Fire Diversity Promotes Biodiversity

Dr N.D. Burrows
***Science** Division*
Department of Conservation and Land Management
Western Australia

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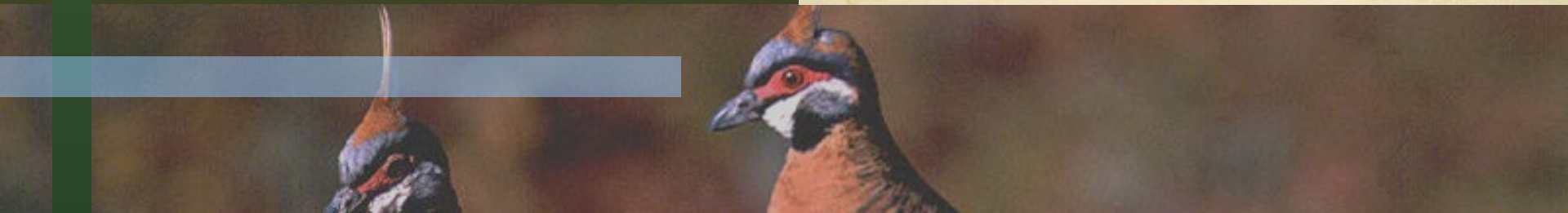
Conservation
AND LAND MANAGEMENT

Introduction

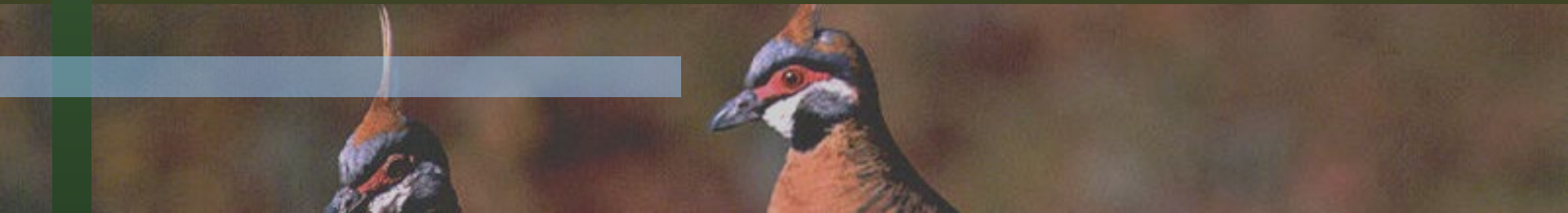
- Long association between fire, climate and south-west ecosystems
- Arrival of humans c. 50 000 yrs ago
- European colonisation 1829



Adaptations to fire?

- Plants & animals display physical and behavioural traits that enable them to persist in a fire prone environment.

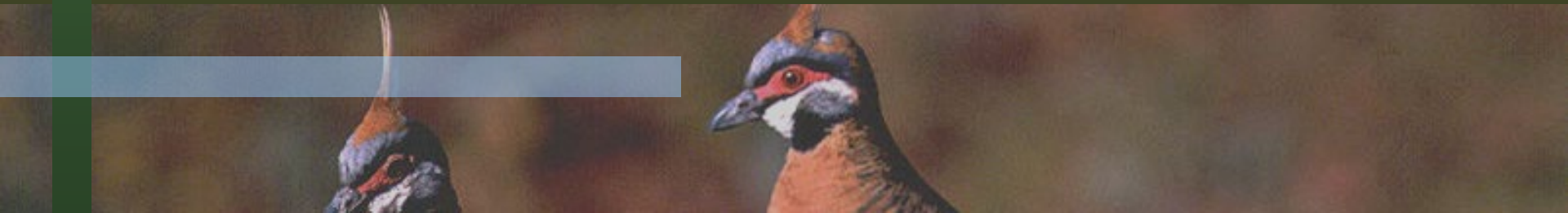
- Are they adaptations to fire or to other environmental selection pressures?



Scientific knowledge of Fire Ecology

- We know quite a lot
- There is still a lot to learn
- We don’t apply all that we know
- Knowledge summarised in:

  “*Fire in ecosystems of south-west Western Australia: impacts and management*”



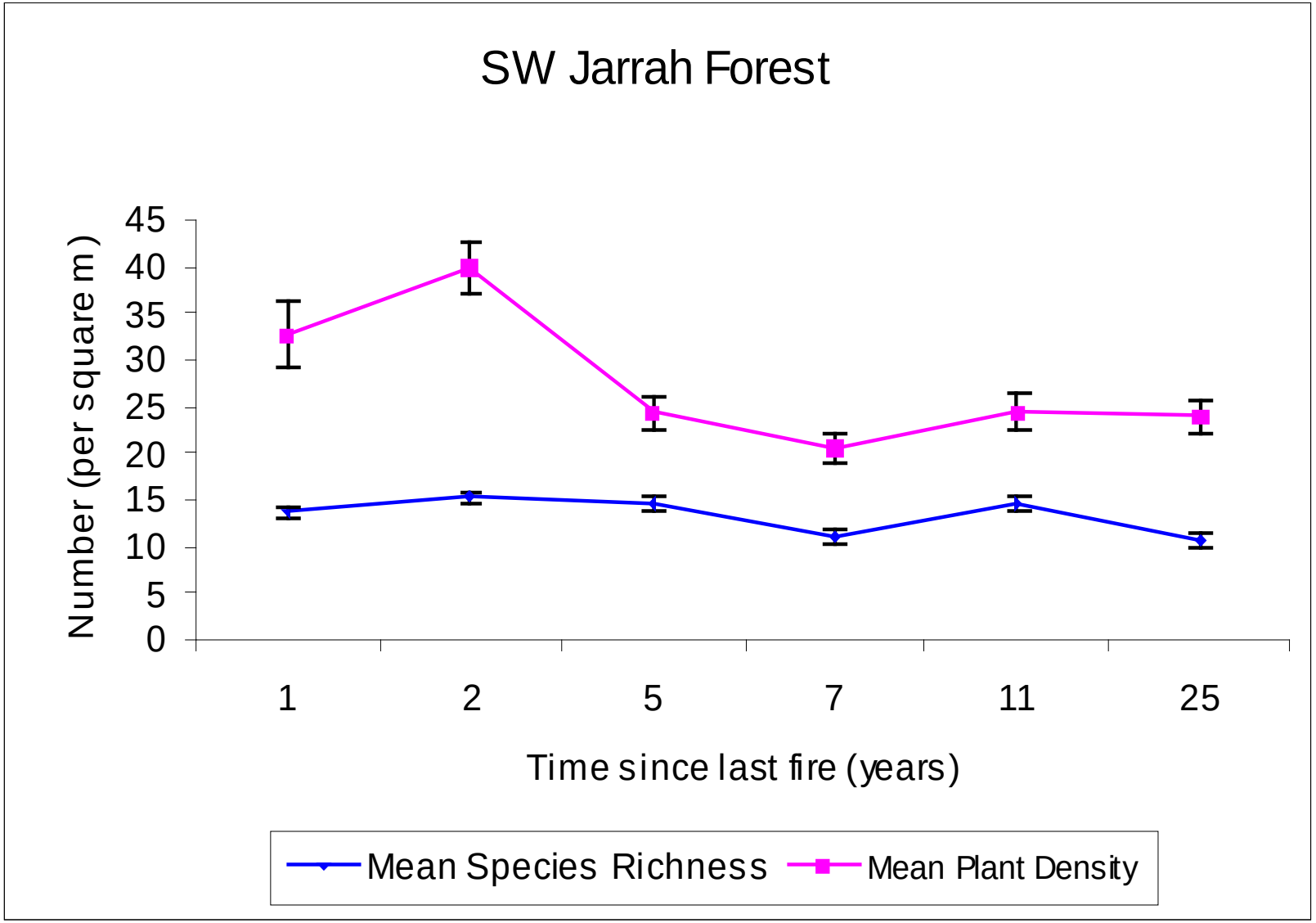
Plants: Adaptive traits

- Resprout
- Thick bark
- Serotony
- Fire-induced reproduction

Plants: community responses

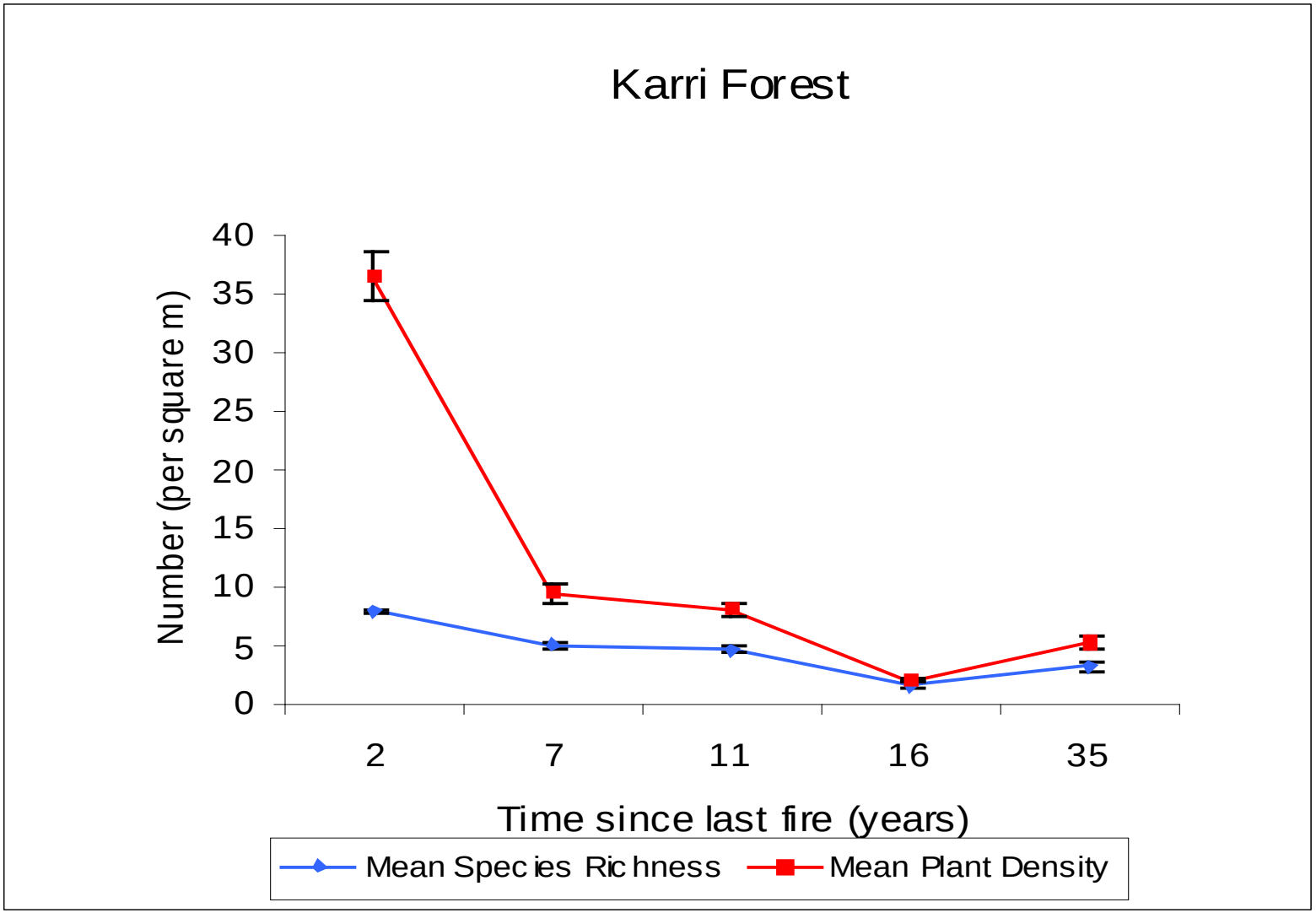
Plant community responses to a fire

Species richness & abundance with time since fire

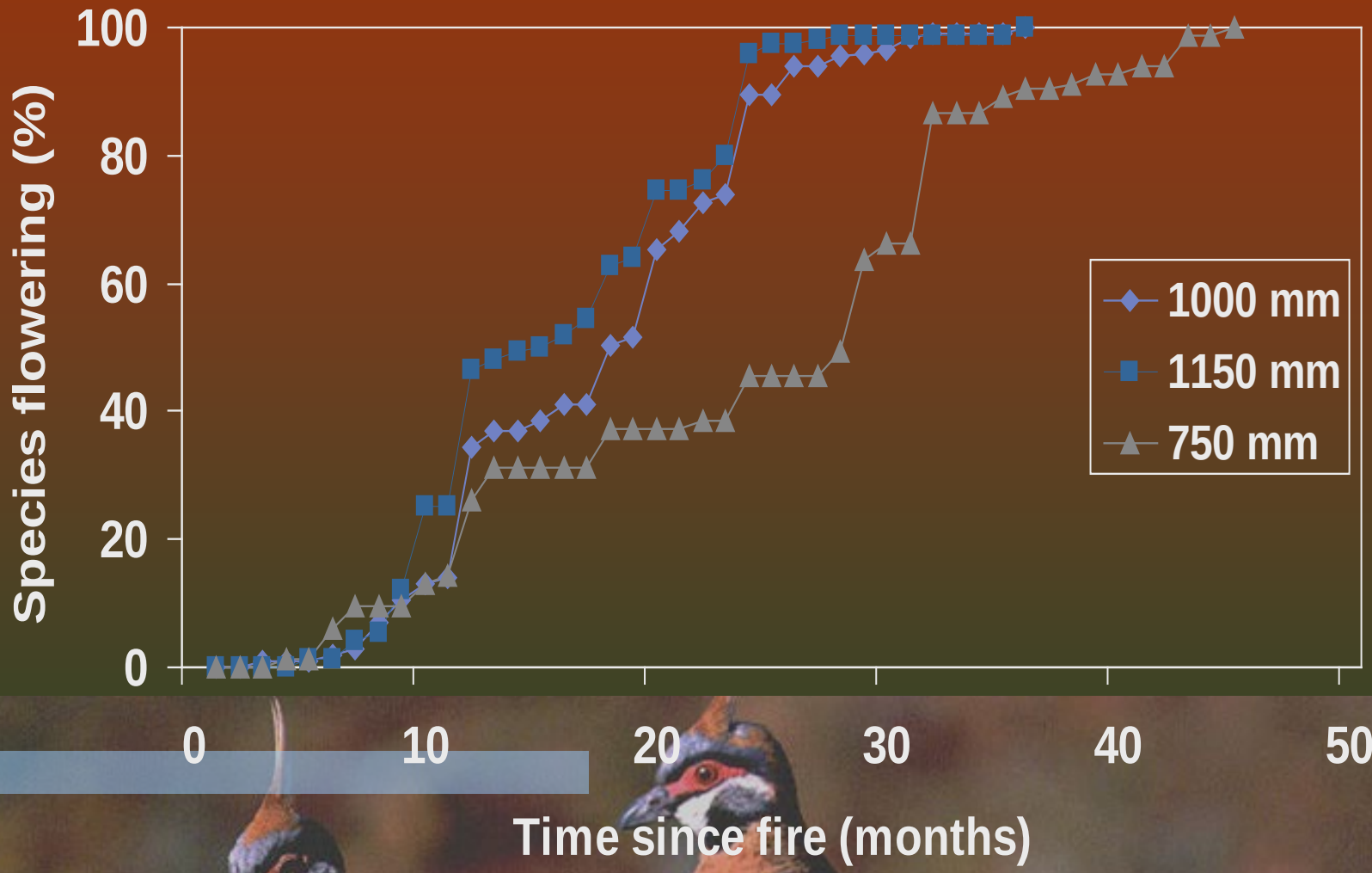


Plant community responses to a fire

Species richness & abundance with time since fire



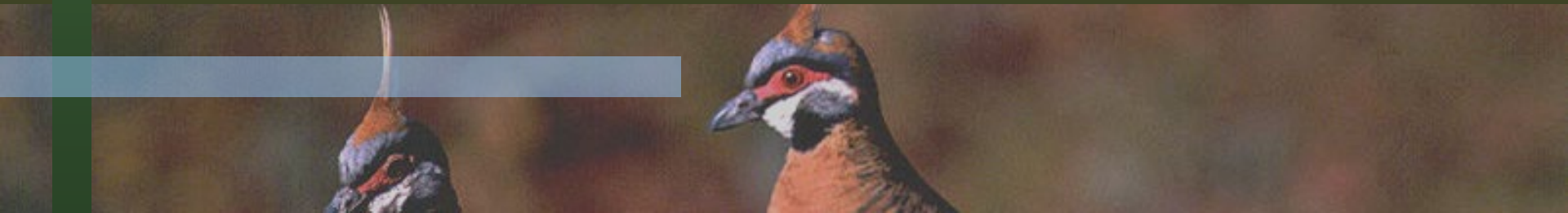
Time to first flowering after fire for some 500 upland forest understorey species



Fire regime effects

Fire regime:

- fire intervals (frequency)
- fire season
- fire intensity
- fire patchiness and scale



Definition

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- fire intervals (frequency)
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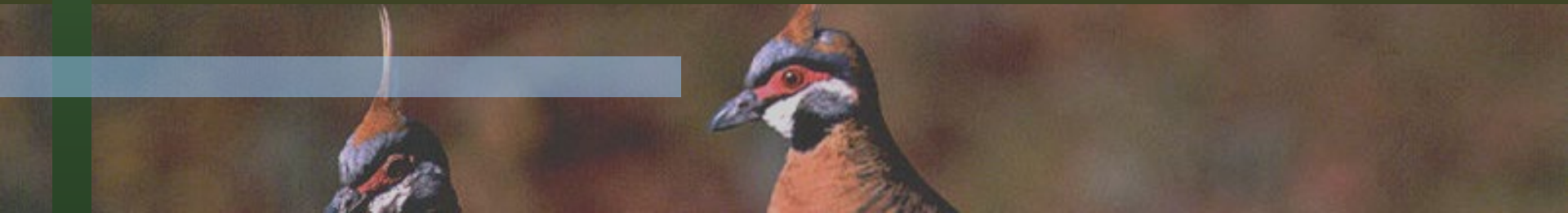

Number of jarrah forest species that increased or decreased in abundance: 1970-2001

Fire Regime	Increased	Decreased
1 w/fire in 30 yrs	5	7
Spring 3-5 yrs	8	8
Autumn 5-7 yrs	7	5
Autumn & spring 5-7 yrs	9	8
Spring 7-9 yrs	11	5
Autumn 3-4 yrs	10	6

Fire and Fungi

- Successional flush of post-fire fungal fruiting
- Long unburnt sites have higher number of mycorrhizal roots
- Species diversity is similar on long unburnt sites and recently burnt sites but composition is different
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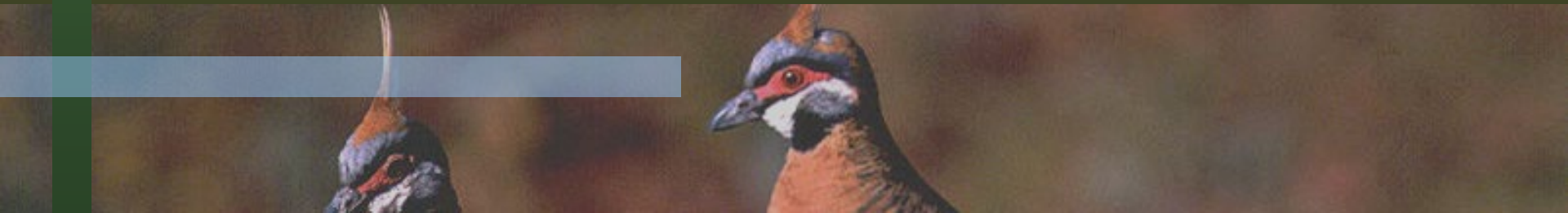
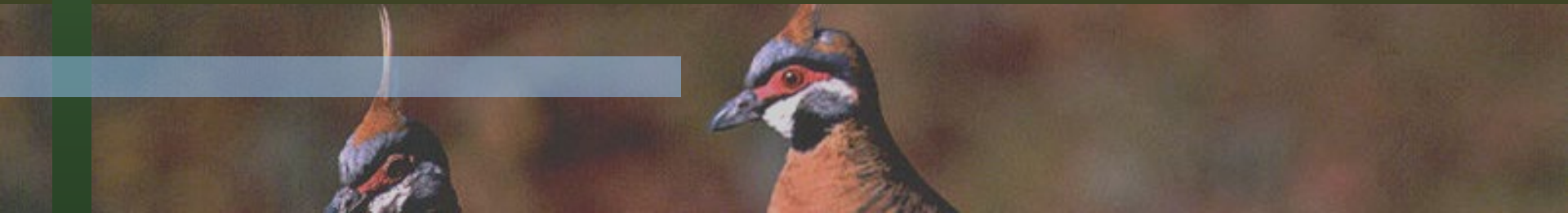


Fire and Mammals

- Mammal numbers reduced by intense fires that burn substantial areas
- Low intensity, patchy fires have little effect
- Response varies with species
- Large macropods prefer recently burnt areas



Fire and Mammals ctd

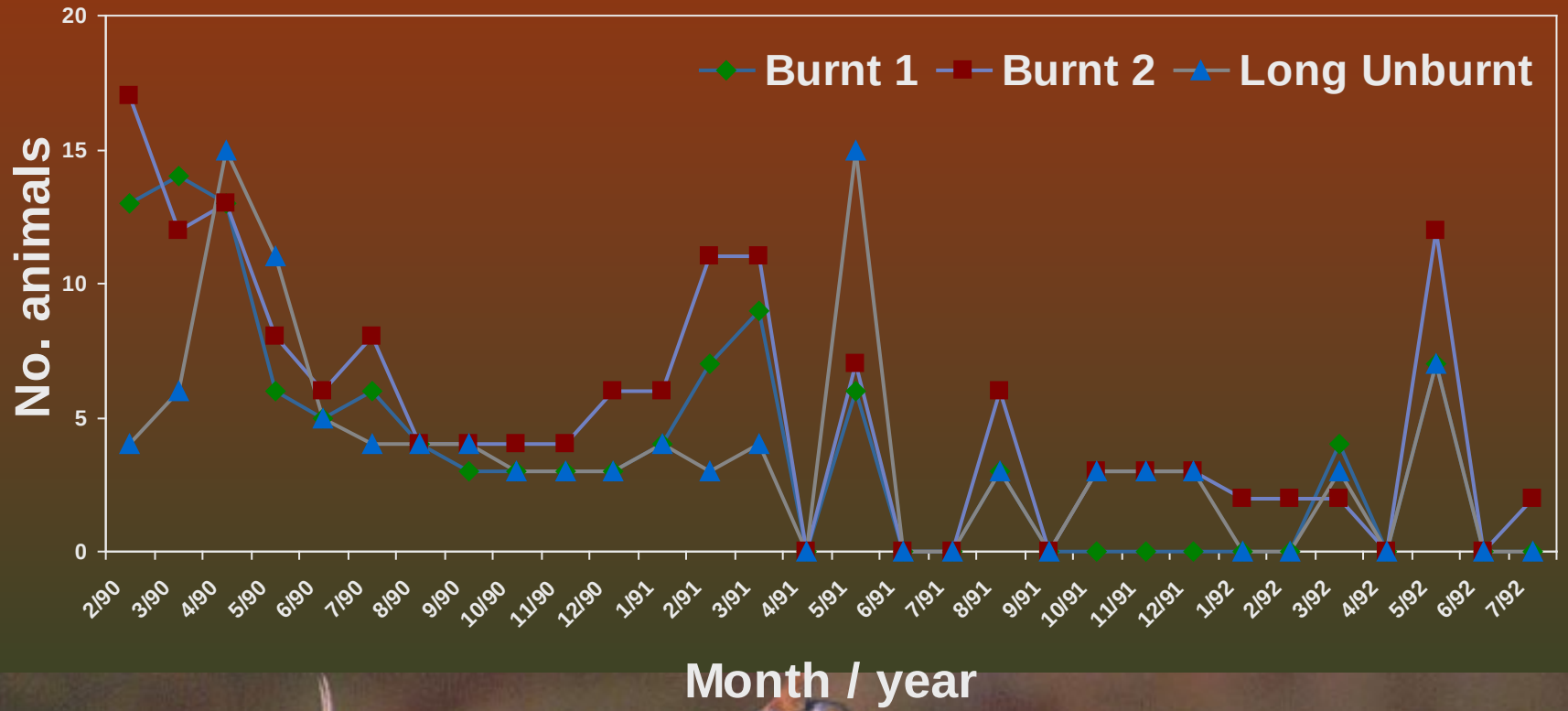
•Quokka, Honey possum and Mardo mature vegetation unburnt for 10 yrs or more.

•Tammars require infrequent fire (25-30yrs) to regenerate thicket (in presence of fox?)

•Post-fire response patterns are reasonably predictable

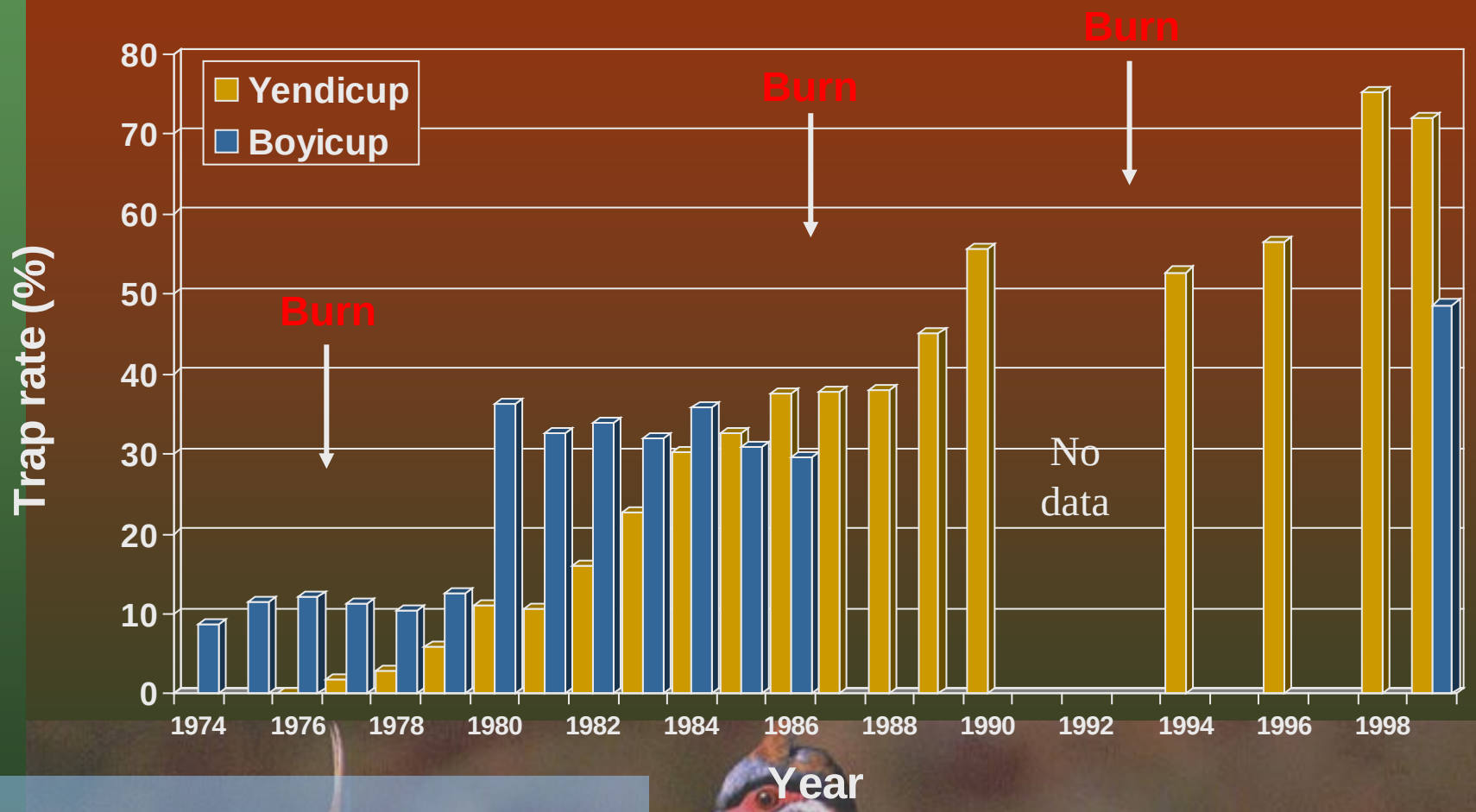
•Inadequate long term data

Response of Red-tailed Phascogale to a 100 ha fire



•(Burrows &Friend 1998)

Mammal trap rates in Perup forest (woylie, possum, quenda, chuditch)



Birds and Fire

- Bird communities are relatively resilient to single fire event
- Extent of impact on species diversity is related to extent of impact on habitat and habitat recovery rate
- Some species prefer recently burnt, others prefer long unburnt

Fire and invertebrates

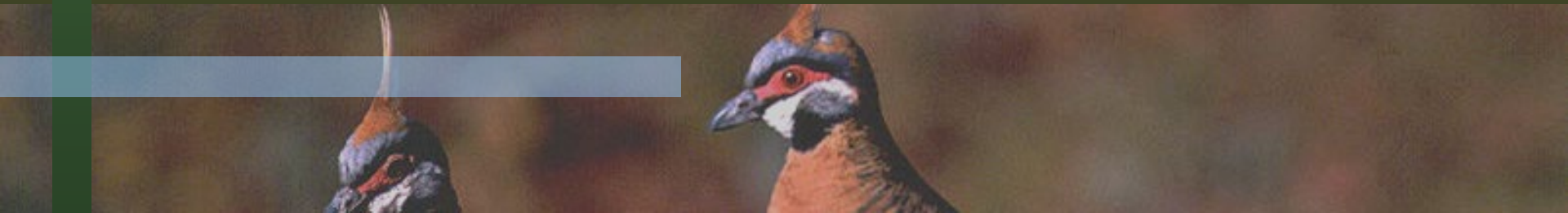
- Some species prefer recent fire, others prefer long unburnt
- Species decline immediately after fire, then recovers with time
- Species diversity is greatest where habitat heterogneity is maximised

Fire, Frogs and Reptiles

- Limited reliable data
- Banksia woodlands – little long term impact
- Forest – Geocrinia – 30-50% reduction post-fire, then recovery by 5-7 yrs
- Sunset frog – post-fire condition promotes breeding activity

Important Knowledge Gaps

- Long term effects of fire regimes
- Landscape scale effects
- Appropriate grain size of fire mosaic
- Effects of fire on niches such as wetlands (especially organic rich substrates), rock outcrops, riparian zones
- Interactions with other disturbances/changes
- Climate change and fire response



Summary

- Fire has a very long association with natural ecosystem in south-west WA
- Fauna & flora display a range of physical and behavioural adaptive traits
- Organisms and communities vary in their response to fire
- No single fire regime benefits all organisms
- Diverse fire regimes promote biodiversity at the landscape scale
- Fine scale fire-induced mosaic promotes diversity at the landscape scale