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# Integrating fire management and biodiversity

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## The changing context of public land management in the last 20 years….

- Vastly expanded network of reserves managed primarily for conservation
- Multiple-use management overtaken by:
  - focus on threatened species and the implementation of recovery plans
  - biodiversity as a management goal
- Greater community expectations
- Greater agency accountability to Government
- Agency focus on programs rather than on area-based management



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## Fire Management by Objectives

- Objectives for fire and biodiversity conservation should be clear and achievable but this is often difficult to achieve in practice
- Objectives apply at different scales:
  - Landscape
  - Ecosystem
  - Management Unit
  - Species



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## Managing Fire & Uncertainty

Researcher:

- It's all very complicated
- We don't know enough and need to do more research
- We shouldn't do anything until we have a better understanding of the consequences of our actions

Manager:

- Simplify it and give me an paradigm to manage to
- Tell me what you know and how I can best use it while your doing more research
- The 'do nothing' strategy will give rise to unacceptable consequences



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## Managing fire for conservation: some possible responses (1)

- Strategy: Exclude planned fires until better information becomes available
- Examples:
  - Noisy Scrub birds
  - Granite monadnocks
- Outcome: Fire excluded for 15-20 years followed by intense summer wildfires caused by lightning
- Consequences:
  - Adverse impact on targeted values
  - Adverse impacts on broader ecosystem structure and function



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## Consequences of attempted fire exclusion in jarrah forest:

- high mortality of trees, shrubs and seed stores
- fire penetration into sensitive granite plant communities
- adverse impact on soil and water



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## Mount Many Peaks – 1 Jan 2005
## Initial stages of fire development



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## Managing fire for conservation – some possible responses (2)

- Strategy: Targeted fire management for populations of threatened species
- Examples:
  - Autumn burning to regenerate *Gastrolobium* thickets for Tammar wallaby
  - Rare flora
- Outcome: Site specific fire plans
- Issues:
  - Limited by understanding of species distribution and biology
  - Potential for conflict between species with differing requirements
  - Target species may be unrepresentative of the surrounding landscape



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# Managing fire for conservation – some possible responses (3)

- Strategy: Target distribution of vegetation age class across
- Examples:
  - Victorian guidelines for ecological burning
  - south-west WA fire and biodiversity project
- Outcome: Landscape fire management plans
- Issues:
  - What is an appropriate age class target?
  - Distribution reflects landscape and management unit scales but may not reveal patchiness and patterning within units
  - Focus on time since fire as an indicator of biodiversity outcomes



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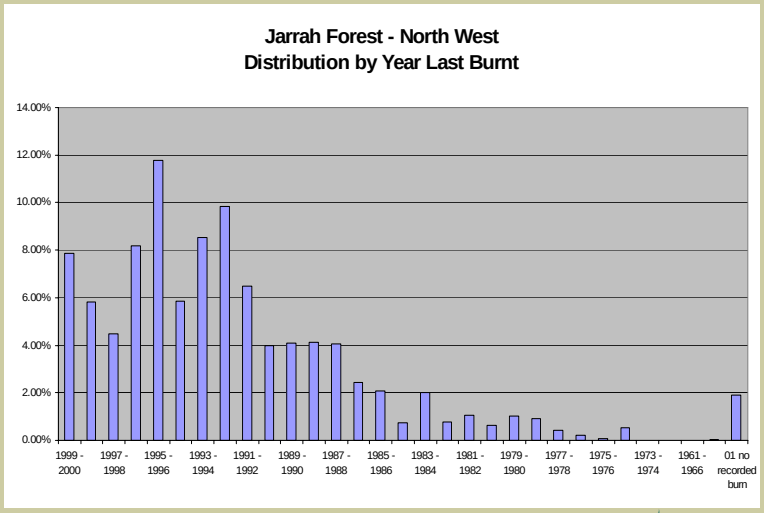




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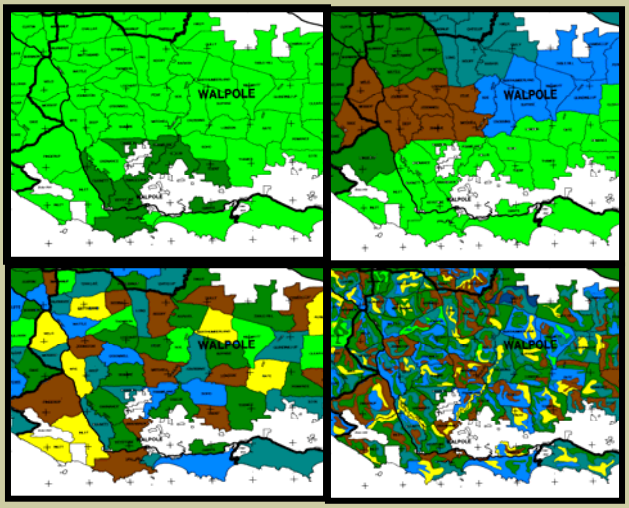
## Heterogeneity of post-fire age can exist at a range of scales



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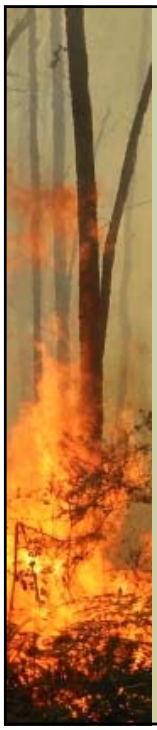

## Fire Regime

- Is the history of fire interval, season and intensity experienced by a landscape, ecosystem or patch
- Scale and patchiness of fires are increasingly recognised as critical factors at the landscape scale



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## Appropriate Fire Regimes

- Ecologically appropriate fire regimes are regimes that conserve biodiversity and maintain ecosystem processes
- Ecologically unacceptable (or inappropriate) fire regimes stress or degrade an ecosystem by significantly and irreversibly changing:
  - Structure (simplified), or
  - Function (diminished reproduction, recruitment, dispersal, nutrition etc.)
  - Composition (permanent loss of species)



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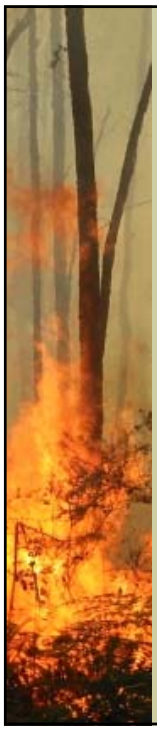

## Extent of management control over fire regime components

- Management can exert varying levels of influence over fire regime components
- Fire frequency and season can be readily influenced by:
  - use of planned ignition,
  - prevention of unplanned ignition
- Fire intensity can be influenced at the landscape & management unit scales but there is less certainty at ecosystem or site scale
- Managing scale and patchiness at the ecosystem or site scale requires a sound understanding of fire behaviour, site specific information on fuels, and suitable ignition techniques. There will always be a residual level of uncertainty.



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## Interaction between components of regimes using planned fires

| | Season | Intensity | Scale | Patchiness |
|---|---|---|---|---|
| Frequency | | Strong | | Strong |
| Season | - | Strong | | Strong |
| Intensity | | - | Possible | Strong |
| Scale | | | - | Strong |
| Patchiness | | | | - |



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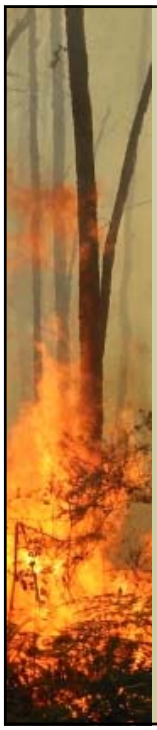

## Interactions between fire regime components can affect biodiversity outcomes – an example

- Fire sensitive plants with canopy stored seed are considered vulnerable to local extinction by regimes with a fire frequency close to the juvenile period.
- This prediction has a sound basis in ecological modelling.
- However, field evidence indicates that some fire sensitive species exposed to regular fires can develop multi-aged populations because fires are patchy and low intensity in young fuels
  eg *Lambertia rariflora*



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**Large *Lambertia rariflora* in forest subject to regular prescribed fire. Estimated age 100-125 years. Species has thin bark and poor re-spr**



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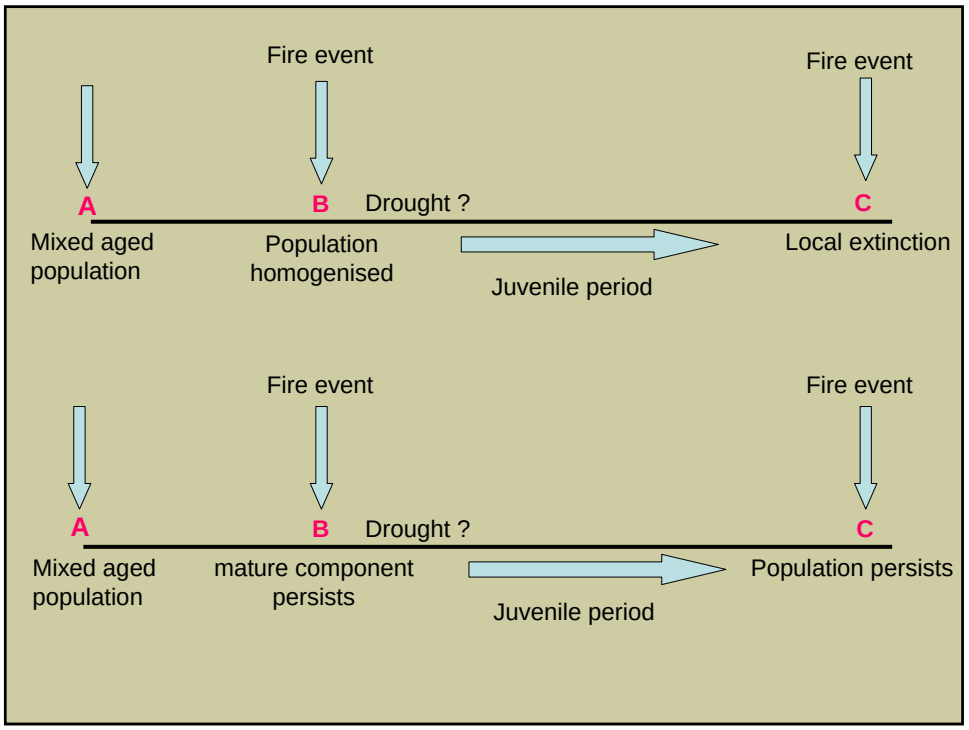

## Potential for research to contribute to improved management for biodiversity

- Better prediction of fire spread in landscapes with complex vegetation mosaics to allow reliable implementation of patchy fires
- Validation of ecological models designed to predict population responses over time, and further exploration of interaction between fire regime components
- Accurate and consistent assessment of fire severity using remote sensing, particularly in multi-layered vegetation



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Thank You



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