



→ Prescribed burning: How can it work to conserve the things we value?

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Background

Definition

The controlled application of fire under specified environmental conditions to a predetermined area and at the time, intensity, and rate of spread required to attain planned resource management objectives.
(AFAC)

Primary purposes are:

- a) Fuel reduction burning - "human assets"
- b) Ecological burning - "ecological assets"





- Subject to considerable debate in the public, media and scientific literature
- Three common viewpoints
 - Too much fire
 - Not enough fire
 - Inappropriate fire





Background

Role of science in the debate is generally secondary to public opinion

- Data is often patchy
- Data are complex
- Political response to public opinion



Strong scientific evidence is needed to underpin effective fire management of Australian ecosystems (Whelan 1995).



Aims

1. Examine the literature to assess the effectiveness and impact of prescribed burning in Australian ecosystems
2. Identify hurdles to implementing better fire management practices
3. Discuss the challenges faced by those implementing prescribed burning in the future



Fuel reduction programs

Fuel management objectives:

- a) to protect human life and property from wildfires;
- b) to protect highly-valued public assets (including timber plantations); and
- c) to prevent the spread of wildfires onto neighbouring properties.

Forests NSW - Fuel Management Plan (2007)



Fuel reduction burns - basic premise

Fire intensity ~ Heat * **Fuels** * Rate of spread

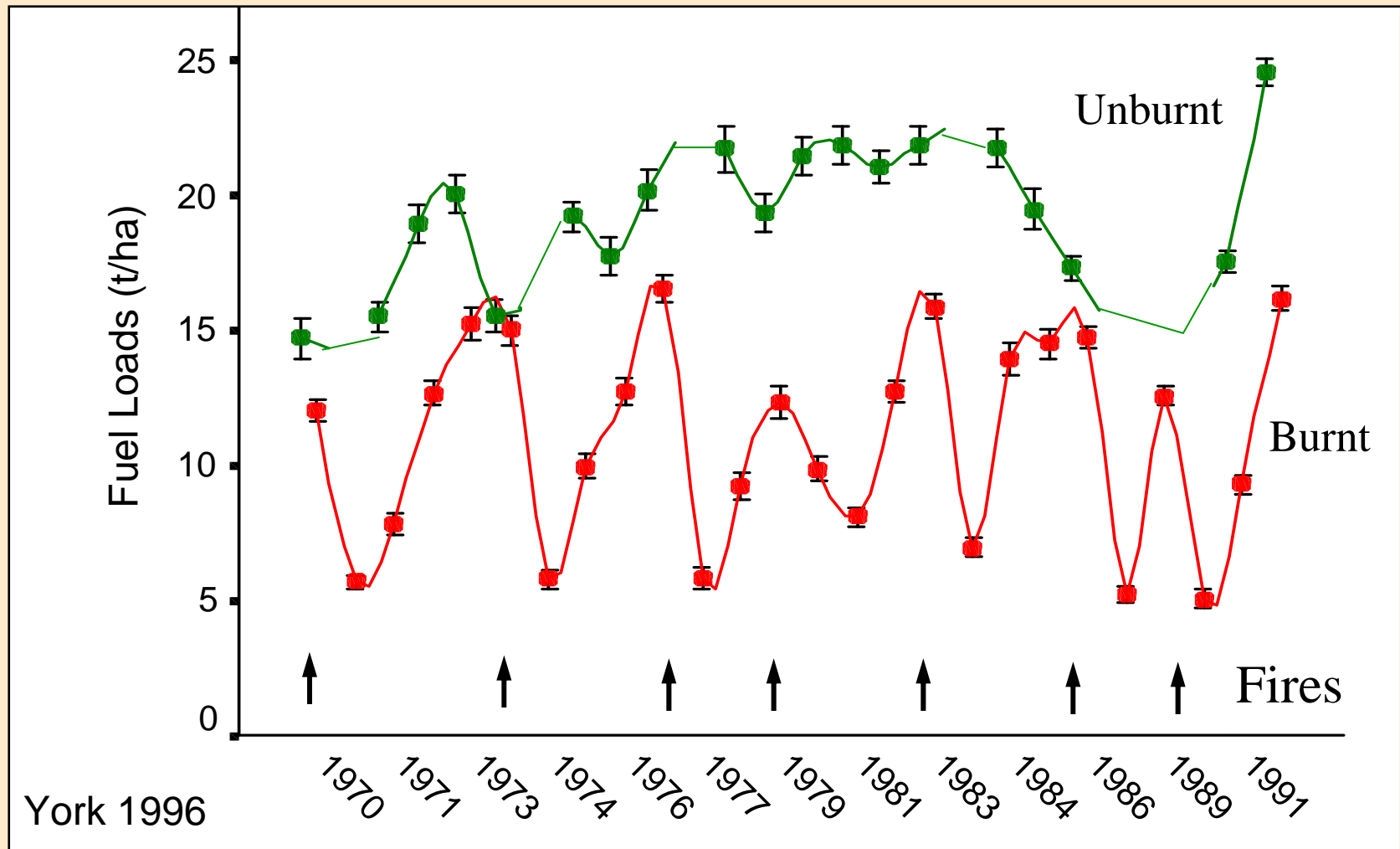
↓ fuels -> ↓ intensity -> ↑ p (control)

Examples of successful PB

- Fernandes and Botelho (2003) - review
- Underwood et al. (1985)
- Rawson et al. (1985)
- Grant and Wouters (1993)
- Gould et al. (2007) - Project Vesta



Fuel reduction burn - Strategic burn

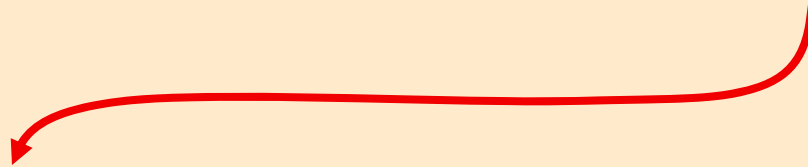


York 1996



Fuel reduction burn - landscape 1

$p(\text{success}) \sim p(\text{encounter}) \times p(\text{stopping})$



$p(\text{stopping}) \sim f(\text{weather, topography, fire intensity \& suppression effort})$



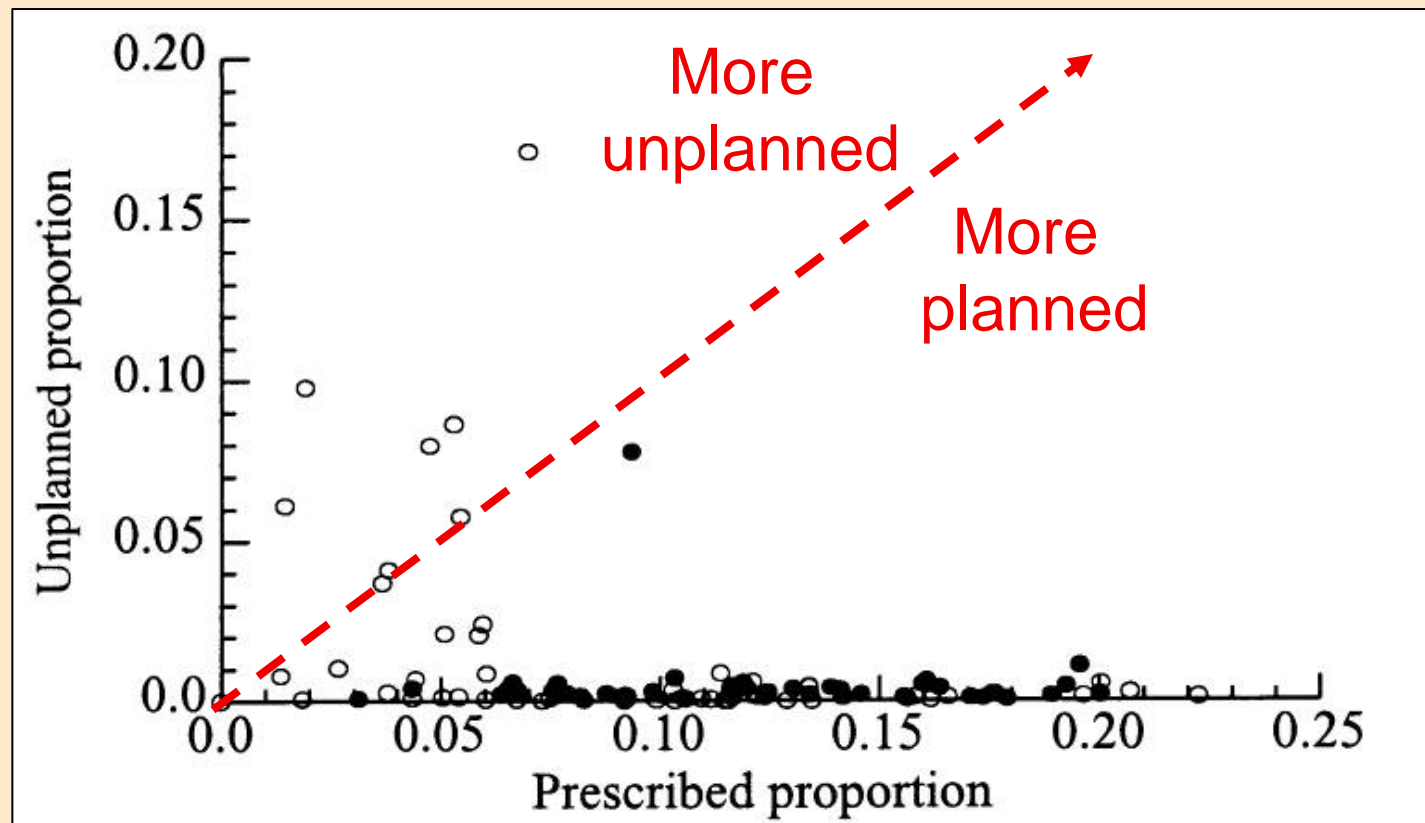
Fuel reduction burn - landscape 2

Effectiveness measured by comparing the proportion of landscape treated and area burned by unplanned fire





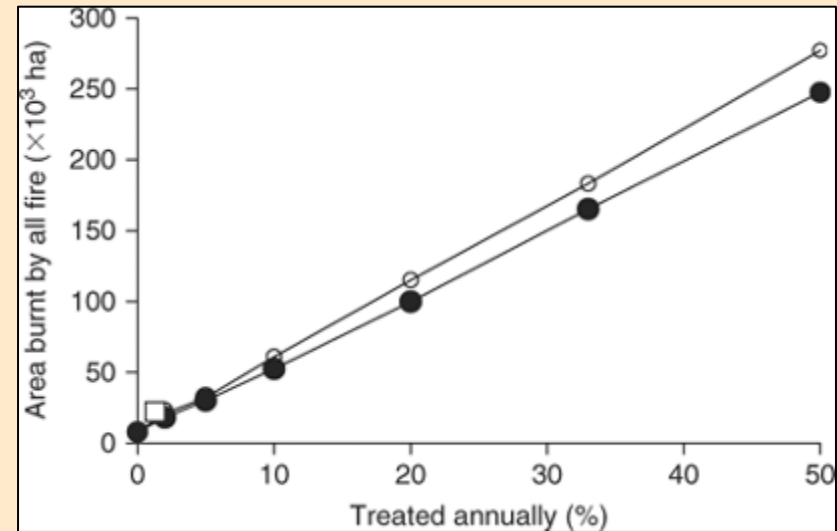
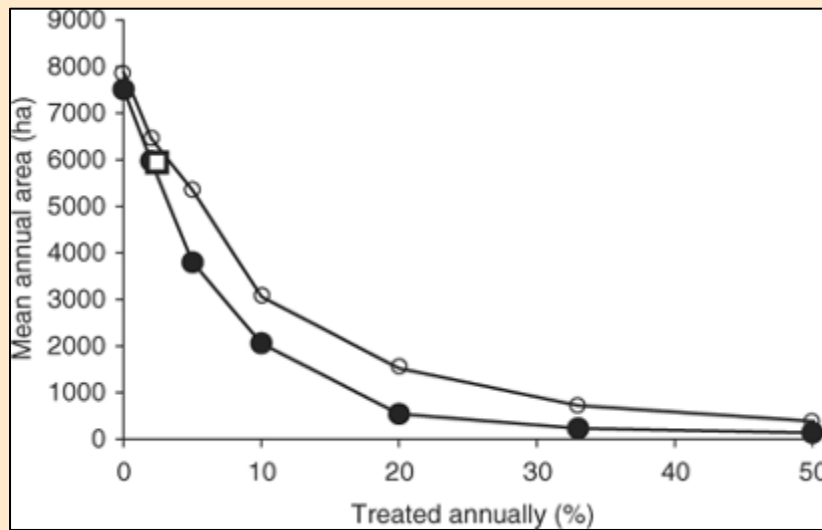
Effectiveness of fuel reduction programs Gill and Moore, 1997 - SW Australia





Effectiveness of fuel reduction programs

King et al. 2006 - Tasmania



See Cary et al tomorrow



Ecological burning

Definition:

Conducting prescribed burns in order to promote or protect ecological assets

Examples

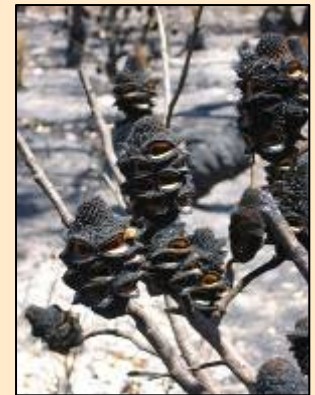
1. Indigenous burns
2. Regeneration burns in forestry
3. Biodiversity management





Effectiveness of ecological burns

1. Effectiveness is analogous to fuel reduction
2. Single burns are effective in achieving immediate goals
 - a) Triggering germination
 - b) Weed control
 - c) Stimulate flowering
 - d) Habitat modification





Ecological asset protection - savanna



Ecological impacts in savanna – low, generally acceptable



Ecological asset protection - SE forests



Ecological impacts in SE forests – high, unacceptable

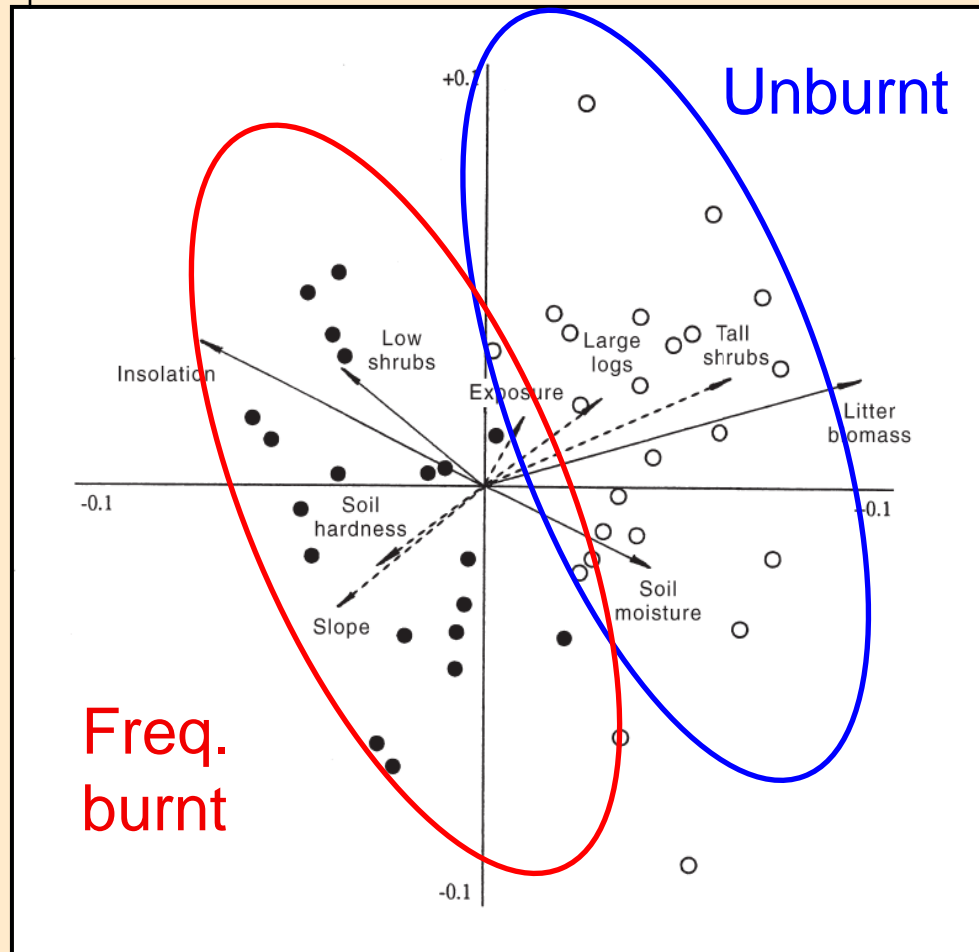


Landscape effectiveness of ecological burning

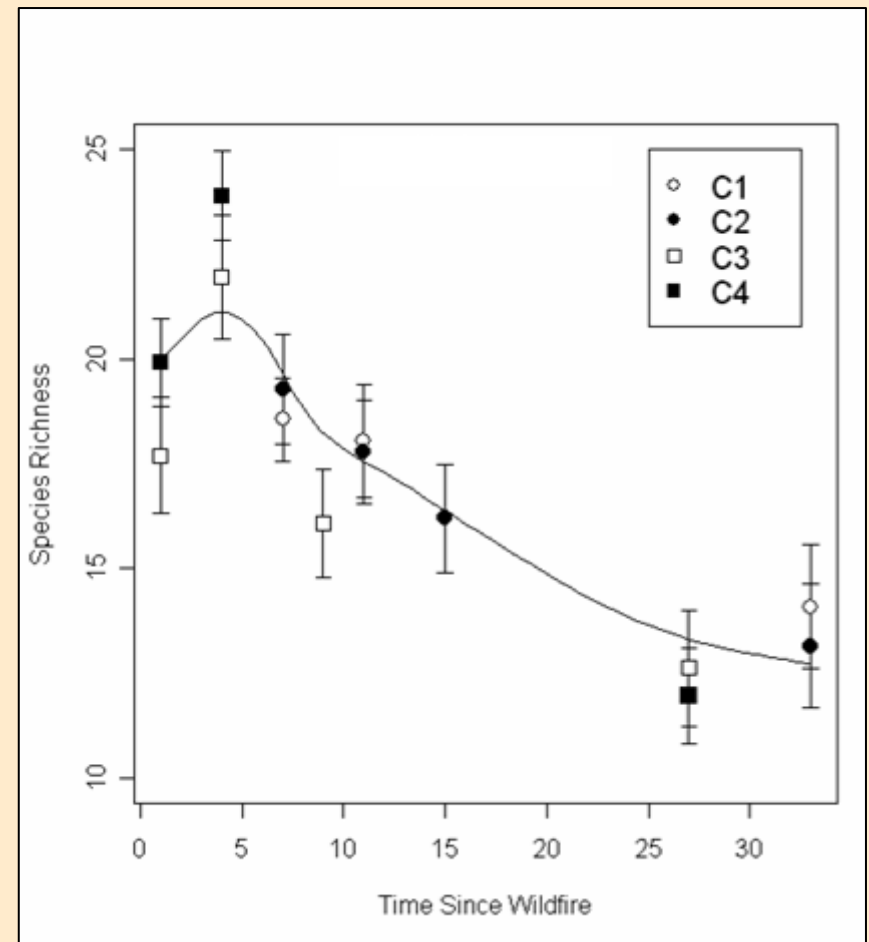
1. Quantitative assessment of ecological burning not possible at present time
2. Objectives poorly defined
 - a) e.g., maintain biodiversity in the landscape
 - b) Success difficult to quantify and measure
3. Responses long term and sensitive to fire regime
 - Frequency - planned and unplanned fire
 - Seasonality
 - Patchiness
 - Scale
 - Intensity



Biodiversity and Frequency



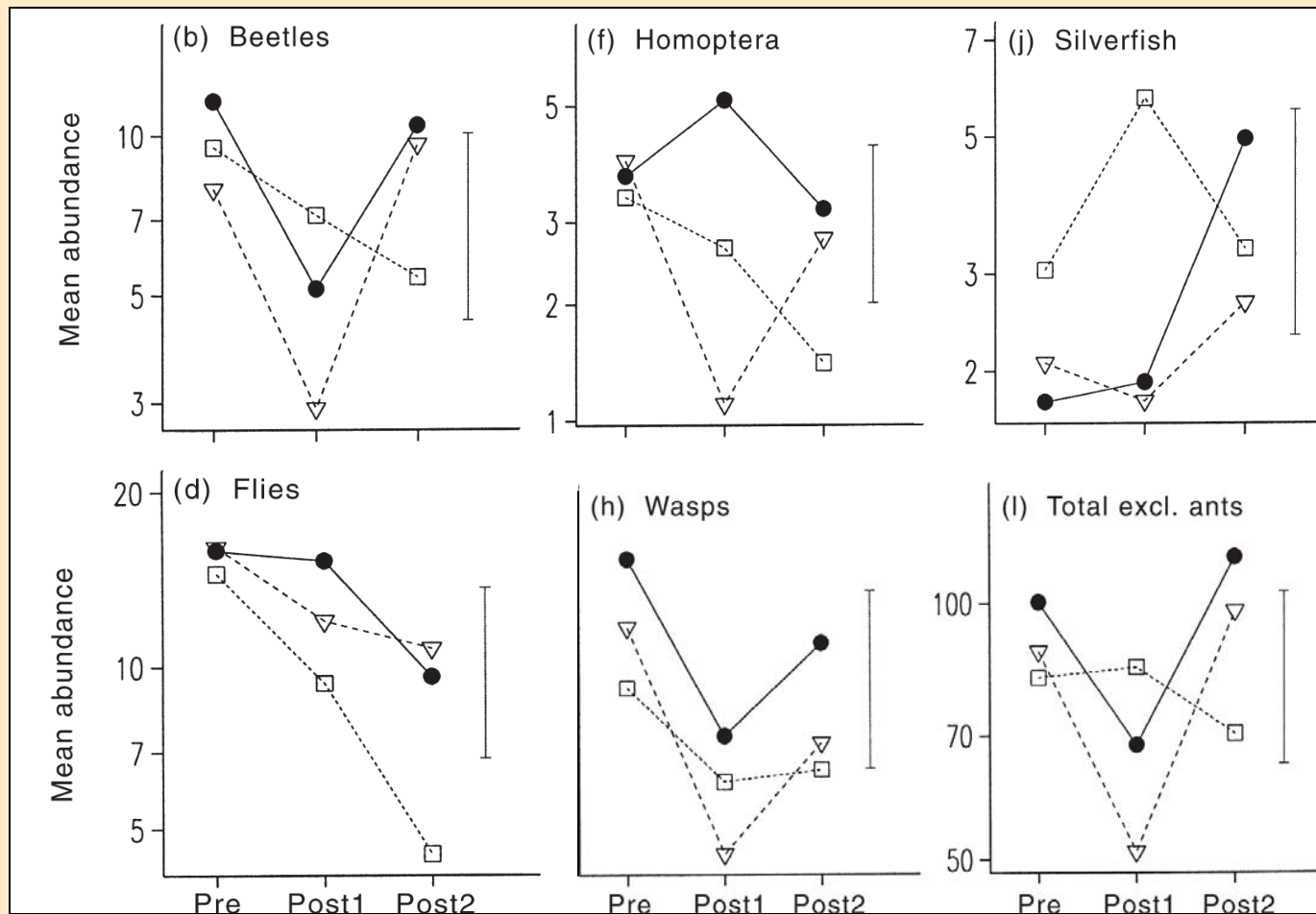
York 2000



Penman et al. in press



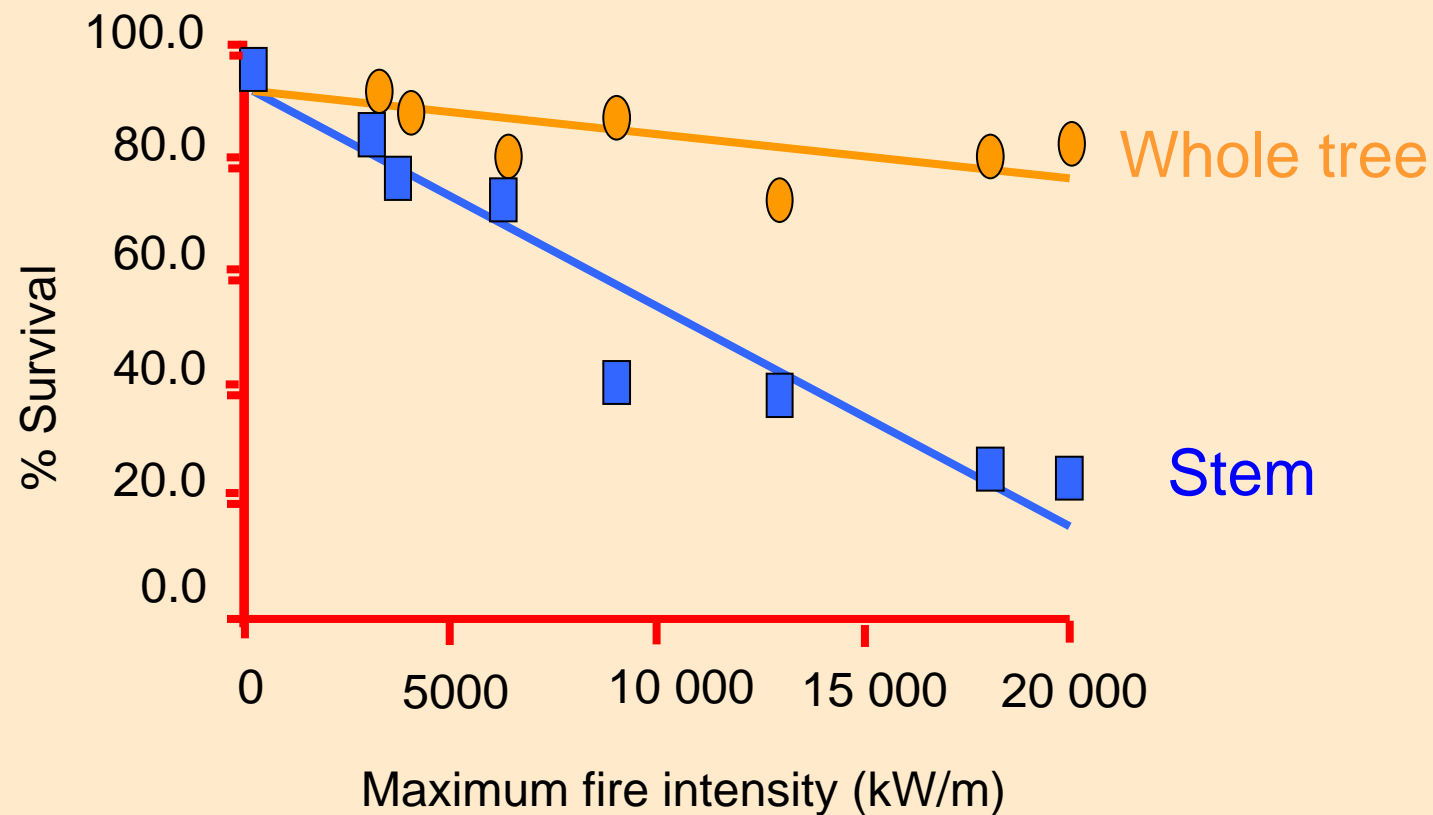
Biodiversity and seasonality



Andersen and Muller 2000



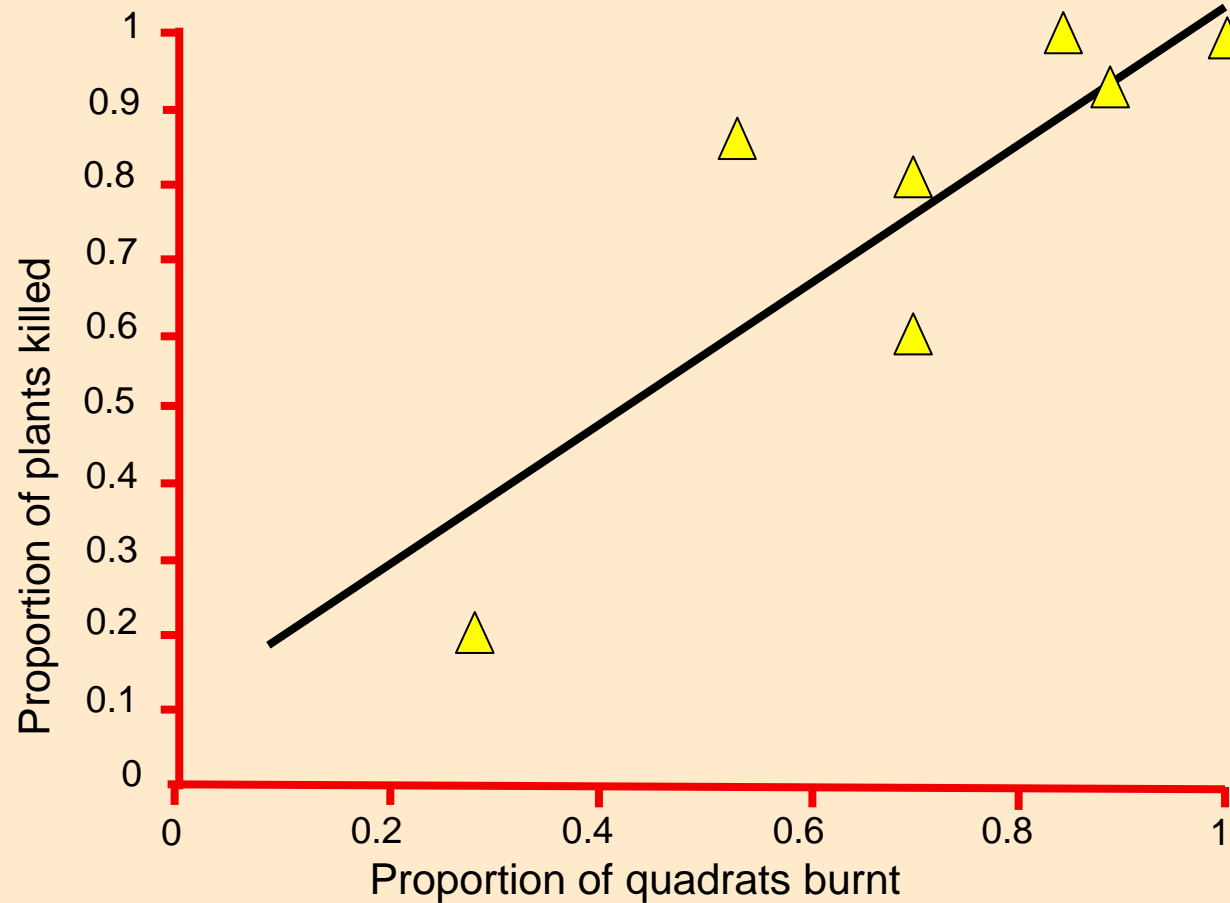
Biodiversity and fire intensity



Redrawn from Williams et al. 1999

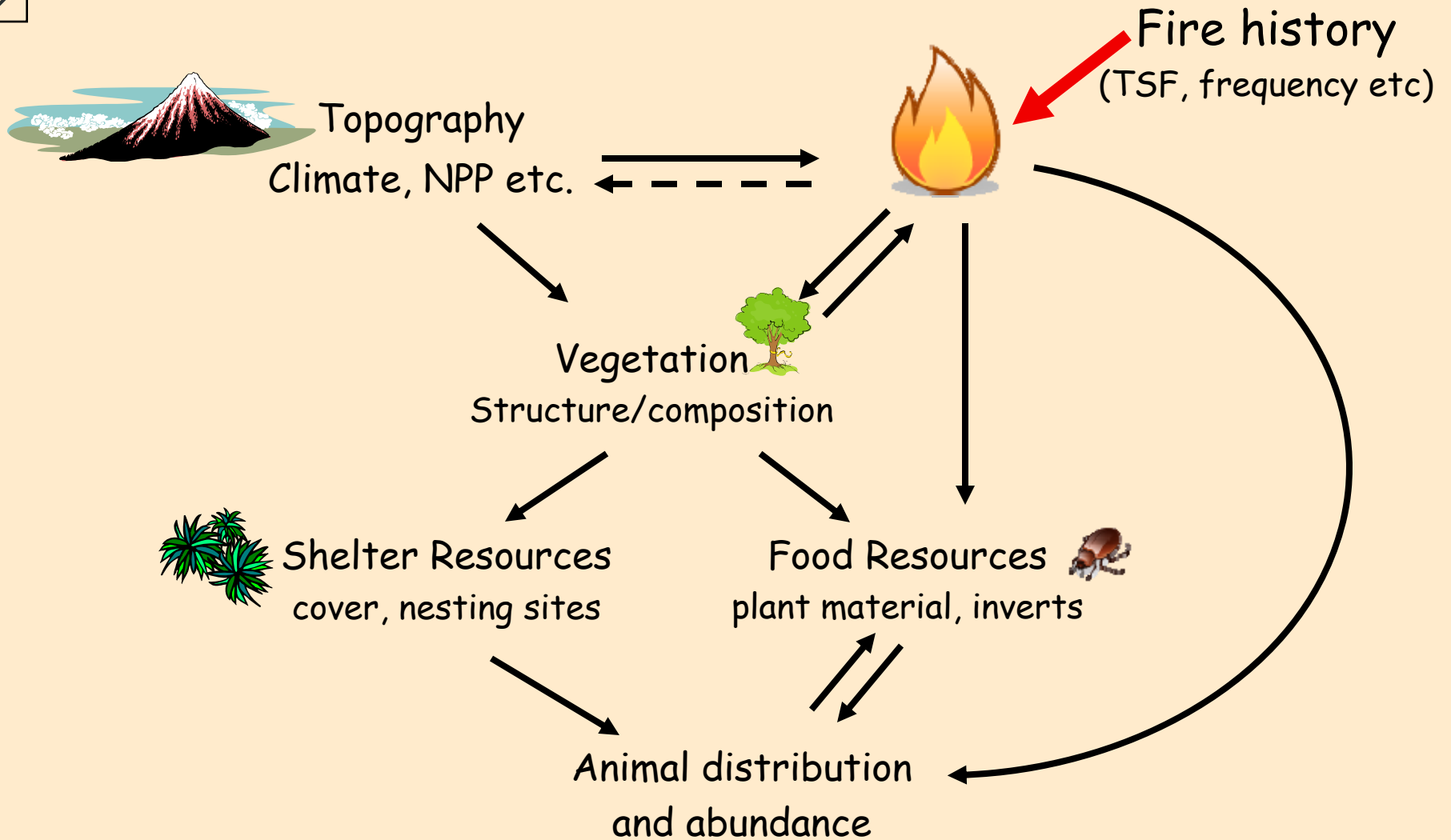


Biodiversity and patchiness



Redrawn from Ooi et al. 2006

Schematic diagram of ecological effects of a fire



→ Long term data

Few studies available for Australian systems

- Eden Burning Study Area - SE NSW (23 years)
- Wombat Study Area - Victoria (24 years)
- Bulls Ground Study Area - NE NSW (35+ years)
- Bauple, Beerwah, Peachester SF - SE QLD (38 years)
- Other unpublished examples



Generally based on varying one or two aspects of the planned fire regime



Long term data

Results indicate species and communities do not always conform to *a priori* predictions

E.G., Driscoll & Henderson (2008) predicted reptile responses to fire treatments in the Mallee

- 19% correct
- 25% trended to model, but not significant
- 50% response was opposite to prediction
- 6% curvilinear response



Targeted monitoring program essential to determine success



An ideal prescribed burning program

1. Have clear objectives for both fuel reduction and ecological purposes assessed within a risk management framework
2. Overlap between ecological goals and fuel reduction objectives desirable but not always essential
3. Be accompanied by a monitoring program to assess the extent to which the program achieves its objectives
4. Feedback loop into management



Hurdles to implementation - pt 1

1. Lack of data to create clear, measurable objectives to determine success/failure
 - e.g., concepts of patch mosaic/pyrodiversity

2. Reconciling requirements and impacts of:
 - a) Aboriginal burning practices
 - b) Contemporary burning practices
 - c) Conservation burning practices





Hurdles to implementation - pt 2

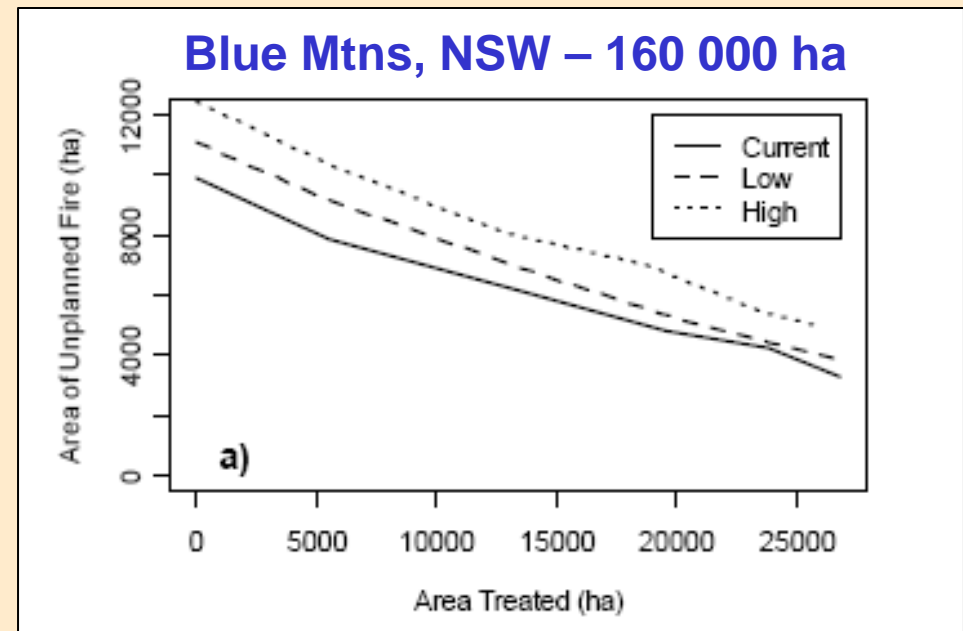
3. Research vs management
 - Varying outlook
 - Varying goals
 - Varying timeframes
4. Institutional differences
5. Budgetary constraints
6. Social perceptions of fire





Future of PB in Australia - pt 1

1. Predicted climate change varying impacts
 - a) Increased occurrence and extent of wildfire
 - b) Changed season of wildfire and PB
 - c) Decreased window for PB



(Bradstock, Davies, Price & Cary unpub.)



Future of PB in Australia - pt 2

2. PB in carbon/fire mitigation schemes in NT
3. Increased role of indigenous communities in developing and implementing PB programs
4. Long term research programs addressing the effectiveness of ecological burning regimes
5. Strong integration of science into fire management



→ How can PB work to conserve the things we value?

1. Have clearly defined measurable objectives
2. Monitor and adjust management accordingly
3. Greater communication between science and management and vice versa
4. Educate the community about the costs and benefits of prescribed burning programs





Acknowledgements

Ecological Society of Australia - symposium

