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
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

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
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

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

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
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)

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.
Interaction between components of regimes using planned fires

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

Diagram:

- **A**: Mixed aged population
- **B**: Population homogenised
- **C**: Local extinction

- **Drought ?**
- **Fire event**

**Transition:**
- Juvenile period

**Process:**
- Mixed aged population
- Mature component persists
- Juvenile period
- Population persists
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

Thank You