of the group discussions were sorted in to themes for Sessions 4 & 5.

Question 1: What do we want to manage these forests for?
Question 2: How do we know when we are successful?
Question 3: What might we do to achieve success?

Question 1: What do we want to manage these forests for?

Group 1 Responses

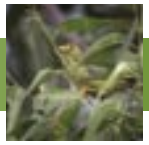
- Conserving biodiversity
- Sustainable timber production
- Sustainable land management
- Future generations
- Protect cultural values / cultural landscapes / use
- Protect threatened species
- Long term health and productivity
- Ecological sustainability
- Greenhouse / carbon sequestration
- Recreation opportunities
- Hydrology / catchment protection
- Economic values eg bee production

Group 2 Responses

- Maintaining healthy ecological processes
- Catchment protection for water production
- Species survival
- Retain future options
- Sustainable timber production for domestic use long term
- Long term maintenance of broad cultural use / values
- Recovery and prevention of poor health of forests
- Biodiversity conservation long term
- A proportion of the forests to be managed for commercial timber
- Maintenance of forests naturally dynamic ecosystems

Group 3 Responses

- Biodiversity preservation (landscape value)
- Sustainable timber production
- Landscape value
  - » water and yield quality
  - » soil conservation
  - » scenic value
  - » tourism
- Ecosystem function
- Improving forest health and viability - tourism
- Agricultural economics - grazing, bee keeping
- Protection of aboriginal values (policy)



Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 1: What do we want to manage these forests for?

- Protection of non-aboriginal cultural heritage
- Scientific value / research
- Social values - employment, recreation

Group 4 Responses

A Healthy ecosystem with many values

B Forest health
- structure
- function
- biodiversity
- extant species
- nutrient cycles

C habitat and species diversity

D manage for more mature age class

E full suite of forest values inherent in a healthy example of the forest types that occur in that area

F enhance long term timber production

G biodiversity

H Safe / rewarding experience for visitors

I Removal of lantana

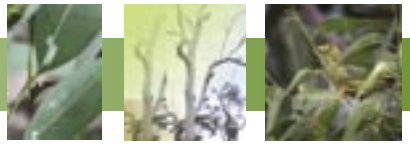
J Reduced Bell miner populations

K Broad scale experimental trials

L Reduction in visible / actual BMAD

Group 5 Responses

- Maintain ecosystems for forest health
- Conservation of biodiversity in perpetuity
- Maintenance or restoration of healthy, viable and natural ecological communities
- Ensure full range of forest diversity - vegetation communities
- Protection of natural (living and non-living) and cultural values and assets
- Protection of catchment values and ecosystem services eg water quality
- Manage forests for timber, tourism, and sustainable agricultural production
- Restoration of ecological and species diversity with special regard for fauna, flora, invertebrates etc
- Restoration of natural aesthetic values
- Habitat provision and corridors
- Maintain climatic stability



Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 1: What do we want to manage these forests for?

Group 6 Responses

- Maintaining native biodiversity
- Restore to healthy forest
- Ecologically Sustainable Forest Management
- Restore natural processes
- Focus on management to stop spreading
- Maintenance of forest health
- Restore forest health to greatest possible extent - rainforest, eucalypt
- Timber harvesting or not, where appropriate

Group 7 Responses

- Healthy forest (pre-dieback) benchmarked ecosystem } productive capacity;
- Healthy landscape function and integrity
- Biodiversity
- Maintenance of landscape health: clean air, water volumes, soil
- Amenity - recreation and visual
- Environmental and cultural heritage
- Sustainable resource management - timber
- Reflecting aspirations of local community
- Apiary
- Tourist utilisation
- Carbon cycle management
- Grazing
- Miscellaneous products

Group 8 Responses

- Ecosystem health / balance
- Ecological sustainability
- Return forests to health
- Economic sustainability
- Timber production
- Water quality
- Threatened species management
- Biodiversity
- Soil health
- No unintended negative impacts
- Reduce impacts of introduced pests
- Minimising erosion
- Air quality
- Protecting dominant species
- Aesthetic and amenity values
- Recreation
- Tourism
- Science and education

Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 2: How do we know when we are successful?

Group 1 Responses

- Biodiversity maintained / enhanced
- Rate of BMAD spread halted
- Timber production maintained / quality enhanced
- Production maintained sustainably
- Aesthetic values maintained
- No loss of sites / values
- Continued honey production
- Continued access to recreation opportunities
- Maintained water quality and quantity

Group 2 Responses

- Forest health will be when ecological health is more important than economic growth
- Need to develop performance indicators
- Future generations have access to domestic timber
- Long term employment
- Maintain forest types in 'original' condition
- Our children's children respect the decisions we make
- Susceptible forests will not decline to poor health and affected forests will commence recovery
- Biodiversity is maintained or improved
- Profit $
- Need to improve health of forests in their current locations

Group 2 Responses

- Forest health will be when ecological health is more important than economic growth
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Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 2: How do we know when we are successful?

Group 3 Responses

- Maintenance of native species 'comp' and population
- Knowing / defined key indicators
- Knowing indigenous species
- No weeds
- Restored healthy forests
- Timber - yield no declining products (species / size)
- Agricultural values sustainable
- Have well funded integrated monitoring
- Knowing and integrating aboriginal and social values

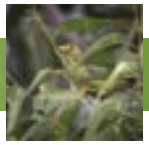
Group 4 Responses

F production relative to healthy forest (inventory - 4yr - 10yr - 40yr).
Move BMAD forest towards healthy
ALL baseline / benchmark data
D dbh relative to species, hollow formation
D being able to establish a 'causal' link to management actions
H implemented Risk Management Planning
H positive change to visitor feedback
K corporate commitment to experimental trials
I removal of 'predetermined' level of lantana cover

Group 5 Responses

- Definition of forest health needed
- Specific parameters to measure
  * Natural benchmark sites that are relatively undisturbed: structure, weeds, flora, and fauna
- Reduction in area of forest with crown decline
- No expansion of existing problem
  * Recognition that exclusion of fire is not natural
- Return of avian diversity and arboreal mammals
- Absence of Bell miners
- Regeneration initiation to displace lantana
- Reduction in the imbalance of scrubby forest over grassy forest
- Initiation of sufficient regeneration to enable restoration of forest structure
- Maintenance of existing levels of timber production
- Forest health parameters to be measured: canopy condition, abundance of Bell miners and psyllids, level of regeneration using target species, abundance and diversity of flora and fauna, nutrient cycles for underlying edaphic conditions, water quantity and quality, weed levels, feral animals
- Visitor satisfaction

* *part of monitoring actions*



Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 2: How do we know when we are successful?

Group 6 Responses

- When major indicators eg BMAD, bellbird, psyllid populations, forest structure indicators including understorey / mid storey densities, tree stress, hydrological….
- Stabilising / reducing area affected

Group 7 Responses

- Forest structure
- Native species complexity
- Regeneration / recruitment - flora & fauna; native species; weed species
- Interactions - nitrogen cycling, hydrology
- Containment / decline in spread of BMAD - are affected
- Range of ecosystem conditions present
- Canopy health indicators (ref. C.Stone)
- Increase / decrease product
- User satisfaction
- Uptake by agencies to try new approach
- Community satisfaction
- Need targets / benchmarks

Group 8 Responses

Declining areas of BMAD - forests returned to health

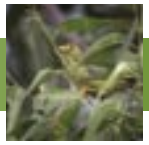
1. **Biodiversity (account for short and long term fluctuations / change)**
- Avoid biodiversity loss within management area
- Management for key species
- Maintain appropriate diversity in ecological communities
- Appropriate management of BMAD
- Results
- In small and stable populations of Bell miners

2. **Economic**
- Survival and growth of millable trees (appropriate species)
- No reduction in numbers and visitor satisfaction of tourists in benchmark sites
- Survival and growth of trees for other economic purposes with required characteristics intact
- No unintended negative consequences
- Re-establishing structure of forest

3. **Environmental Services (soil, air, quality, water quality etc)**
- No decline in stream water quality and quantity leaving affected areas
- No new pathogens
- Maintenance of soil health, structure, chemistry

4. **Cultural**
- Community satisfaction
- Declining complaints

5. **Restoration**
- regeneration



Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 3: What might we do to achieve success?

Group 1 Responses

- Soil chemistry / nutrient studies
- Gather more information
- Develop a jointly funded / government / timber industry research organisation to address the issue
- In north east NSW seek representative sample of BMAD affected sites for research across tenures
- Research to monitor, collate data, publicise, solicit outside comment / information, re-collate, use again in the field
- Research and monitoring programs in place for flora and fauna diversity and abundance
- Expand the area of study, i.e. the rest of the State. We nee to know how big the problem is
- Undertake flora / fauna / cultural heritage site surveys to identify 'what' is there
- Measuring biodiversity values - healthy and unhealthy forests
- Mapping / monitoring crown condition

Group 2 Responses

- Initiate and support research and monitoring programs to measure performance criteria
- Establish benchmarks
- Map the affected BMAD areas
- Identify susceptible BMAD areas (hazard rating maps)
- To develop management methods that control / prevent BMAD

Group 3 Responses

- Adequate resources to do the job
- Need to have site specific information
- Ask the 'right' scientific question
- Integrate science and management
- Rigorous baseline data measured against species 'comp' and population
- Change policy settings and protocols for protection of aboriginal values
- Link silviculture and land management options
- Re-establish fire regime
- Weed control
- Minimise unnatural disturbance
- Remove bureaucratic obstacles (context dependence)
- Education program for community awareness and involvement

Group 4 Responses

- Establish the cause(s) of BMAD (ref. Experimental trials)
- Comprehensively identify, map and describe all BMAD affected forests in NSW

Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 3: What might we do to achieve success?

Group 5 Responses

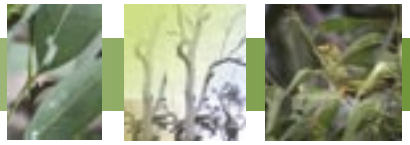
- Science information needs to be site specific
- Rigorous baseline data measured against species composition and population
- Diversify actions pending research results - don't allow situation to expand / get worse by ignoring the obvious short term management
- Research into past fire regime and links between Bell miner populations and psyllids
- Identify structural and physical attributes that encourage Bell miner proliferation and undertake trial manipulations of these attributes to find effective control measures
- Give priority to old-growth, riparian and other key forest habitat areas for on-ground BMAD control initiatives

Group 6 Responses

- Research each of the key themes - fire, logging, weeds, natural process? And research how they relate to each other
- Conduct research trials into each variable
- Establish actual cause(s)
- Understand the causative factors involved. No management objective can be achieved without reducing this unknown
- Undertake adaptive management trials at a landscape scale
- Research casual factors
- Moratorium on logging in forests at risk
- Proper risk assessment strategy
- Management trials to be properly designed and implemented with scientific rigour (and peer review), on a limited basis. Results then lead to different / same management trials (adaptive management)
- Stop being eucalypt obsessed an d do more rainforest regeneration
- Adaptive management approach be the basis for a range of actions to be taken - used and assessed / monitored
- Patch enrichment planting with species likely to be resistant - with planting at, or thinning to wide spacing - to develop a more woodland type structure in the long term
- Investigate ways of modifying changed soil nutrient status (nitrogen?) which may trigger psyllid outbreaks
- Know how the problem is being created and perpetuated

Group 7 Responses

- Make use of good experimental design in management to integrate outcomes
- Map and predict spread
- Identify forestry and other land use practices that are contributing to BMAD and change methods
- Establishment of benchmarks / reference sites in 'healthy' forests / landscapes
- Identify current extent of problem
- Develop standard monitoring methodology
- Protected (fenced) areas in each catchment
- Change nutrient status (eg fertilise)
- Manage soils as a biological (living) entity



Session 3 - Workshop Session - Defining Management Objectives, Key Indicators and Management Actions

Question 3: What might we do to achieve success?

Group 8 Responses

Biodiversity

- Keystone species identified
- Increases in threatened species
- Decreases in weed species

Economic

- Regeneration and survival of canopy eucalypts in previous dieback sites
- Halt spread of dieback
- Return productivity to previous levels
- Develop management regimes to cure dieback and increase productivity

Environmental Services

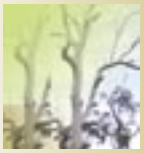
- Measure water quality
- Reduce nutrient build up in soils (i.e. NH_4^+)

Cultural

- Have happy campers after visits to our forests

Additional Notes:

- Replicated management treatments across multiple sub-catchments
- Infrequent, extensive canopy fires
- Frequent burning
- Control lantana
- Bell miner culling
- Eliminate exotic species eg lantana
- Reduce stress on canopy trees
- Reduce area of young foliage in canopy
- Reduce Bell miners - kill them
- Reduce lantana
- Weed control - bush regenerators
- Investigate why psyllids attach trees
- Use of fire over large areas
- Measure what are some of the factors in a healthy forest to act as a control
- Allow some areas to remain untreated
- Establish several large plots and treat with different techniques to deal with weeds
- Plant eucalypts
- Encourage rainforest establishment
- Small areas of restoration - which give short term success
- Monitor eucalypt growth, survival and leaf canopy state
- Monitor biodiversity (key species populations)
- More funding for active management (bush regeneration)
- Managing or finding seed banks for disturbed areas which do not have seed banks
- Measure status quo of BMAD on a management area basis re tree health biodiversity, environmental services, cultural values
- Calculate and model future status of BMAD
- Obtain funding to carry out biodiversity, economic, cultural and restoration criteria highlighted in Question 2
- Carry out interventions / actions to control BMAD
  a) remove Bell miners
  b) manipulate understorey (fire, physical)
  c) restoration planting
- Measure response and effect of intervention on area, economy, culture



Bell miner Associated Dieback National Forum 2005

Session 4 & 5
Workshop Session

Deriving Management Linkages

Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Workshop Process

Sessions 4 and 5 involved delegates working in eight themed groups. These themes were derived from the outcomes of the previous Session 3 and delegates nominated which group they wished to work in.

Theme 1 - Weed Control
Theme 2 - Fire Management / Regimes
Theme 3 - Bell miner and Psyllid Management
Theme 4 - Forest Production Management
Theme 5 - Regeneration and Restoration
Theme 6 - Education and Learning
Theme 7 - Policy, Process and Coordination
Theme 8 - Risk Assessment

The **objectives** of these Sessions were:

- To identify specific management actions
- To identify impacts on the forest
- To relate actions to management outcomes

These objectives were then broken down into three key **questions**:

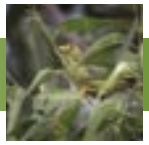
1. What (theme) related things do we need to do to prevent or control BMAD in affected and potentially affected forests?
2. How will these things impact on the forest?
3. How will these impact on BMAD?

Each action identified in the process was then **ranked** according to its importance using the descriptors “high”, “medium” or “low” for the following questions:

1. What is the quality of existing information?
2. What is the level of influence on the outcome?
3. What is the feasibility of filling the information gap?

The final task in these sessions was to **evaluating the linkages**. This was done using the following scale:

1. already tested
2. likely, worth testing
3. uncertain, research needed
4. possible, too difficult to test
5. unlikely, not worth testing



Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 1: Weed Control

Consider 2 broad forest types

- DRY - grassy, fire history. Use fire as a tool
- MOIST - control weeds to re-establish mid-storey

1. Establish / research links between weeds (lantana) and BMAD
   What is role of weeds
   Mapping
   - impact on nutrients
   - micro-climate
   - habitat for Bell miners

➔ already tested

2. Try helicopter spraying 4:1

➔ likely, worth testing

3. Integrated approach
   - with fire
   - mechanical, cultural, chemical

➔ likely, worth testing

4. Seasonality / trial burning

5. Address nursery distribution through BFNS. Remove lantana from sale

6. Identify target weeds (lantana, cissus, vines, others?)

➔ already tested

7. Bio-control - investigate options

➔ likely, worth testing

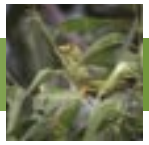
8. Test 3 strikes and out mechanical control theory

➔ likely, worth testing

9. Determine through trials the most cost-effective lantana control -- Best Management Practices. (consider cross tenure issues)

➔ likely, worth testing

10. Agencies: Practice looking for opportunities
    - responsive control actions (e.g. after fire)
    - incorporate into Best Management Practice



Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 1: Weed Control

➔ uncertain, research needed

11. Manual control

12. Limit disturbance / logging / canopy removal in at risk and affected areas

➔ uncertain, research needed

13. Limit spread of weeds through management activities.
e.g. washing vehicles etc; minimise disturbance

➔ uncertain, research needed

14. Consider other possible mechanisms of tree stress. Eg. exotic grasses, monoculture

➔ already tested

15. Maintenance of control and rehabilitation sites

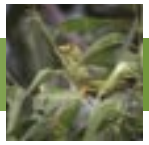
➔ likely, worth testing

16. Encourage local councils to address environmental as well as noxious weeds
- through NCWAC (North Coast Weeds Advisory Committee?)
- National Lantana Management Group
- Rural Lands Protection Boards
Seek consistency of approach

➔ uncertain, research needed

17. Establish / ensure regeneration of native species following control

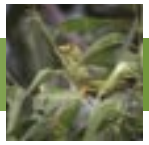
➔ uncertain, research needed



Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 1: Weed Control

	Impacts on Forest	Impacts on BMAD
Research into links, target weeds & bio-control options	• Identify factors critical to forest health and long-term health improvements • Short-term disturbance at trial sites (if involving trial) • Spin-offs for other forest threats • Improved knowledge generally	• Fixed • Eliminated • Improved knowledge to target real causes and provide more effective control
Control Activities	**Helicopter spraying and other chemical controls** • Impacts on non-target species (flora and / or fauna) • Social impacts (objections) • Cost (resource hungry) • Effects on bird species composition (hopefully positive) • Habitat removal / change • Soil and water impacts from broad-scale • Mechanical • Damage to non-target species • Soil disturbance • Effects on bird species composition (hopefully positive) • $ hungry • Impacts on Aboriginal cultural sites • Habitat removal / change • Soil and water impacts from broad-scale • Burning • Impacts of too frequent burning - changes species composition and soil nutrients • Potential escape to wildfire • Burning fauna • Impacts on changing regeneration forest type (burning or not burning) • Habitat removal / change • Soil and water impacts from broad-scale	• Restoring forest structure, removing dense under-storey of lantana in dry sclerophyll forest, re-establish mid-storey wet forest. Bell miners not controlling site • Disruption of Bell miner habitat and nesting sites • Benefits forest resilience • Improves forest health • Recruitment of native species • Reinstatement of natural predators • Restore / maintain shrub species diversity? (may initially be less significant than structure)
Administration / Management Arrangements	• Reduced intensity and extent of spread of weed invasion • Improved forest health • Cost effectiveness + more funds • Feed back of information + improved management • Improved awareness + reduce establishment of weeds • Reduce damage because more timely response • Improve awareness and attention of managers • Improved biodiversity, threatened species	• Reduce spread of weeds + stop spread of BMAD • Results in controls, coordination, consistency across tenures / borders + more effective control • More timely identification of problem sites (at risk, new or existing hot spots) from sharing information



Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 1: Weed Control

Evaluation	Control Activities		Admin / Management Arrangements		Research Activities
1	• Regenerating mesic forest at management scale • Dry forest (fire in grassy forest)	L L	• Management techniques • Coordination (cross tenure & borders)	H (+) weed control L BMAD control (not telling) H	
2	• Regenerating mesic forest at management scale • Dry forest (fire in grassy forest)	H? H?	• Management techniques • Coordination (cross tenure & borders)	H? H	
3	• Regenerating mesic forest at management scale • Dry forest (fire in grassy forest)	H H+ M aerial	• Management techniques • Coordination (cross tenure & borders)	H / M H	
Ranking	• Regenerating mesic forest at management scale • Dry forest (fire in grassy forest)	2 / 3 2	• Management techniques • Coordination (cross tenure & borders)	2 / 3 1 / 2	

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Theme 2: Fire Management / Regimes

Fire Management - Possible Action	**How will this impact the forest?**	**How will this impact on BMAD?**
1. Undertake frequent burning immediately prior to Bell miner breeding season	• Simplify understorey structure. Decrease understorey / canopy cover • Reduce habitat for smaller non-aggressive birds • Initial impact upon non-target flora and fauna species • Creates a naturally occurring mosaic burn pattern • Potentially increase erosion	• Improved tree health leads to decreased psyllid population, then decreased bellbirds • Could lead to increase in number of bellbirds
2. Establish and implement burn mosaics across fire dependent communities across the landscape	• Increase diversity, structure and composition • Initial impact upon non-target flora and fauna species • Creates a naturally occurring mosaic burn pattern • Potentially increase erosion	• Improved forest health leads to decreased psyllid leads to decreased bellbirds
3. Reintroduce frequent low intensity fire regimes in the landscape	• Creates a naturally occurring mosaic burn pattern	• Improved tree health leads to decreased psyllid population which leads to decreased bellbirds
4. Use appropriate fire as a tool to reduce lantana	• Increase diversity of mid-storey / understorey • Potentially increase erosion	• Leads to increased forest health therefore deceased psyllid and bellbird populations

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Theme 2: Fire Management / Regimes

EVALUATION				
	What is the quality of existing information?	What is the level of influence on the outcome?	What is the feasibility of filling the information gap?	Ranking
Undertake frequent burning immediately prior to Bell miner breeding season	L	L	H	3
Establish and implement burn mosaics across fire dependent communities across the landscape	H	M	H	2
Reintroduce frequent low intensity fire regimes in the landscape	H	M	H	2
Use appropriate fire as a tool to reduce lantana	M	H	H	2
Investigate various fire regimes with regard to site specific variables	M	M	M	2
Design monitoring programs to investigate effects of burning and non-burning over a long period	H	N/A	H	1
Understand the effect of various fire regimes through adaptive management in affect forests	M	H	H	2

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Theme 3: Bell Miner & Psyllid Management - Evaluation

1. Quantify Bell miner population status - colonies, etc
2. Understand differences between BMAD and non-BMAD areas and bird populations
3. Manage forests for minimal 'discriminating' disturbance to reduce Bell miner and psyllid population increases
4. Priority and Bell miner and psyllid control in critical areas - threatened species, other values, etc (maybe consider holding pattern approach)
5. Does removal of Bell miners result in control of psyllids (and vice versa)
6. Link 'actions' with 'research'
7. Investigate possible role of alternate habitat structures (fire, nutrients, hydrology, disturbance, invertebrates, vertebrates, species composition, pathology) on Bell miners and / or psyllids. Options: Do nothing or revert or rainforest
8. Investigate hydrological links to BMAD areas

All research to include replicated treatment / control approach including BMAD and non-BMAD (and management areas)

9. Investigate possible role of alternate fire regime in minimising BMAD in susceptible areas (possible preventative)
10. Look at historic change in land management (positive / negative change in canopy / vegetation species) to refer to BMAD status. Grazing, fire, timber, bees, etc
11. Map affected and susceptible forest types
12. Investigate psyllid population dynamics (sensitive factors for big changes)
13. Investigate other psyllid predators, etc
14. Develop and test alternate models of BMAD development
15. Research Bell miner and psyllid biology
16. Find out what factors affect Bell miner occupancy of forest
17. Do stratified research.

Bell miners ⇄ Psyllids at different densities etc

Research and / or monitoring must be an intrinsic component of management (the scale related to management imperative and resources and skills)

Check acceptability / viability of treatments

Plan ahead

Modify Habitat

- Herbicide removal of scrub layer
- Mulch lantana, etc (tritter)
- Remove artificial water supply
- Restore / develop mid-storey (vegetation structure)
- +/- supplementary planting of non-susceptible, locally appropriate canopy species?

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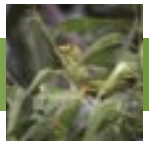
Theme 3: Bell Miner & Psyllid Management - Evaluation

	What is the quality of existing information?	**What is the level of influence on the outcome?**	**What is the feasibility of filling the information gap?**	Ranking
Removal of psyllids from BMAD forests: • insecticide (aerial appl)? • Insecticide (stem injection) • other methods of removal (nutrient shifts etc)	M (other horticult/silv) L (in forests) L + M	H	H ? (may be very hard to achieve)	2
Modify habitat - Lantana Control (need to consider much wider range of habitat modification treatments)	L	M	H	3
Modify fire regimes: • stratify frequency / intensity • plan contingencies for wildfire • explore extreme fire regimes NB: need protocols for monitoring by non-scientific skilled people for unplanned / opportunistic sites and / or events	L - M	M (uncertain, maybe L)	H (H - M)	2 (maybe 3)
Removal of Bell miners • shooting • trapping	L - M (available papers are of limited applicability)	M	H (subject to being well planned and located)	2



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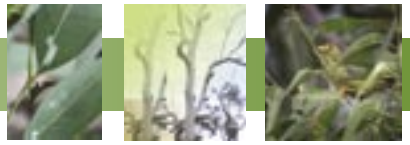
Theme 4: Forest Production Management

	What is the quality of existing information?	What is the level of influence on the outcome?	What is the feasibility of filling the information gap?	Ranking
1. Logging moratorium on BMAD susceptible forests (not management moratorium) • while rigorous adaptive management trial undertaken • with sound silviculture management practices in relation to BMAD	H / M	H	H	2 / 3
2. Management of forest canopy retention / damage/ structure	L / M	H / M	H / M	2
3. Aggressive forest restoration through clearing / high temperature fire / spraying and ongoing maintenance and evaluation	L	H / M	H	2 / 3
4. Thin stressed / over stocked forests more for timber and grazing production	M	L / M	M / H	2
5. Reduce industry economic pressure	M / L	H / M	H / M	1 / 2
6. Obtain / attempt to correlate BMAD logging relationship SCIENCE				



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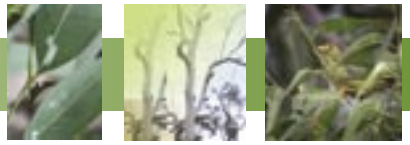
Theme 4: Forest Production Management

Possible Action	How will this impact the forest?		How will this impact on BMAD?	
	Positive	**Negative**	**Positive**	**Negative**
1. Logging moratorium on BMAD susceptible forests	• Retain some eco-system process • For genetic providence • Minimises potential for BMAD spread	• Loss of production • No impact on areas of National Parks or those not being harvested • Reduce opportunities to restore forest logging infrastructure (roads = access)	• Time to better understand BMAD process • Unknown • Achieves adaptive management	• Promote BMAD unabated • Unknown • Logging compounds BMAD
1. Management of forest canopy retention / damage/ structure through better BMAD friendly logging practices to mimic natural processes	• Maintain forest structural integrity • Achieve productive forest	• Long term forest degradation • High cost of production	• Undefined	• Undefined • Prevent BMAD outbreak
2. Aggressive forest restoration through clearing / high temperature fire / spraying and ongoing maintenance and evaluation	• Allow eucalypt recruitment • Increase productivity • Zones of land use - options forestry	• Tried and failed potential to change ecosystem • Until trialed, more ad hoc, not adaptive management plantation	• Reduce BMAD by healthier trees and less nesting opportunities	
3. Thin stressed / over stocked forests more for timber and grazing production	• Healthier trees • More grazing		• Less shrubbing-up (BMAD habitat)	
4. Reduce industry economic pressure. Political / agency cultural change (new blood at top)	• Allows forest time to breathe	• Less money for people		
5. Obtain / attempt to correlate BMAD logging relationship SCIENCE				



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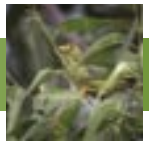
Theme 5: Regeneration & Restoration

	What is the quality of existing information?	What is the level of influence on the outcome?	What is the feasibility of filling the information gap?	Ranking
Define aims				
Undertake site assessment to predict outcomes (A)	M	H	H	1 / 2
Develop predictive models (A)	M	H	M / H	2
Develop list of parameters (A)	M	H	H	1 / 2
More emphasis on assessing soil physical and chemical properties (variable across regions, acidity, salinity values - degree of degradation) (A)	M / H	H	H	2
Identify priority sites (ground based) (A)	M / L	H	H	2
	H	H	H	1 / 2
Determine severity of problem (A)	H	H	H	1 / 2
Develop overall strategies as well as specific techniques (P)	M	H	M	1 / 2
Ensure consideration of fauna values (P)	H	H	H	1 / 2
Develop universal principles to restore or regenerate BMAD areas (P)	M / L	VH	M	2 / 3
Consider forest structure goals (P)	M	H	M	2
Ensure adaptive management approach (P)	H	H	H	1
Ensure ongoing simple, effective monitoring (M)	H	H	H	1
Consider time factor constraints (P)	Don't know	-	-	Footnote
Apply integrated pest management (P)	H			
Identify source of funding (F)	Don't know	VH	H	2
Consider constraints of agencies (F/P)	Refer to policy			
Secure long-term funding to implement (F)	Don't know	VH	H	2
Re-introduction of key absent features (R)	M	H	H	2
Incorporate into other BMAD actions (fire, weeds) (R)	M	H	H	2
Incorporate into public and private logging operations (R)	L	H	M / H	2
Incorporate local BMAD resistant species (R)	M	H	H	3
Incorporate into bush regeneration (E)	Footnote	H	Don't know	2
Educate landowners (E)				

Above letters were not explained.
Following is a possible key

A aim
P planning
M monitoring
F funding
R restoration / regeneration
E education



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Theme 6: Communication, Education & Learning

1. All key stakeholders to have the same key messages

Quality of Information	low / medium
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

➔ likely, worth testing

2. Incorporate the BMAD message in to the whole environmental message

Quality of Information	high
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

➔ likely, worth testing

3. Develop a monitoring kit. What it is used for (eg weeds); who is it targeting

4. Target different sections of society by different methods

5. Develop a school kit

6. Mobile extension / education officers in community regularly (links with (9) below)

7. Communicate success / failure to all stakeholders. Eg Landcare, bird groups, community newsletters / papers

8. Develop a plain English brochure on BMAD

9. BMAD extension officer

Quality of Information	low / medium
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

➔ uncertain, research needed

10. Develop interpretive signs

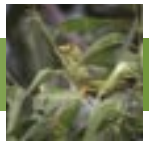
11. Encourage university students to research / do assignments / monitoring on BMAD

12. Identify distribution points for brochures

13. Encourage BMAD funding (links with (19) below)

Quality of Information	?
Level of Influence on Outcomes	high
Feasibility of filling in information gap	low

➔ uncertain, research needed



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Theme 6: Communication, Education & Learning

14. Website for BMAD information - people can add info / data to it. Chat room

15. NPWS discovery Program into schools

16. Aboriginal State Land Council to distribute information to the Land Councils about BMAD

17. Video / DVD on BMAD

18. To build a timeframe into educating / learning

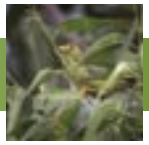
19. Interpretation Strategy (links with 1, 3, 4, 5, 8, 10, 12, 14, 16, 18)
    Quality of Information high
    Level of Influence on Outcomes high
    Feasibility of filling in information gap high
    ➔ likely, worth testing
    (enabling the community)

20. Need for basic biological information / resources re BMAD
    Quality of Information medium
    Level of Influence on Outcomes high
    Feasibility of filling in information gap high
    ➔ already tested

21. Think about experimental design
    Quality of Information medium
    Level of Influence on Outcomes high
    Feasibility of filling in information gap high
    ➔ likely, worth testing
    (identify successes / failures)

22. Support for BMAD Working Group
    (enable the stakeholders)

Notes:
- Know the steps to take and when to take them
- Manage expectations
- Better forest health leads to a decrease in BMAD



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Theme 7: Policy, Process & Coordination

Existing policies etc

- Native Vegetation Act (Property Vegetation Plans)
- National Parks & Wildlife Act and Schedules
- Integrated Forest Operations Agreement (Threatened Species licences, rules for logging in native forest)
- LA Act (noxious weeds etc)
- Threatened Species Conservation Act
- Clean Waters Act (pollution etc)
- State Environmental Planning Policies
- Not working for indigenous people

Statewide Priority Mapping and Research

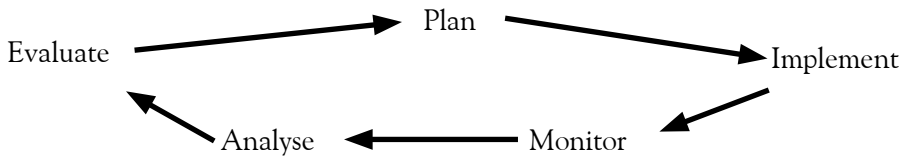
Quality of Information	high
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

- Statewide issue
- Ground-truthing
- Oral histories (local current and past)
- "Establish the 2005 BMAD status quo"
- Map (remote sensing) of BMAD affected and at risk forests - should be #1 priority
- Correlate BMAD mapping with data such as logging history, fire history, geology, topography
- Gain comprehensive knowledge of the true extent of the problem state-wide, to pinpoint priority areas for experimental trials and / or control activity

Establish a culture of learning and adaptive management

Quality of Information	high
Level of Influence on Outcomes	high
Feasibility of filling in information gap	low

- Deal with constraint of Government wood supply agreements
- Long term cost benefit analysis: analyse against short term economic constraints
- Acknowledge demands of the market
- Acknowledge holistic issues re supply/demand
- Find an influential champion
- Embed culture of learning through adaptive management into government agencies
- Commitment to active adaptive management approach
- Use adaptive management cycle to unify the approach across government



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Theme 7: Policy, Process & Coordination

Policy / Regulatory Framework

Quality of Information	medium
Level of Influence on Outcomes	medium
Feasibility of filling in information gap	medium

- Include in Property Vegetation Plans code
- 3 year Investment Strategy and Catchment Action Plan for Catchment Management Authorities
- link to Australian Government 5 key priorities for research ("economic benefit")
- Ecologically Sustainable Forest Management (integrate)
- Logging moratorium in BMAD affected and at risk forests (low feasibility)
- Establish BMAD policy
- Make / write new NPWS / TSC Act Regulations re schedule 10(?)
- Approval for direct BMAD eradication
- Relate current Local Government Areas / Rural Land Protection Boards to BMAD
- Relate NSW forest / conservation policy to global third world / native people issues
- Integrate BMAD control and prevention in park Property Vegetation Plans and State Forest planning
- Build BMAD prescriptions into Integrated Forest Operations Agreement

Whole of Community Approach

Quality of Information	medium
Level of Influence on Outcomes	medium
Feasibility of filling in information gap	high

- Seek out and involve key people
- Careful thought to involvement of indigenous communities
- Missing stakeholders: tourism, private landholders (graziers)
- Carefully distinguish between different lulls of involvement
- Include south of Hunter
- Include 'natural history' (eg of clearing) perspective
- Involve all stakeholders
- Ensure all affected stakeholders are invited to contribute ideas for Action Plan
- Enlarge and appropriately fund continued existence and work of BMAD Working Group
- Continue BMAD Working Group with agencies, landholders, Non Government Organisations
- Create an appropriate coordinating body for whole of government (state-wide) approach to BMAD prevention and control (not too large)
- Indigenous Corridors - re-establish indigenous values re plants and animals
- Policy that reflects affected area with good governance and better Fire Management Plan that are flexible, looking at longer terms of management

Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 7: Policy, Process & Coordination

Resources - Money and Time

Quality of Information	high
Level of Influence on Outcomes	high
Feasibility of filling in information gap	low

- Embed monitoring and evaluation in budget
- Document closely (re continuity)
- Success in BMAD = reduced costs for Government (+ reverse)
- Relate to 3 year election cycle AND lifecycle of forest
- Link Treasury allocations to progress under Adaptive Management cycle
- Ensure a long term commitment to BMAD control from Government

Action Plan

Quality of Information	high
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

- Framework for everything
- Adaptive management across tenures
- Scientific rigorous trials - fire, weed control, etc
- Establish useful, practical, relevant research policy
- Devise a comprehensive BMAD Action Plan, based on sound science and involving all affected stakeholders, to pitch to Government for appropriate resourcing ($ & people)
- Coordinated approach to weed / pest management strategies
- Fund research on priority areas identified in the BAMD Literature Review
- Systems analysis of BMAD / psyllid / weed / logging / fire interaction
- Research and prepare historical analysis of existence of BMAD in Australia (to support case for urgent action)

Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 8: Risk Assessment

- Get good statistical precision and accuracy
- Map BMAD + spatial model + identify risk + management options
- Define most at risk areas by forest type, by Bell miner presence and abundance, soil type and predisposition to Lantana infestation
- Moratorium on logging at risk areas until the factors in BMAD have been resolved
- Test and assess management options
- Identify BMAD thresholds
- Raising awareness of BMAD risks on private land
- Moratorium on forestry activities and / or other human impacts in at risk areas (eg roads, dams, visitors etc)
- Conceptual model
- Retrospective research (eg historical management)

Retrospective Research

Quality of Information	medium
Level of Influence on Outcomes	medium / low
Feasibility of filling in information gap	medium

- Help identify patterns of spread
- Identify clues / factors involved in BMAD
- Another source of information
- Define appropriate management options

➔ likely, worth testing / uncertain, research needed

Moratorium on Logging

Quality of Information	low / high?
Level of Influence on Outcomes	high (if logging is a contributing factor)
Feasibility of filling in information gap	high

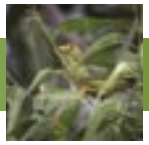
- Remove risk to areas of risk

➔ likely, worth testing

Mapping

Quality of Information	low / medium
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

➔ likely, worth testing



Session 4 & 5 - Workshop Session - Deriving & Evaluating Management Linkages

Theme 8: Risk Assessment

Modelling

- Identify risks

Quality of Information	high (restricted area - data) / low
Level of Influence on Outcomes	high
Feasibility of filling in information gap	high

➔ likely, worth testing

Management Options

Quality of Information	low
Level of Influence on Outcomes	high
Feasibility of filling in information gap	low / high (because outcomes unknown)

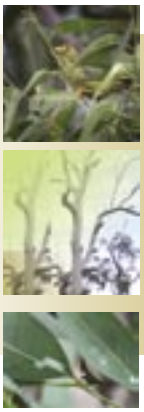
➔ likely, worth testing / uncertain, research needed

Map BMAD + spatial model + identify risk + management options

- Risk assess models need to be incorporated into FNSW FRAMES
- Provide appropriate information for timber quotas
- Provide a framework for trials
- Trial objectives
- Identify and quantify contributing factors
- Test management options
- Identify actions necessary for rehabilitation
- Cost benefit / deficit analysis for prevention and rehabilitation
- Prevent an increase in BMAD
- Reduce extent
- Reduce severity
- Mechanism for monitoring and reporting on ESFM

Additional Notes

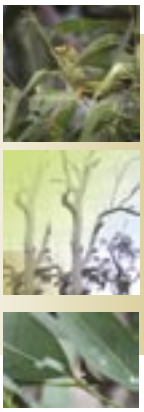
- Conduct a risk management analysis on dead trees in or adjacent to all visitor thoroughfares
- Conservation risk analysis - what is at risk from dieback and various outcomes
- Risk analysis (full range of forest values) to understand better the extent and area covered by the problem (BMAD). Risk analysis + risk management strategies + actions
- Implement threat minimisation
  - » Control pests
  - » Manage birds
  - » Disturbance
  - » Maintenance
- Develop risk assessment for forests at risk
- Conceptual model of forest health for each community to frame risk assessment and risk management



Session 6

Consolidating Outcomes and Setting Direction for Day 3

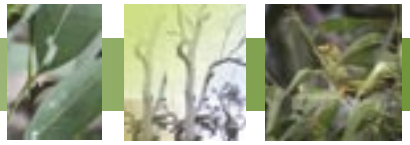
Outcomes discussed in plenary but unavailable for inclusion.



Session 7
Designing Management Options

Adaptive Management in Practice -

Dr Bernard T Bormann, USDA Forest Service



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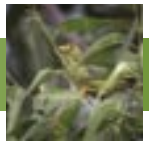
Slide 1



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Slide 2

Learning Design

Questions for the management study:

- Can late-successional habitat be restored and protected from high-severity fire by managing in more than one way in the Reserves (not designated as roadless) burned in the Biscuit Fire?
- How fast will various management pathways, and their interactions with natural disturbances, achieve late-succession conditions?

Pathway debate:

- Group 1 --- Need to intensively salvage and regenerate conifers.
- Group 2 --- No need for salvage.
- Group 3 --- Need to re-institute indian burning patterns.

Pathway decisions:

Pathway A. Group-1 like: maximum salvage; no fuels-management zones around the perimeters

Pathway B. Group-2 like: promote natural recovery processes & add 200-ft fuels-management zones

Pathway C. Group-3 like: reestablish landscape-scale, low-intensity fire & 400-ft fuels-management zones

Slide 3

Selecting experimental units

Size of areas applying 1 pathway (experimental unit) were based on:

- A minimal area for operations
- Access logistics (road layout)
- Encompassing the patterns of the fire

Conclusions:

- Need 3 to 4 townships to have reasonable chance of encompassing full range of fire intensities (3000 to 4000 ha);
- Could mainly use watershed boundaries because most roads are on ridgetops;

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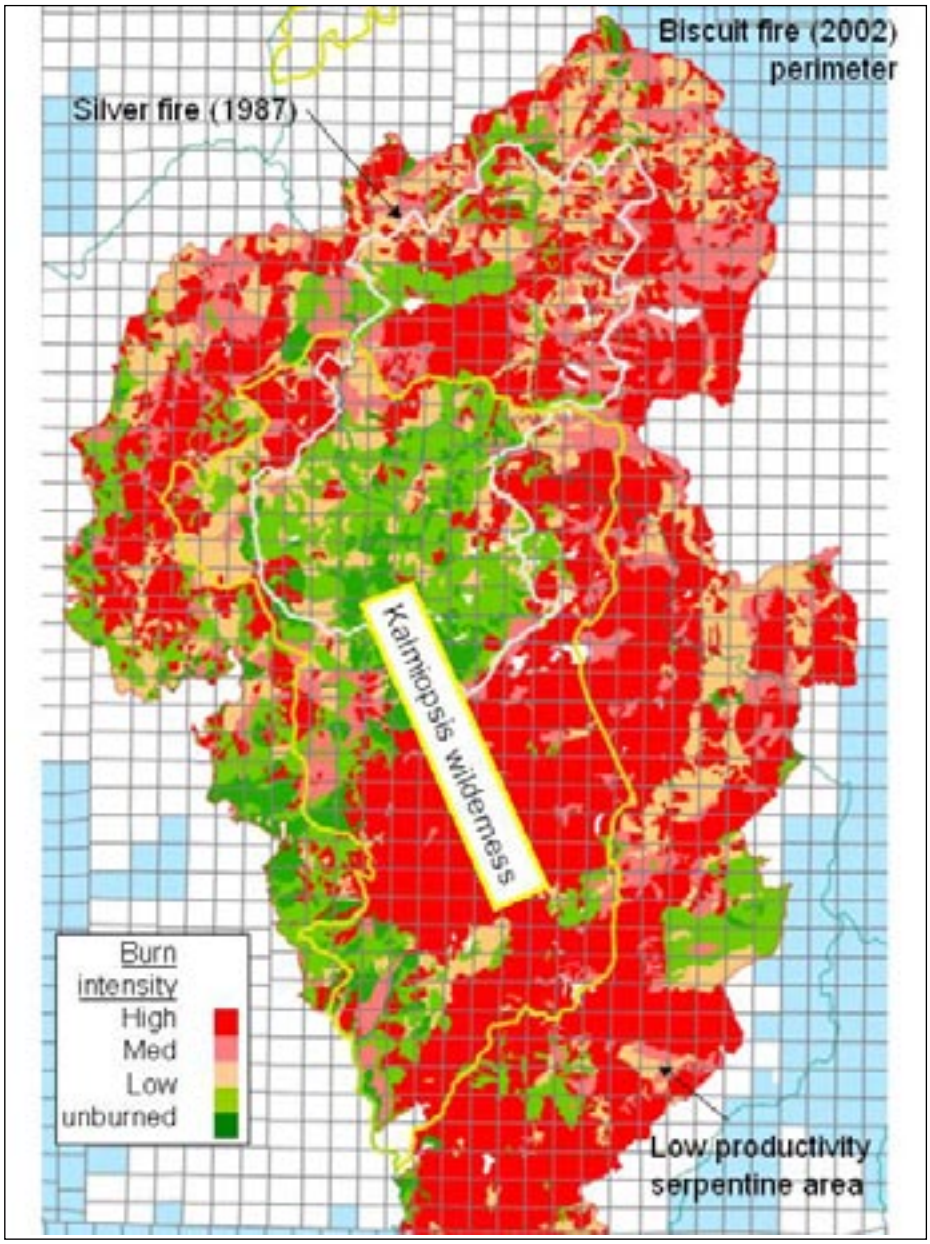

Slide 4

Similarity analysis

Put similarity variables (in priority order)

- What is the potential for rapidly achieving late-successional conditions?
  - » Habitat that survived the fire
  - » Areas with some remaining habitat elements
  - » Extensively burned areas or surviving small trees
- Will helicopter yarding be needed?
- Will matrix-designated areas be included?
- What proportion is in serpentine and high-elevation plant associations?
- Are the areas managed by the BLM or the Forest Service?

Slide 5

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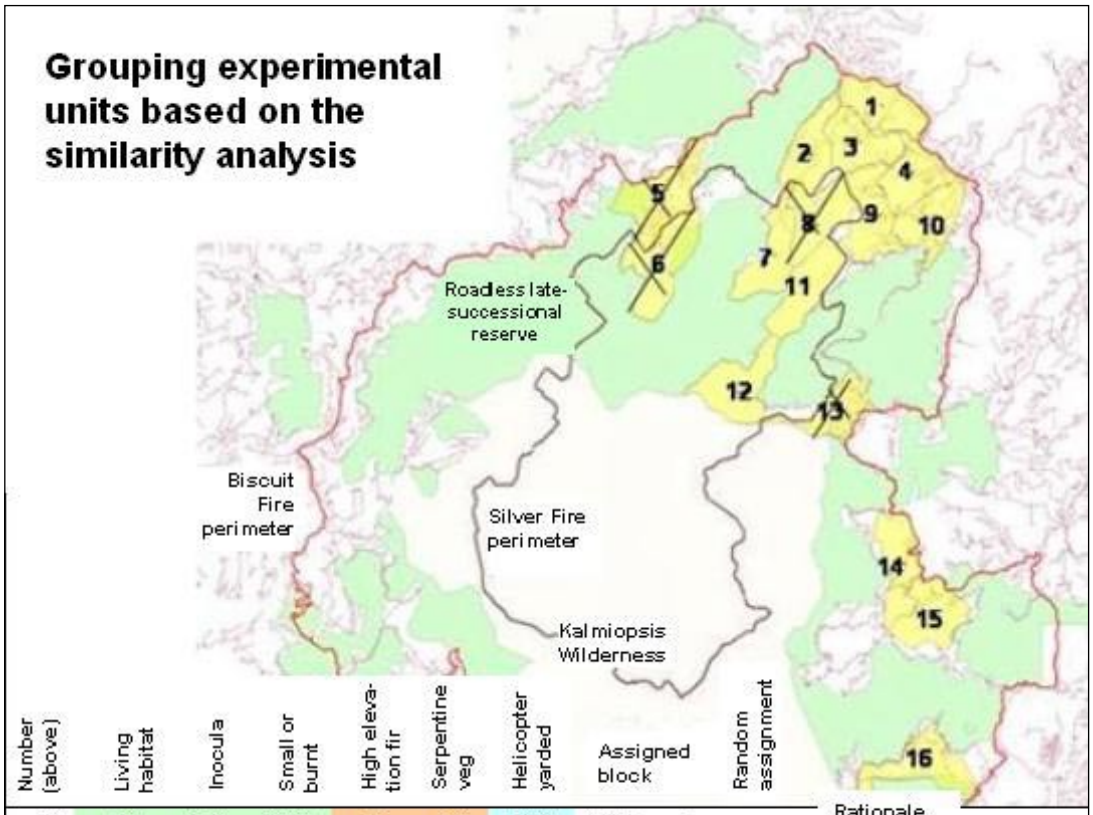
Slide 6



Number (above)	Living habitat	Inocula	Small or burnt	High elevation fir	Serpentine veg	Helicopter yarded	Assigned block	Random assignment	Rationale
7	8%	14%	78%	0%	0%	54%	Fishhook	A	Silver Fire; low habitat potential; few roads; non-matrix; low elevation veg.; non-BLM.
11	8%	21%	71%	0%	0%	82%	Fishhook	B	
12	2%	9%	89%	0%	1%	79%	Fishhook	C	
1	43%	22%	34%	2%	0%	0%	Sourgrass	C	Non-Silver; highest habitat potential; many roads; non-matrix; non-serpentine; 1 BLM experimental unit
3	37%	21%	42%	1%	0%	7%	Sourgrass	A	
4	20%	39%	39%	6%	0%	8%	Sourgrass	B	
2	24%	30%	46%	4%	0%	7%	Hobson	C	Non-Silver; moderate habitat potential; many roads; non-matrix; minor high elev. serpentine veg.; 1 BLM experimental unit.
9	9%	19%	71%	2%	5%	10%	Hobson	A	
10	13%	33%	54%	1%	1%	0%	Hobson	B	
14	7%	30%	63%	0%	2%	17%	Briggs	C	Non-Silver; moderate to low habitat potential; many roads; non-matrix; minor serpentine.
15	16%	35%	49%	0%	1%	13%	Briggs	B	
16	13%	29%	57%	3%	2%	3%	Briggs	A	
5	14%	26%	60%	0%	12%	0%	Rejected		Matrix
6	17%	23%	60%	2%	2%	52%	Rejected		Poor fit: in Silver
8	15%	27%	57%	0%	0%	74%	Rejected		Poor fit: in Silver
13	4%	26%	70%	1%	22%	0%	Rejected		Poor fit: low live habitat, matrix

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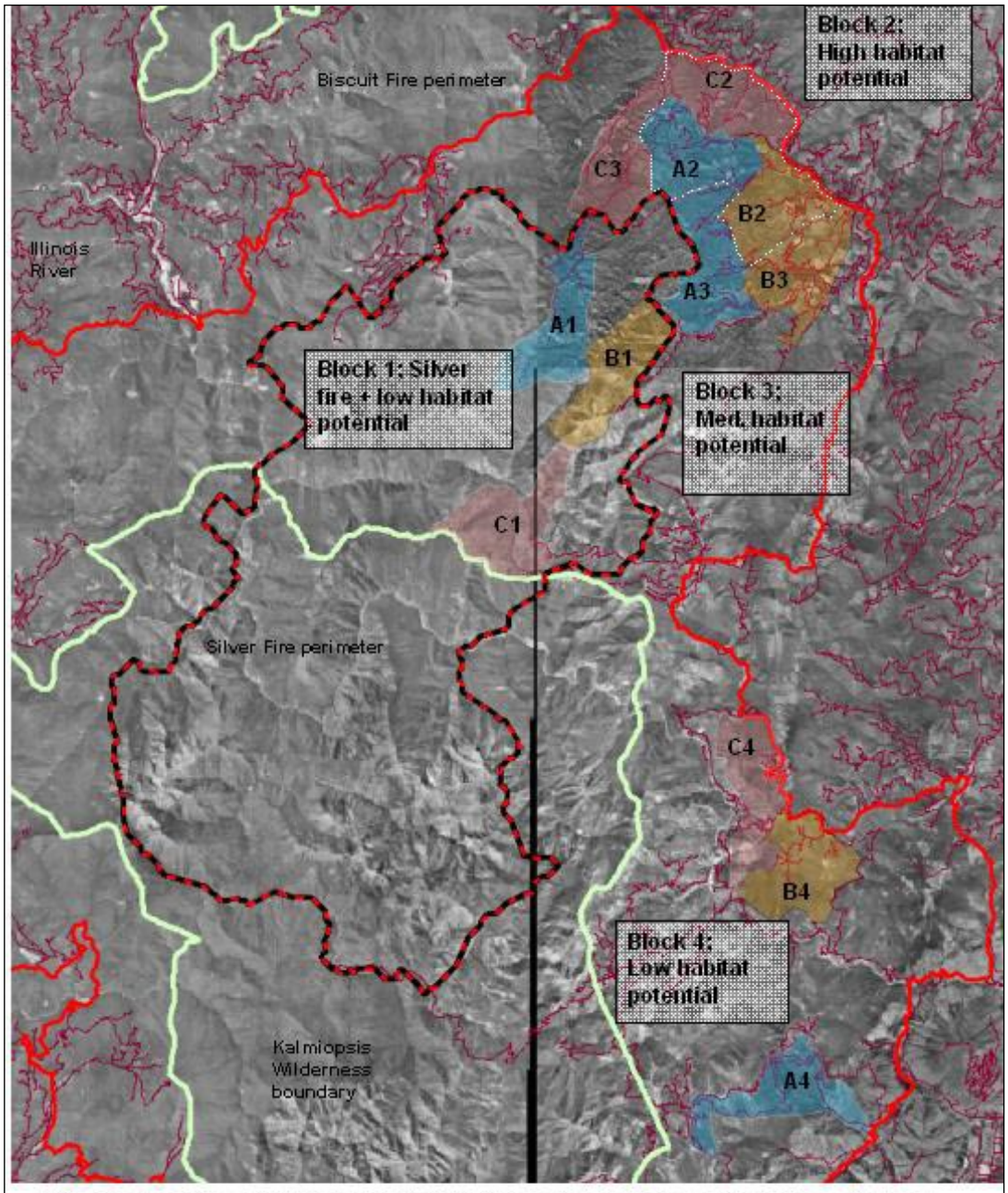
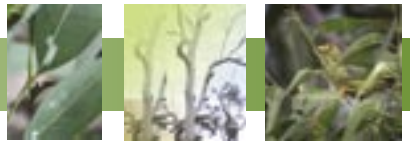
Slide 7



Final experimental layout with 3 treatments randomly assigned within 4 initially similar blocks, with different habitat potential and fire history.



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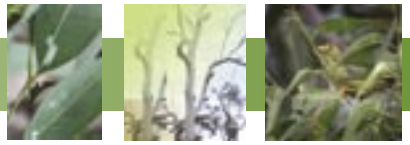
Slide 8

Table 2. Primary variables to compare pathway outcomes

Goal	Primary variables	Units	Approach
Restore habitat in late-successional stands	Conifer stocking	Trees acre-1	Permanent stand-exam plots extrapolated to units with remote sensing (photo interp.)
	Conifer 100-yr growth	Site index, G&Y models#s & vol. acre-1	
	Snags and logs	#s & vol. acre-1	Brown transect lines
	Understory diversity	Species cover	Ecology-plot methods
Protect late-successional stands from high-severity fire	Dead fuel amounts and distribution	Volume acre-1 layer-1	Permanent Brown transects extrapolated to units with remote sensing (photo interp.)
	Live fuels amounts and distribution	Biomass acre-1 layer-1 by species	Permanent stand-exam plots extrapolated to units with remote sensing (photo interp.)
	Undesired ignitions controlled	#s	Fire response records
	Wildfire behavior entering units	Acres day-1	Infra-red, satellite, images
Manage land-scapes to approach historical late-succession pattern and extent	Pattern-generating management and natural disturbances	Patterns, patch sizes and distributions	Mapping changes in tree mortality from fire, insects, diseases, wind, landslides, etc.
	Distribution of various late-successional habitat inocula	Acres, distances, frequencies	Spatial statistics
Implement pathways according to study plan	Salvage volumes by closure class, planting, and fuels treatments	Acres, volumes	Standard implementation monitoring



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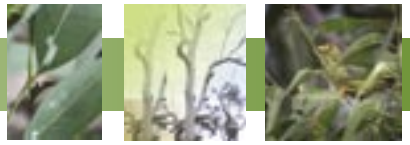
Slide 9

Table 3. Additional interpretive and contextual variables.			
Goal	**Secondary variables**	**Units**	**Approach**
Restore habitat in late-successional stands	Fire effects on soil fertility	C, N kg ha-1	PLTEP methods on small plots
	Snags effects on regeneration		Permanent stand-exam plots and Brown transects
	Hardwoods: competition and soil effects	Biomass acre-1 C, N kg ha-1	LTEP methods on small plots
Protect late-successional habitat from high-severity fire	Fuel reduction by prescribed burning	Tons ha-1 and distribution	Compare different prescribed-fire approaches in small-scale experiments on timing, fuel conditions, weather, escapes
	Conifer mortality from prescribed fire	Trees acre-1	Permanent stand-exam plots extrapolated to units with remote sensing (photo interp.)
	Hardwoods as fuel ladder or suppressant	Cover ha-1 by species	
Describe historical late-succession pattern and extent	Describe patterns from Government Land Office records for the late 1880s and 1930s photos	Acres of late-successional habitat	Remote sensing and GIS
Provide commercial wood products	Wood volume harvested, jobs, etc	Board feet unit-1	Cruise, harvest, and mill records
Protect firefighters and communities	Changes in fuel distributions and access	Fuel distribution, burnout corridors	Remote sensing and GIS
Restore and plant and animal habitat	Plant biodiversity	Species presence & abundance	Ecology-plot methods
Restore water quality and fish habitat	Erosion from stands	Tons ha-1 x	Small-plot erosion traps
	Sedimentation and landslides	Tons ha-1 x	Permanent cross-stream transects extrapolated to units with remote sensing
Learn	Quality of monitoring and scientist-manager interactions	Options forestry criteria	(Bormann and Kiester 2004)



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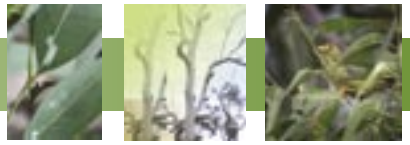
Slide 10

Monitoring plan (1 of 3)		
Focus	**1. Commitment of the Siskiyou National Forest[a]**	**2. Potential Forest commitment, given additional funding**
Understanding the Biscuit Fire's behavior and effects	Make all historical and current data available to researchers and others. This includes georectified post-fire photos, management records, and plot data.	Digitize all historical air photos and Government Land Office records and make into GIS layers.
Restoring habitat - trees and stand structure	Monitor species, growth trajectory of dominant trees, and stand structure with standard exams. Use permanent plots[c] monitored at years 0, 1, and 3 years after the pathways are established and remote sensing to draw inferences on unit responses.	Extend the sampling to years 5 and 10, and every 10 years thereafter; expand the sample size of permanent plots to speed the detection of differences between pathways.
Restoring habitat - snags and woody debris	Monitor size and numbers per acre of burned and insect-created snags and logs with standard exams and remote sensing.	Monitor effect of shade from snags on planted and natural tree seedlings.
Restoring habitat - landscape patterns	Track changes in amount and distribution of "patches," including seral stages, interior habitat, structure, canopy density, and layering from air-photo interpretations (LSRA 1995).	

[a] Includes the Medford BLM as well.

[b] Includes synthesis of ongoing federally sponsored research on the Forest ecology and inventory plots and the long-term ecosystem productivity experiment, with new analyses of available data.

[c] See text for description of permanent plots.



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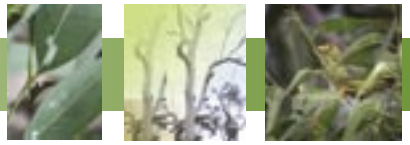
Slide 11

Monitoring plan (2 of 3)		
Focus	**1. Commitment of the Siskiyou National Forest[a]**	**2. Potential Forest commitment, given additional funding**
Restoring habitat—plants	Monitor plant biodiversity and exotic weeds on permanent plots and use sampling and remote sensing to infer experimental unit responses.	Expand the sample size to evaluate effects on rare species.
Restoring habitat—animals	Monitor animals directly to meet sale-layout requirements.	Track changes in behavior and reproductive success of known spotted owl pairs, prey bases, and owl predators after major losses of habitat, repeat every 10 yrs.
Restoring LS habitat—soil productivity	Monitor soils directly only to meet sale-layout requirements, and track changes in site index with a database of all previous geo-referenced site-index measures.	Monitor erosion and establish a soil-sampling grid (following long-term ecosystem productivity protocols—www.fsl.orst.edu/ltep) on burned and unburned stands with and without brush-control.
Protecting habitat through time—dead fuels	Monitor dead fuels on permanent Brown line transects with traditional size-classes in treated areas.	Monitor dead fuels on permanent Brown line transects with traditional size-classes in untreated areas.
Protecting habitat through time—live fuels	Monitor vertical distribution of live fuels on permanent plots in treated areas and use sampling and remote sensing to infer experimental unit responses.	Monitor vertical distribution of live fuels by species on permanent plots in treated areas.
Protecting habitat through time—risks	Run fire models (fuels, resistance to control, and potential fire behavior) to predict fire risks.	



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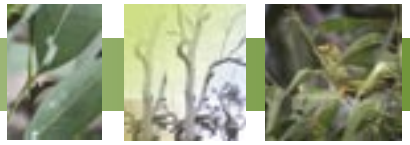
Slide 12

Monitoring plan (3 of 3)		
Focus	**1. Commitment of the Siskiyou National Forest[a]**	**2. Potential Forest commitment, given additional funding**
Protecting habitat through time—future fires	Evaluate how future wild and prescribed fires actually behave through different pathways and experimental units.	Study intensity, duration, and containment of prescribed fires in pathway C to modify techniques for subsequent trials.
Forest management costs and benefits	Record costs and benefits associated with management and monitoring.	
Other important effects—aquatic conservation	Monitor riparian habitat and organisms to meet sale-layout requirements.	Monitor landslides and new sediment deposits along streams draining different pathways with satellite images, checked with low-elevation photographs.
Other important effects—landslides	Analyze available aerial photos (every 5 years or less) for large landslides, document them on the ground, and compare them to predicted danger-class and proximity to stand and road management.	
Other important effects—social perceptions	Maintain a database with public comments relating to the experiment.	Build interpretive trails into representative parts of each management pathway (would require changes to the final EIS or a new NEPA document).

[a] Includes the Medford BLM as well.

[b] Includes synthesis of ongoing federally sponsored research on the Forest ecology and inventory plots and the long-term ecosystem productivity experiment, with new analyses of available data.

[c] See text for description of permanent plots.



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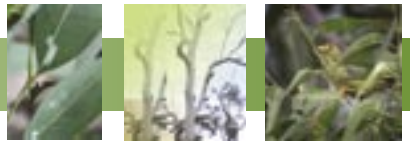
Slide 13

Table 6. Timeline for Forest commitments (federal agencies cannot budget beyond current year)							
Activity	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Conduct surveys as required for timber sales	XX						
Layout sales to meet study design	XX						
Publish the hypothesis database on a web page, detailing various assumptions in table 3 and model projections, and invite alternative hypotheses.	XX						
Establish permanent stand exams and transects	XX						
Redo late-successional reserve assessment on units	XX						
Take pre-treatment ground measures	XX						
Take post-treatment measures (10 yr thereafter)		XX		XX			
Monitor activities and costs specific to pathways	XX	XX	XX	XX	XX	XX	XX
Develop and test remote-sensing techniques	XX	XX	XX	XX			
Track all ignitions and fire spread in and near units	XX	XX	XX	XX	XX	XX	XX
Monitor fire intensity in prescribed fires		XX	XX	XX	XX	XX	XX



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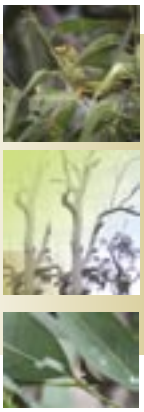
Slide 14

Table 7. Timeline for other Forest and research commitments—these will only happen with specified additional funding ($ thousands)							
Activity	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Assemble and geo-rectify key historical data including GLO, post-fire air photos, management records, …..	50	50					
Coordinate retrospective and other research	25	25	25	25	25	25	25
Retrospectively analyze fire behavior across stands with different pre-fire conditions in study area	120	120	120				
Retrospectively analyze pre-fire vegetation and fire intensity effects on soil fertility and sedimentation	120	120	120				
Assess fire effects on spotted owl pairs	TBA	TBA					
Publish retrospective study synthesis.		50			50		
Monitor landslides and sediment deposits	30					30	
Establish soil and erosion plots	100						
Monitor soil changes on productivity plots[a]	100						100
Synthesize monitoring data (proximity,…)				50	50	50	50
Evaluate adaptive management (Five Rivers, Biscuit, others) with options forestry criteria.			10				
Small-scale silviculture experiments focused on veg control and snag removal (idealized pathways)[a]	200	50					50
Track neotropical birds and animals	100	100	100				100
Monitor stream reach habitat by pathway							
Build interpretive trails (1 per pathway)		50	50				
Evaluate public reactions				75			
Sum of estimated costs	845	565	565	150	125	105	325

[a] Productivity and silviculture research might be combined



Session 8 & 9

Workshop Session - Developing Plausible Management Options and Predicting Outcomes for Single Factor Scenarios

Identifying the Uncertainties

Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Workshop Process

This Session involved Delegates breaking up into six groups. The **themes** of these groups were:

Theme 1: Management Action Plan

Theme 2: Regeneration and Restoration Regimes incorporating Weed Management

Theme 3: Communication Strategy incorporating Adaptive Learning and Policy

Theme 4: Logging and Silviculture Regimes

Theme 5: Fire Regimes

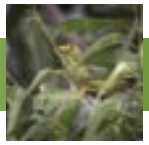
Theme 6: Bell miner and Psyllid Management

The **objectives** of this Session were:

- To determine how options are to be undertaken
- To predict the impact of options
- To determine how to measure the outcomes
- To identify the uncertainties in options and
- To identify future research requirements

Five key **questions** were asked of each group. These were:

1. How where, and when do we do this?
2. What impact would you expect on the forest?
3. How will you know if it has been successful?
4. Where are the uncertainties?
5. What research is needed?



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 1: Management Action Plan

RECOMMENDATIONS

1. Commission a report to "make the case" for the importance of BMAD to ensure adequate resources and commitment in the long term. This should include retrospective historical analysis and long term CBA. One member of the Working Group wanted to ensure that we promote this within the FRAMES system but we didn't have time to discuss this.

2. Create a Scientific Reference Group to set standards for the operational trials and to create a priority research plan.

3. Set a minimum adequate time for preparation of Action Plan so it doesn't take too long.

4. Seek ArcLink PhD grant(s)

Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 1: Management Action Plan

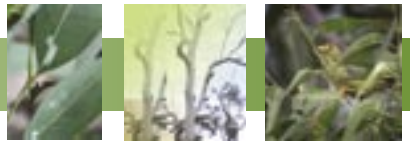
Management Options - Discussion

1. Statewide priority mapping and (research?) / modelling
2. Culture of learning and adaptive management
3. Policy and regulatory framework - moratorium
4. Ensuring and allocation resources (financial and time) - cost/benefit - FRAMES process
5. Risk assessment and management - moratorium
6. Institutional arrangements - building alliances; state-wide BMAD Working Group; add "southern" reps to BMAD Working Group
7. (a) Monitoring, evaluation, reporting and review
7. (b) Standards for trials (including monitoring and evaluation and data management) and links / conceptual framework for trials
8. Statewide involvement - building alliances
9. Making the case - historical perspective
   - » cost / benefit analysis - FRAMES short & long-term
   - » threatening process under TSC Act
10. Vision / goals

Other groups

- Whole of community approach
- Fire, logging, weed trials
- Bell miner and psyllid management trials
- Communication plan

} must include monitoring and evaluation



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 1: Management Action Plan

Adaptive Management Framework - Unifying Concepts; Embedding learning

PLANNING
Action Plan & Strategy
- Communication Plan
- Trials
- Standards
- Risk Assessment
- Coordinating structures
- Researching
- Research Plan

IMPLEMENTATION
- trialing
- communicating
- coordinating
- researching

MONITORING
- implementation success
- trial outcomes
- plan effectiveness

REPORTING
- research reports / papers
- trial outcomes
- plan implementation/effectiveness

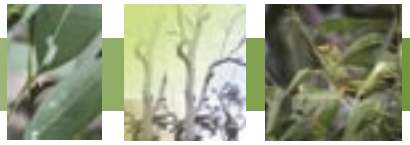
ANALYSIS
- what did we learn?

EVALUATION
- what does this mean?
- how should we change our approach?

CONTROL & PREVENTION OF BMAD

EFFECTIVENESS

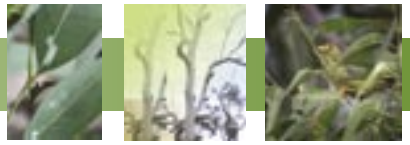
IMPLEMENTATION



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 1: Management Action Plan

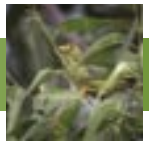
What	**Discussion Point 1** • Hazard rating (existing & potential), remote sensing • Purpose » trial sites » political » baseline / monitoring » will assist "making the case" » developing GIS techniques • Separate short term process identification of trial sites **Who**: Multi - agency team (existing)
How	• ground-truthing • encouraging multi-disciplinary, multi-agency approach • remote sensing • seek sites through communication plan (?) • instruct agencies to find sites • new techniques will require training and communication long term
Where	NE NSW; Richmond Range, Rest of NSW
When	2005, 2006, 2007
Impact	Will assist "making the case"
Success Measure	• data for design of trials • engender political support • achieve adequate funding • establish baseline • achieve increases in community involvement
Uncertainty	• no funding • timeframes • technical ability • disparity between remote sensing and ground-truthing • funding adequacy • lack of community support • lack of adequate agency commitment
What	**Discussion Point 2** Feed Action Plan into existing agency processes - find the links. • Action Plan has to spell out what we do with the improved knowledge - communication; existing planning processes. • Creating interdisciplinary teams » interface community / agencies; inside agencies; AND outside agencies • Action Plan explains Adaptive Management. Philosophical framework. • Pulls together trials etc. • Identify champions within agencies • Use DEC's NPAC to kick-start in one agency • Use CMAs **Who:** BMAD Working Group
	• No suggestions made



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 1: Management Action Plan

What	**Discussion Point 7 (b)** • Standards (link to Adaptive Management) fro operational trials, across replicas and across different sorts of trials • Form Scientific Reference Committee » identify key research needs » identify standardised approach to information collection » minimum data sets and methodologies » data management » standards for cost effectiveness measurements (to compare trials) » monitoring framework (to include across trials **and** other projects) » training » OHS including Job Safety Analysis • Conceptual framework methodology for overall trial processes
How	Standards • investigate options for information collection (to standards) » Agency Fire Officer » Project Officer » PhD students » Landholders • Create Scientific Reference Committee » standards • priority research plan
Where	N/A
When	ASAP
Impact	• Scientific rigor • Credibility • Replicability
Success Measure	• standards • rigorous, replicable, successful trials • useable data • a few answers
Uncertainty	• timeframes (too much navel gazing) • use of standards in real world • different scientific opinions
Research needs	



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 2: Regeneration and Restoration Regimes incorporating Weed Management

RECOMMENDATIONS

1. Complete mapping of BMAD areas to direct site selection and assessment for trial options.

2. Implementation of integrated management trials at an appropriate scale to provide useful feedback on all aspects of BMAD management

3. Find an efficient balance between research, monitoring and operational implementation and secure more funding long term for ongoing field management trials

4. Set up a CRC (BMAD / Forest Health)

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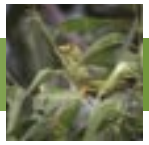
Theme 2: Regeneration and Restoration Regimes incorporating Weed Management

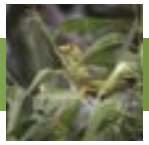
Option	Restoration incl weed treatment within highly degraded (no canopy o/storey) BMAD area & follow-up	Restoration incl. weed removal within moderately degraded (canopy sufficient to enable natural regeneration from seed-fall) & follow-up
How	• Weed removal • Soil disturbance • Fire / mechanical • Seeded and/or planted	• Weed removal (fire / mechanical) • Soil disturbance in large gaps • Planting of understorey optional • Post logging and burning
Where	• Wet / dry forest (eg Toonumbar) • (topography variety) • (soils) • accessible	• Proximity to seed source as above • Compare understorey types • Consider edge effects
When	• Fire season • Spray in growing season	• Seed fall • Fire season • Spray in growing season
Impact	• Restoration & regeneration • Weed invasion • Enhancement • Soil erosion • Habitat loss • Water quality	• As previously
Success Measure	• % of lantana killed • Health of trees • Understorey restoration	• Presence of other birds • Species diversity • Recruitment density • Forest structure
	• Seed source • Resourcing • Resource intensive over long time • Climate • Bell miner response & forest response	• Climate • Seed availability • Follow-up
Research needs	• Yes! • Design of trial to be robust from interpretation • Site replication • Site selection from mapping • Internal resilient patches	• Standard operating procedures for monitoring, parameters, frequency • Experimental design
Other	• Public concern if large scale • Bell miner loss • Aboriginal cultural • Species selection for seed / plant • Threatened species	• Could incorporate fire



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 2: Regeneration and Restoration Regimes incorporating Weed Management

Option	Restoration incl weed removal within low degradation (Bell miners present, low level lantana, native understorey, largely intact canopy - well stocked , absence of holes or gaps in the canopy)
How	• Fire mostly for dry sites • Manual control follow-up • Spot spraying • Post logging and burning opportunities
Where	• Post harvest logging areas • Wet / dry forests
When	• Seasonality • Burn lantana in Feb-March when soil moist • Optimise seed fall for recruitment
Impact	• Pro-active as preventative approach • Proliferation of inappropriate burning by landowners
Success Measure	• Apply to all • Long term acceptance & uptake of management actions across all tenures • Species diversity, especially birds
Uncertainty	• Restrictions to activities in areas such as riparian • Unacceptable of fire in hot season
Research needs	• Timing of fire to kill lantana (apply to all) • Ecological burning (all options) • Best management practices (all)
Other	• Public concern if large scale • Bell miner loss • Aboriginal cultural • Species selection for seed / plant • Threatened species • Community acceptance of fire regimes • Education on burning

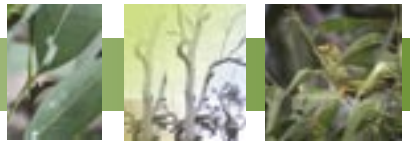


Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 3: Communication Strategy incorporating Adaptive Learning & Policy

RECOMMENDATIONS

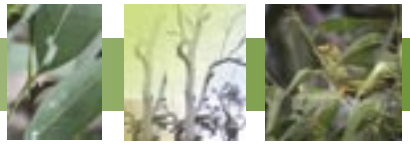
1. Open access to data
2. Two-way communication
3. Get the Communication Strategy Plan done and implement it
4. Another BMAD Forum in three years



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 3: Communication Strategy incorporating Adaptive Learning & Policy

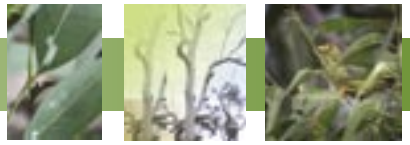
Option	• Negotiate ground rules for open access to information / data for all (data port hole / electronic library) • Ensure it involves 2-way communication • Ensure research communication happens from planning to conclusions • Use info dissemination as an opportunity for info collection (eg brochure, website) • Oral history / anecdotal info • Support for BMAD Working Group
How	• Extension Officers • Interactive Communication Strategy • Agencies to communicate BMAD policy and any BMAD policy change • Strategy has to identify target audiences • All points from "Session 4 Education & Learning" are to be incorporated into the Strategy
Where	• BMAD Working Group • Internet • Content of Communication Strategy to focus initially in areas where BMAD is prevalent or potentially occurs • Communication Strategy will include a timetable for implementation and adaptive revision
When	• Ongoing • Final Communication Strategy in 6 months
Impact	• Impact will be the changing awareness of BMAD in the community • Involvement / support by people on the actions that remedy the forest • Everyone will have learnt more about the ecological processes of the forest
Success Measure	• Feedback • An increase in the number of people involved in various BMAD activities • Community survey eg increased knowledge of affected sites and their history • Number of "hits" on website • Funding received / spent • An increase in articles in newspapers etc; • Increase in research publications • Increase in quality / accuracy of interpretation of the issue
Uncertainty	
Research needs	



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 3: Communication Strategy incorporating Adaptive Learning & Policy

Option	• BMAD Working Group to oversee the Communication Strategy • Establish a Southern BMAD group • Aboriginal rep/s on Working Group/s (not necessarily and Land Council rep) • Consultant / dedicated resource to prepare Communication Strategy • BMAD Working Group to decide on level of consultation in development of Draft Communication Strategy • Ensure relevant stakeholders are involved in the input and output of the Communication Strategy
How	• BMAD news on radio programs to be part of Strategy • Strategy to address how humans impact our environment (specifically BMAD) • Strategy to discuss how BMAD will impact people • Another BMAD Forum in 3 years and so on
Where	
When	
Impact	
Success Measure	• Increase in stakeholder participation • Another BMAD Forum in 3 years • Policy agenda altered as a result of improved understanding of issue • Increased Aboriginal involvement in BMAD issues • Increase in actions on ground to minimise / avoid BMAD
Uncertainty	
Research needs	



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 4: Logging and Silviculture Regimes

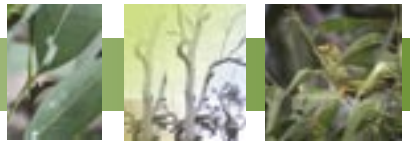
RECOMMENDATIONS

1. Audit of forest practice against matrix below with view to how many treatments are already in some from of application

2. Use matrix to adopt a broad "options forestry" approach

3. Trials / broad-scale

	Silvicultural Treatments (including adequate replication)				
Understorey Bell miner Treatments	Control (moratorium on logging)	Production Biomimicry - internally selected	Production Current logging and thinning	Production Current logging no thinning	Production Current logging & thinning & grazing
Aggressive lantana / Bell miner suppression	BMAD affected	BMAD affected	BMAD affected	BMAD affected	BMAD affected
	BMAD susceptible	BMAD susceptible	BMAD susceptible	BMAD susceptible	BMAD susceptible
No lantana/ Bell miner suppression	BMAD affected	BMAD affected	BMAD affected	BMAD affected	BMAD affected
	BMAD susceptible	BMAD susceptible	BMAD susceptible	BMAD susceptible	BMAD susceptible
Aggressive lantana / Bell miner suppression - Enrich with resistant species	BMAD affected	BMAD affected	BMAD affected	BMAD affected	BMAD affected
	BMAD susceptible	BMAD susceptible	BMAD susceptible	BMAD susceptible	BMAD susceptible



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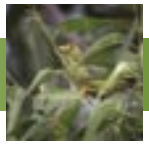
Theme 4: Logging and Silviculture Regimes

Option	1. Do nothing
Option	2. Enrich with resistant species
How	• Enrich BMAD forests using existing naturally occurring & BMAD resistant species (locally endemic sp) with understorey control
Where	• Most BMAD affected or degraded sites
When	• Ongoing
Success Measure	• Achieving canopy cover • Increasing canopy cover • Retaining original forest type
Uncertainty	• Capacity of chosen species to survive if conditions change • Risk of selective herbivory
Research needs	• Benchmark study
Option	3. Clear & replant - site specific silviculture; thinning to invigorate selected trees, combined with fire for understorey management, etc.
How	• Considered application of fire, understorey management, logging, re-afforestation, thinning
Where	• BMAD susceptible
When	• Trials
Success Measure	• Experimental design defines outcomes
Uncertainty	
Research needs	• Benchmark study
Option	4(a) Trial no logging / understorey control
How	• Weed control
Where	• BMAD affected
When	• Trials
Success Measure	• Decline in Bell miner • Significant reduction in weeds / lantana • Adequate regeneration
Research needs	• Benchmark study
Option	4. (b) Trial restoration / understorey control
How	• Light logging • Weed mgt & understorey mgt • Retain natural structure - dist of age classes
Where	• BMAD susceptible
When	• Trials
Success Measure	• No outbreak of Bell miners / psyllids • No outbreak of BMAD
Research needs	• Benchmark studies



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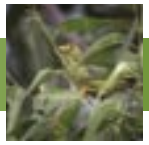
Theme 4: Logging and Silviculture Regimes

Option	5. Trials to achieve best silviculture outcomes
	• No suggestions made
Option	6. Trials to achieve ecological outcomes
	• No suggestions made
Option	7. Logging moratorium on BMAD affected forests while rigorous management trials undertaken (not management moratorium)
How	• Logging moratorium - preliminary / benchmark study
Where	• BMAD susceptible forests (desirable) • BMAD affected State Forest
When	• ASAP
Success Measure	• Chlorophyll content (ref. Christine Stone) • Limit to ongoing degradation
Uncertainty	• Industry / political opposition • Culture of economic growth
Research needs	• How to educate the public about cost of a BMAD collapsed forest
Option	8. Determine what factors contain / prevent BMAD occurring - as benchmark using undisturbed primary habitat to apply silviculture management to affected areas
	• No suggestions made
Option	9. Restore grassy understorey combined with selection logging
	• No suggestions made
Option	10. Removal of lantana to release understorey rainforest
	• No suggestions made
Option	11. Have some sites not logged in traditional silviculture mgt
How	• Current pastoral practices • Education / extension
Where	• Freehold forests (original)
When	• Ongoing
Success Measure	• Maintain potential of other property uses • Appreciation of result • No unbalanced interaction / healthier trees
Research needs	• Find what has worked for other people



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Theme 5: Fire Regimes

RECOMMENDATIONS

1. Sufficient resources be ongoing to implement fire management trial

2. Investigate linkages with rehabilitation

3. Duplicate trials of management options outside the current range of Lantana. E.g. Southern NSW

4. Establish information reporting (e.g. web site) to disseminate information to all stakeholders - liaise with CRC

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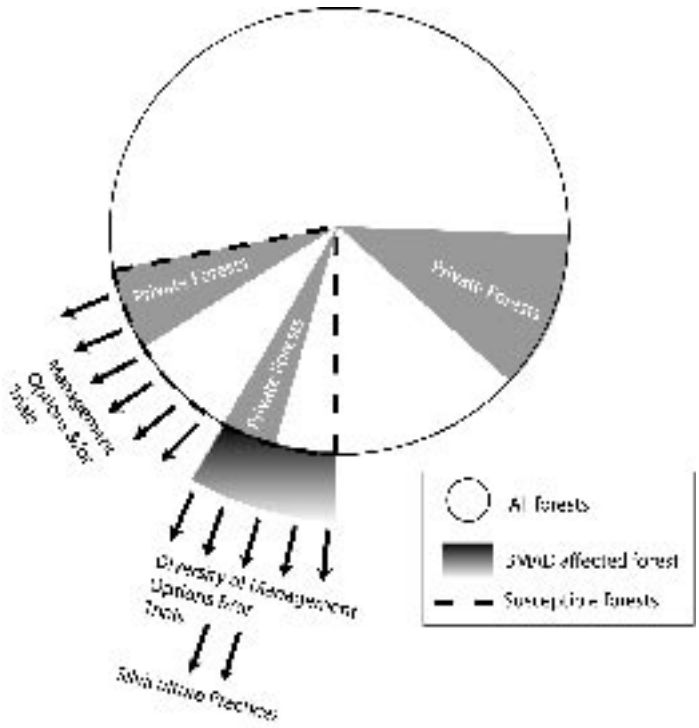
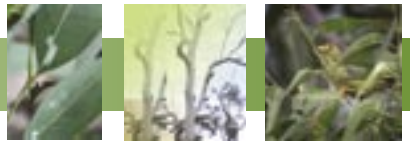
Theme 5: Fire Regimes



Logging Moratorium	Silviculture to mimic natural processes	Logging moratorium with understorey management	Site specific silviculture. (considered application of fire, understorey mgt, logging, re-afforestation, thinning)	Selective log, grassy understorey and grazing	Aggressive silviculture



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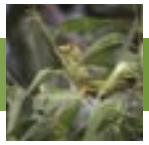
Theme 5: Fire Regimes

Option	Exclude Fire	Fire regimes eg. Bradstock	Frequent burning (low intensity)	Combination of fire regimes
How	• Map area • Establish / maintain fire advantages around areas	• Maintain vegetation within thresholds • Identify point within threshold • Bradstock (Option 2)	• Prescribed burning at about 2 year intervals. Note: 1st fore may need to be moderate • Establish & maintain fire advantages around area	• 2 fires within 3-4 years. Note:1st fire may need to be moderate • Bradstock (Option 2)
Where	• Wet & dry forests, moderately & lightly affected areas • Unaffected areas - wet & dry forests (control)	• As previously	• As previously	As previously
When	• Starting now	• Starting now allowing 1 year lead time	• As previously	As previously
Impact	• Positive: • Rainforest development • Increase structure • Negative: • Decrease eucalypts • Decrease grassy understorey eg for grazing	• Will maintain potentially affected forest • Limited impact on BMAD affected areas • Potential impacts on non-target areas	• Improved canopy health • Change in understorey composition • Change in biodiversity	As previously
Success Measure	• Decrease in BMAD • Increase &/or stabilisation of biodiversity	• As previously	• As previously	As previously
Uncertainty	• Can we exclude fire? e.g wildfire • Will it be successful? • BMAD continues • Impacts	• Ability to maintain specified regime eg. fuel, climatic conditions • Will it be successful?	• As previously	As previously
Research needs	• Monitoring • Canopy, understorey & bird populations • Flora & fauna • Structure & dominant species • Before & after	• As previously • Assess fire weather history & appropriate seasonality	• Assess fire weather history & appropriate seasonality eg. late summer in QLD • As previously	As previously



Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

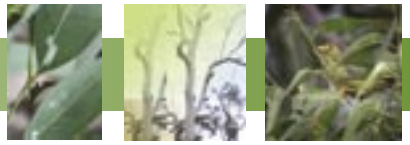
Theme 6: Bell miner & Psyllid Management

RECOMMENDATIONS

1. Establish network / database of managers, researchers in BMAD control to facilitate interaction

2. Integrate management and research of Bell miners, psyllids, fire, tree health and understorey into a national program for experimental management

3. That solutions recognise BMAD is “symptom of” ecosystem gone awry and need to ensure that adaptive management and research looks beyond narrow issue of BMAD



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Theme 6: Bell miner & Psyllid Management

Option	**Remove Bell miners**	
How, Where, When	• Remove & keep them out • Consider different level of effort • Implement control • Replicate across large landscape - similarity analysis; stratified sampling	• Include isolated populations (eg Scheyballey NP) versus continuous populations • Trapping & shooting - when nesting • Measure pre & post response variables (see success measures)
Impact	• Effects of other bird feeding - damage to trees, defoliation • Improved forest health	• Increased biodiversity • Impacts on Bell miner population
Success Measure	• Canopy health indicators • Improved understanding of effort required to achieve outcomes	• Return of other birds except by Bell miners • Flora & fauna diversity • Increase other predators
Uncertainty	• Practicality of keeping them out • How much effort required • Effect on BMAD • Other impacts on forest • Appropriateness for different areas	• Public & Government reaction • Why bell miner / psyllids have increased • Is there a complete return to health • Will other predators emerge / return
Research needs	• Predation on psyllids	
Option	**Trial alternative fire regimes**	
How, Where, When	Broad aim to cover wet / dry forest types with all treatments. Treatment 1: Frequent low intensity fire Treatment 2: Less frequent, higher intensity fire Treatment 3: No planned fire • Stratification • Very long term - possibly in order of decades. Need to include a number of fires within regime • Maintenance in perpetuity • Replication etc as above	
Impact	• Removal of Bell miners • Removal of psyllids • Impacts on nitrogen cycling	• Impact son other plants and animals • Impact of no planned fire - intensity of wildfire • Change of understorey
Success Measure	• As above • Difference in forest health between treatments - provides information	
Uncertainty	• What is "natural" ecosystem • Link between fire regime and psyllid population	

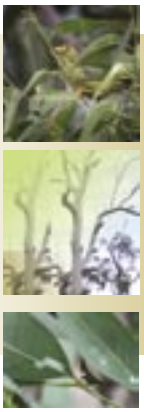
Session 8 & 9 - Developing Plausible Management Options & Predicting Outcomes, and Identifying the Uncertainties

Theme 6: Bell miner & Psyllid Management

Option	Trial understorey modification (not trialing removal methods)	
How, Where, When	Treatments 1. Do nothing (control) 2. Removal of Lantana only - continued removal of Lantana, natural regeneration of other spp	3. Removal of all woody understorey • In forests in a range of conditions • Scale - large plots • Standard removal techniques (1 only - not fire) • Replication etc as above
Impact	• Removal of habitat for other species (birds, plants, mammals) • Soil erosion, water pollution • Impacts on hydrology • Different levels / type with different treatments	• Improved canopy health • Increased biodiversity • Impacts on other psyllid predators
Success Measure	• Canopy health • Bell miner density • Abundance of other birds • Abundance of psyllids	• Change in soil properties • Tree growth • Biodiversity increases
Uncertainty	• Effectiveness of selected techniques - influence of terrain, landscape, etc • Actual links / mechanisms Bell miners and tree health	• Actual cause of health improvement • Impact on biodiversity spp composition • Exact detail of treatments • Impact on other psyllid predators
Research needs	• Causal factors of health impacts • Value of understorey to Bell miners	

Notes:

- Selection of options does not necessarily reflect importance
- Rec: small scale trial of psyllid removal and success measures same for all
- Rec: integrate 3 options to maximise learning / information (9 simliar types of forest)
- Need to consider absence of nesting sites for mammals (and Bell miner predator) and role in psyllid population
- Uncertainty of impacts outside this consideration



Session 10

Synthesis and Management Directions -

Emeritus Professor Harry Recher

Session 10 - Synthesis and Management Directions - Emeritus Professor Harry Recher

The first day of the workshop was highlighted by a willingness of people with strongly differing visions of the future to work together. Forest decline, whether associated with Bell Miners and psyllid insects (lerp) or not, is seen by everyone concerned for Australia's environmental and economic future as an issue of importance. It is a challenge which requires working together for the development of a common, ecologically sound vision of the nation's forests. For the moment, this vision exists only as a torn tapestry needing much care to be made whole and for the ecological integrity of Australia's forests to be restored.

During the first day of the Workshop, the focus was on Bell Miner Associated Decline (BMAD), and six main themes for discussion and action were identified:

- fire and fire management
- Bell Miner and psyllid insect (lerp) management
- forest restoration and rehabilitation, including weeds and weed control
- communication, policy and learning
- the sustainable production of all forest values, including timber harvesting and silviculture
- a plan for action

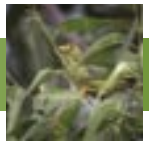
Clearly, an Action Plan embraces all themes. Action plans require multiple pathways to both embrace the complexity of forest ecology, management and conservation, as well as for testing and adapting plans of management for forest decline in Bell Miner affected regions. Action plans are adaptive strategies. It remains to identify these pathways and test community response to the options for conservation and management that will evolve. This will be complex for the reason we are not dealing with a single factor causing forest decline, even in Bell Miner affected forests. Bell Miners are not the only disturbance factor in forests; poorly understood, but changed disturbance regimes acting on largely unquantified spatial and temporal scales also need to be considered.

An Action Plan can identify the variables and set management goals, but reality says only a small number of management strategies can be tested, or even feasible with limited resources. The Workshop helped identify the most important of these. Now a complex process of designing a program of experimental management and learning incorporating ecological necessity, economic goals and social expectations begins.

Whatever is done, community support is needed. This must be an adaptive learning process with a strong focus on educating the public about forest decline and its implications for Australia's environmental, economic and cultural future. It will require a unified vision of the future.

To look back at the end of a two day workshop and search for achievements is always challenging. But the Workshop achieved a great deal and the task is not as hard as it might seem. I saw the Workshop as having had three objectives:

- the first was to give a new and vibrant sense of direction and purpose to the BMAD Working Group by identifying stakeholder values and concerns. Only then could the BMADWG be confident in their actions
- secondly, the Workshop needed to demonstrate to all stakeholders the complexity of the issues surrounding forest decline. After the Workshop, stakeholders should be better prepared to accept the value and necessity of aligning ideas and positions instead of adhering to entrenched views and narrow vision of our forest's future



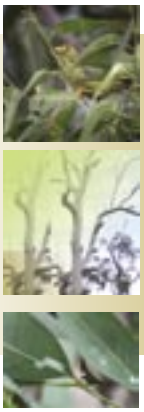
Session 10 - Synthesis and Management Directions - Emeritus Professor Harry Recher

- the third and arguably the most important objective for the Workshop was to find the way forward. As one participant asked, 'how will the outcomes of the Workshop achieve our goals?'

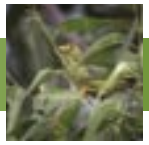
We go forward by providing leadership to government and community. Leadership was our third objective, but good leadership requires clear ideas and directions.

Many good ideas, a new the sense of direction and purpose, and greater understanding among Stakeholders came from the Workshop. Leadership grows from these when they are taken into the community, put into action, and education and learning begin. Resolving the problems of BMAD in northeastern New South Wales, no less so than addressing the issues of forest decline nationally, will take time. The Workshop met its objectives of providing vision, purpose and direction and setting the stage for leadership. We all need to be leaders and communicators about forest decline within the community.

All of us now need to act.



Delegate List



Delegate List

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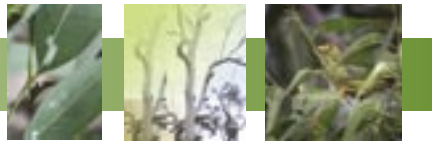

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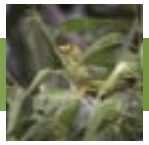

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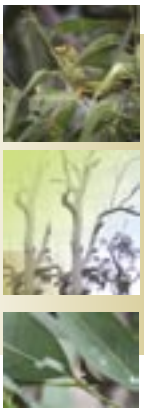


Appendix

Evaluation Responses

Evaluation Responses

Eleven responses to the evaluation survey were received, representing approximately 14% of participants. Participant responses to the achievements and experience at the National Forum were overwhelmingly positive. Responses are summarised below.

Question 1: What were your major aims in attending the Forum?

All respondents felt that the Forum in whole or part met their aims in attending the National Forum.

The majority of respondents aimed to learn about the BMAD syndrome its causes and the extent of the threat, to learn about the causes of BMAD and to contribute to an effective management response. Many of the respondents were landholders with BMAD on their properties and wished to actively contribute to finding solutions. One respondent felt that the National Forum did meet their expectation that participants would reach a science-based consensus on possible causes.

Question 2: What aspects of the Forum were useful to you?

Respondents felt that the National Forum was useful in that:

- Participants were able to have input without undue conflict;
- They gained a better understanding of the problem;
- A good balance was struck between review, presentations, workshops and discussion;
- Site visits provided a better appreciation of the issue in the field;
- Workshops enabled a range of solutions to be discussed; and
- The National Forum offered an excellent opportunity for networking.

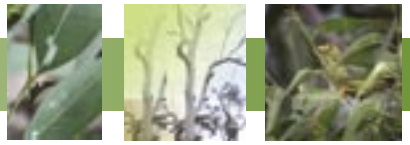
Question 3: How are you going to use your learning experience from this Forum back in your workplace/on your land/in your organisation?

All respondents were positive about the learning they took from the National Forum, and that there would be application of the outcomes to their workplace, community, local environment, or organisation. Responses ranged from the development of research projects, the dissemination of information to colleagues in their workplace, community or organisation, or reviewing the occurrence of BMAD in their local area, to convening a series of scientific papers on BMAD and providing informed advice and knowledge in land use planning projects.

Question 4: Please offer any constructive comments / suggestions to advance the aims of this continuing Forum process?

Respondents offered a range of constructive comments and suggestions to maintain the momentum generated by the National Forum. Comments and suggestions were to:

- Ensure that a series of adaptive management trials were undertaken incorporating the National Forum outcomes, with trials designed with a range of management options included;
- Ensure that the National Farmers Federation are represented in the ongoing work on BMAD;
- Maintain and improve communication, including by greater use of email, by holding another Forum in 3 years time; by reporting on the success or otherwise of adaptive management option trials, and by ensuring good information flow between BMAD Working Group members and their constituencies; and
- The achievement of a science-based consensus on the possible causes and appropriate management measures for BMAD involving scientists and experienced forest managers in a more technical meeting.



Evaluation Responses

Question 5: Please rate your experience of this Forum:

Respondents were positive about the National Forum and their experience. Responses proved for each criterion were:

Criterion	Very Good	Good	Okay	Poor
Overall the Forum was?	9	1	1	0
The Forum structure & process was?	7	2	2	0
The venue was?	9	1	1	0
The facilitation of the workshop sessions was?	7	0	4	0
Information and materials provided prior to and during the Forum was?	9	0	2	0

Comments by respondents about their experience at the Forum were overwhelmingly positive. Comments provided included the following range:

- Information provided at the Forum, including the Literature Review, was excellent;
- The Forum was the best that the respondent has attended, and the use of workshops with good facilitators drew out many good ideas from participants.
- Small group facilitators had a difficult task given the mix of participants. One respondent felt that facilitators sometimes pushed their own views;
- The National Forum was not an open-ended workshop, and the conclusion that adaptive management option trials were the way forward is supported but appeared pre-planned;
- Academics should "walk a mile in a land owners shoes" before condemning their land management practices; and
- One respondent felt that while they took a great deal away form the Forum it did not go far enough in addressing political action.