Fire and plants in south-west forests: A review of knowledge

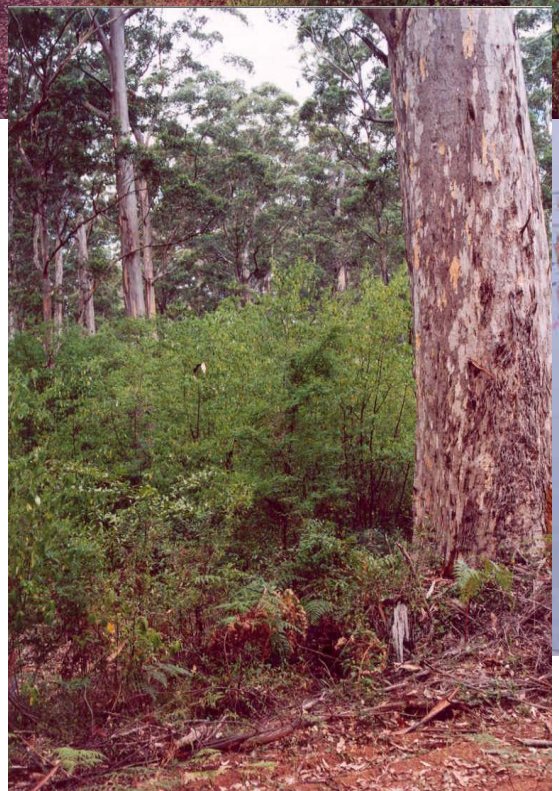
Neil Burrows & Grant Wardell-Johnson

Tingle forest, 50 yrs unburnt (G. Liddelow)

Presentation Structure

- Introduction
- Fire-adaptive traits of plant species
- Plant community responses to a fire
- Plant community responses to fire regimes
- Conclusions

Forests - a complex mosaic



Fire Adaptations

Regeneration Strategies: Resprouters

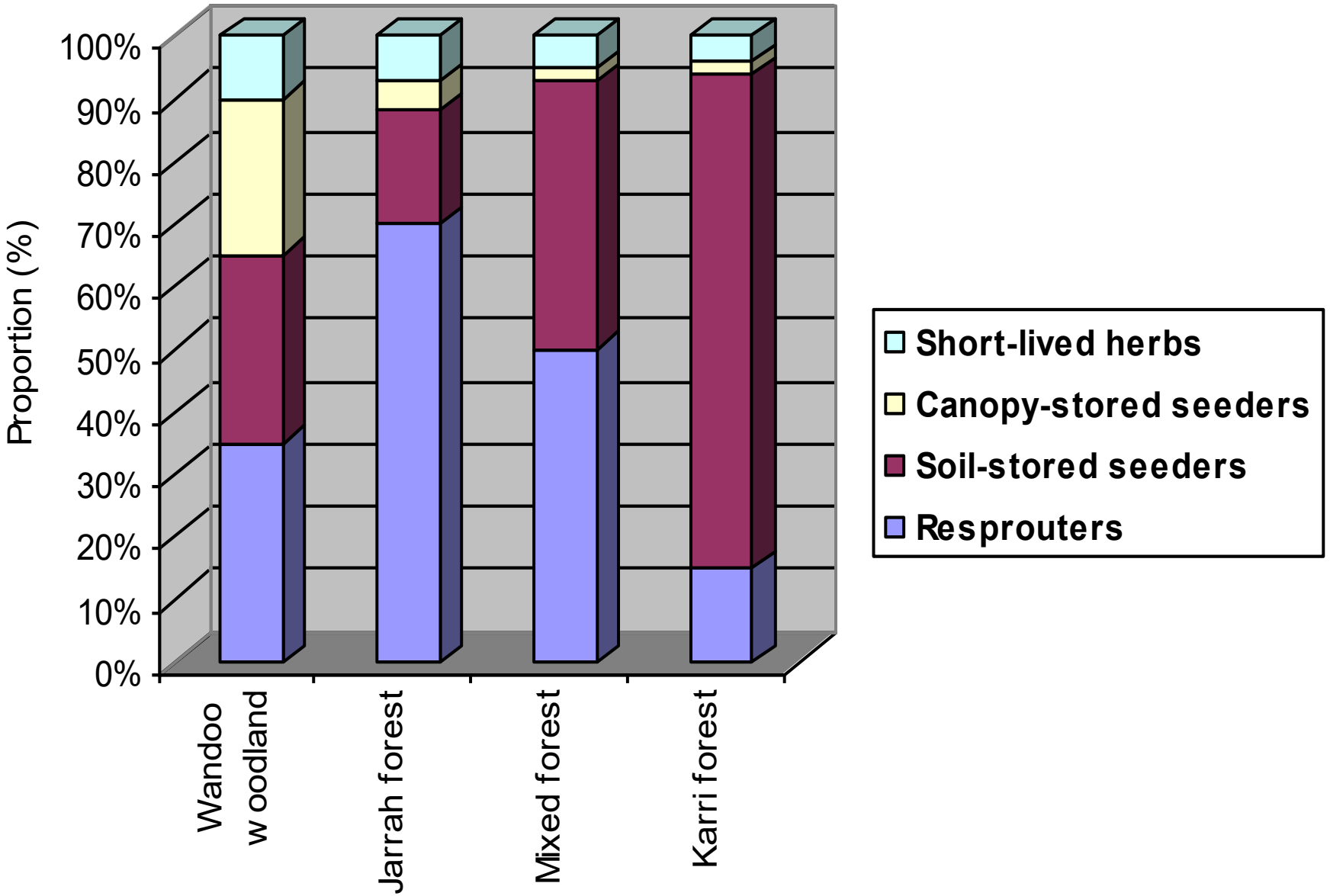
Fire Adaptations

Regeneration Strategies: seeders

Canopy stored seed

Soil stored seed

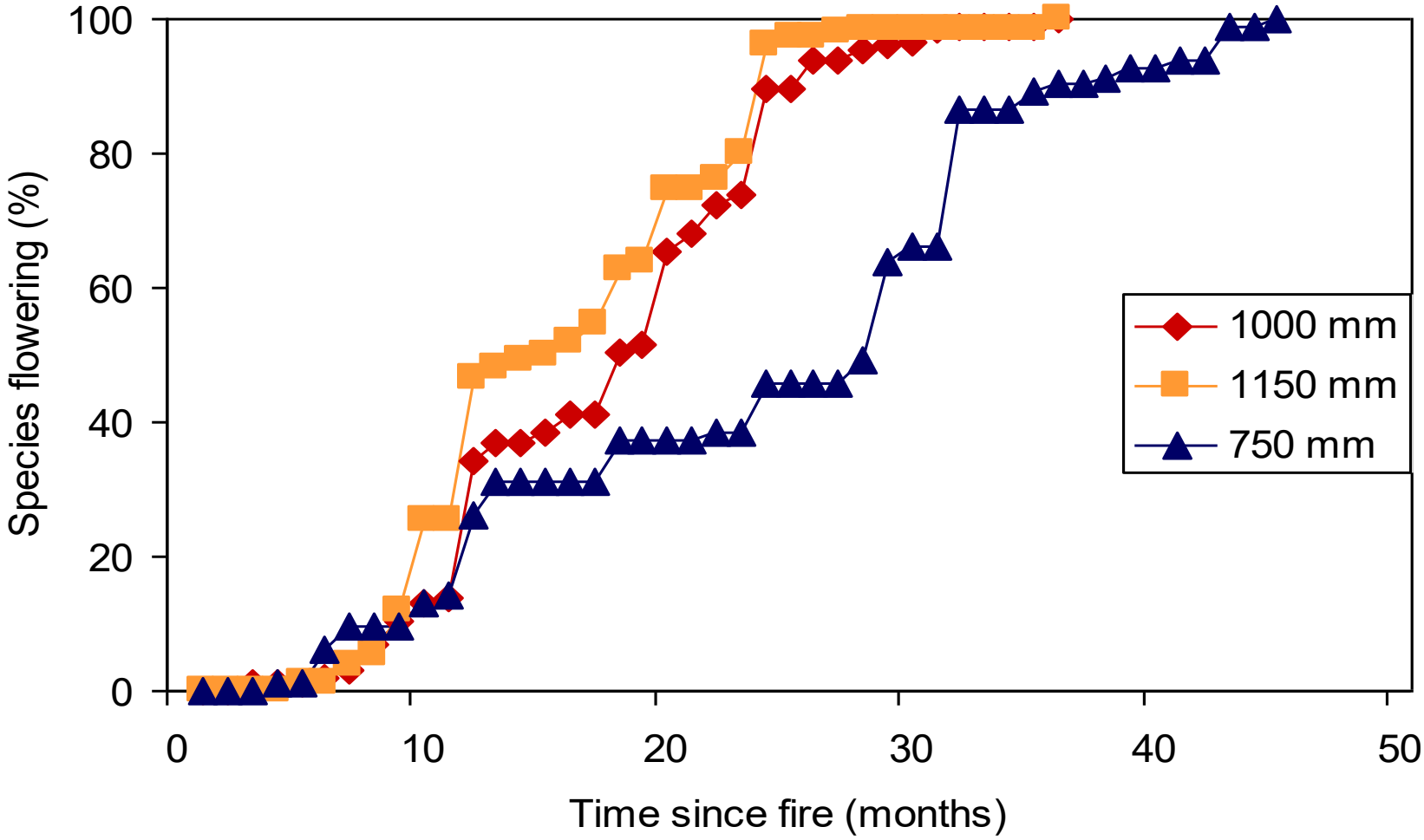
Composition of forest understorey species by life forms



Fire Adaptations

Post-fire flowering

Time to first flower after fire (juvenile period): 3 upland jarrah forest understoreys



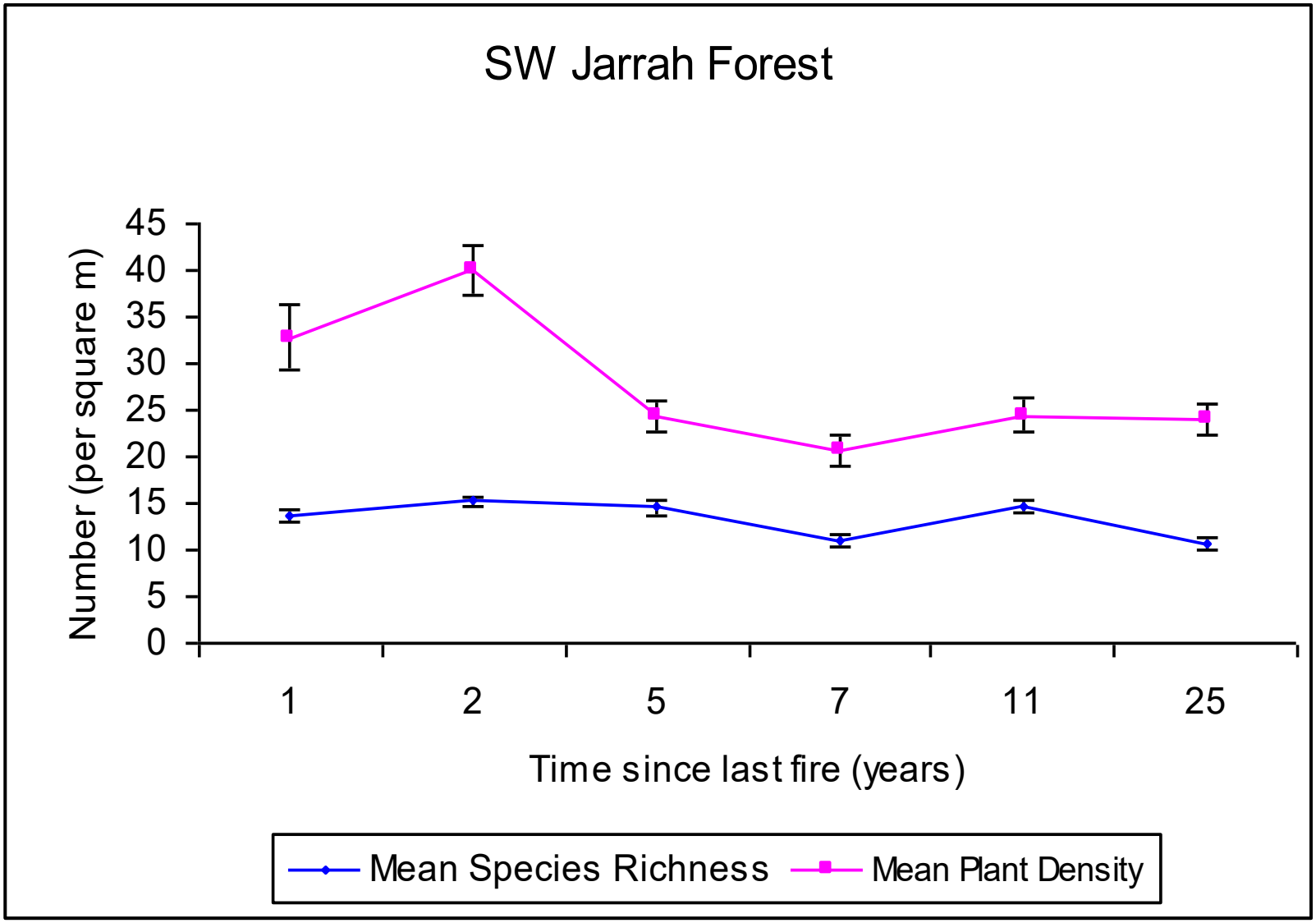
Setting fire intervals (using plants as indicators)

- Minimum fire interval: 2x juvenile period to allow seed-bank replenishment?
- Maximum fire interval: Less than longevity of fire sensitive, serotinous species.

A fire - plant - animal interaction

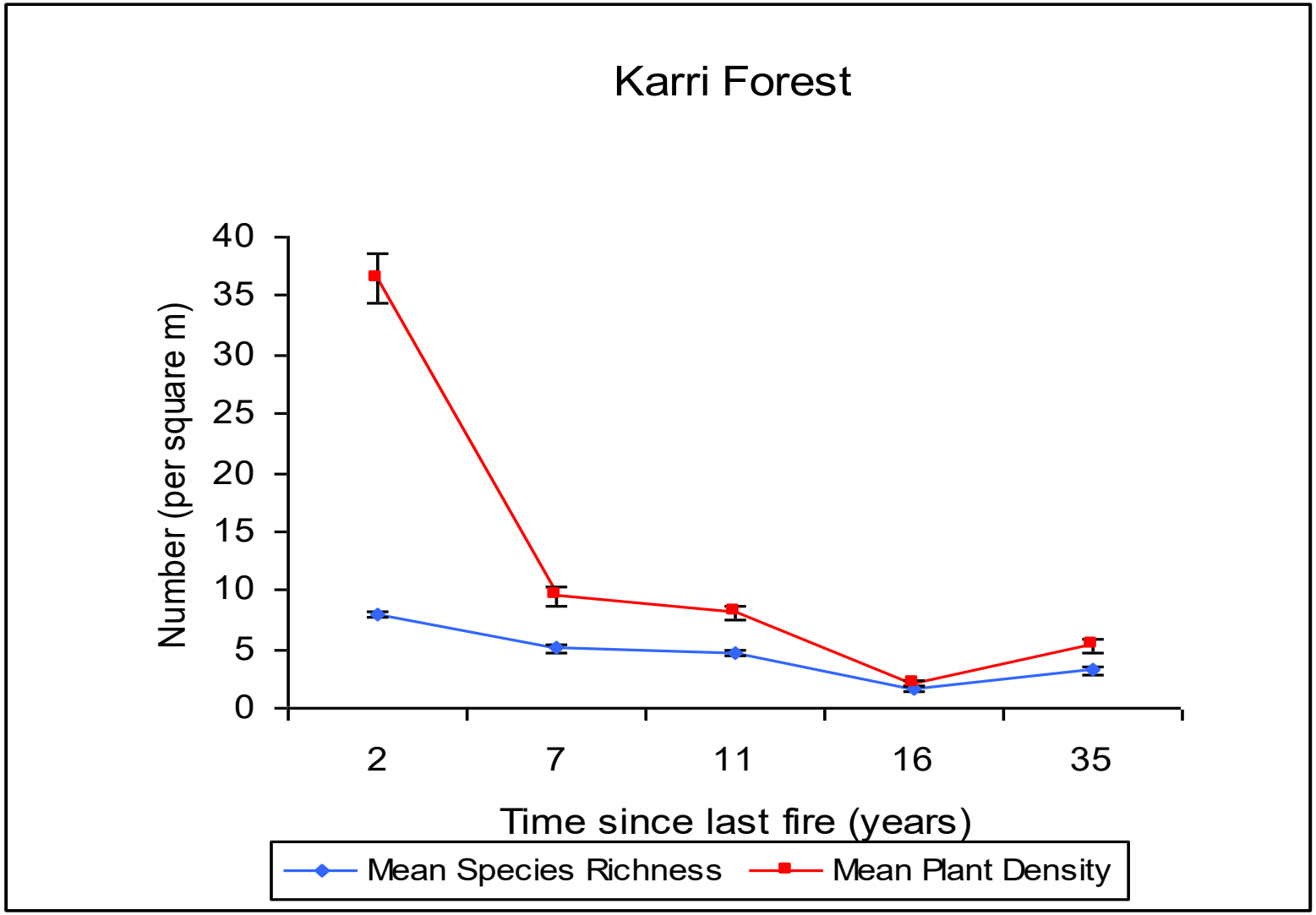
Plant community responses to a fire

Species richness & abundance with time since fire



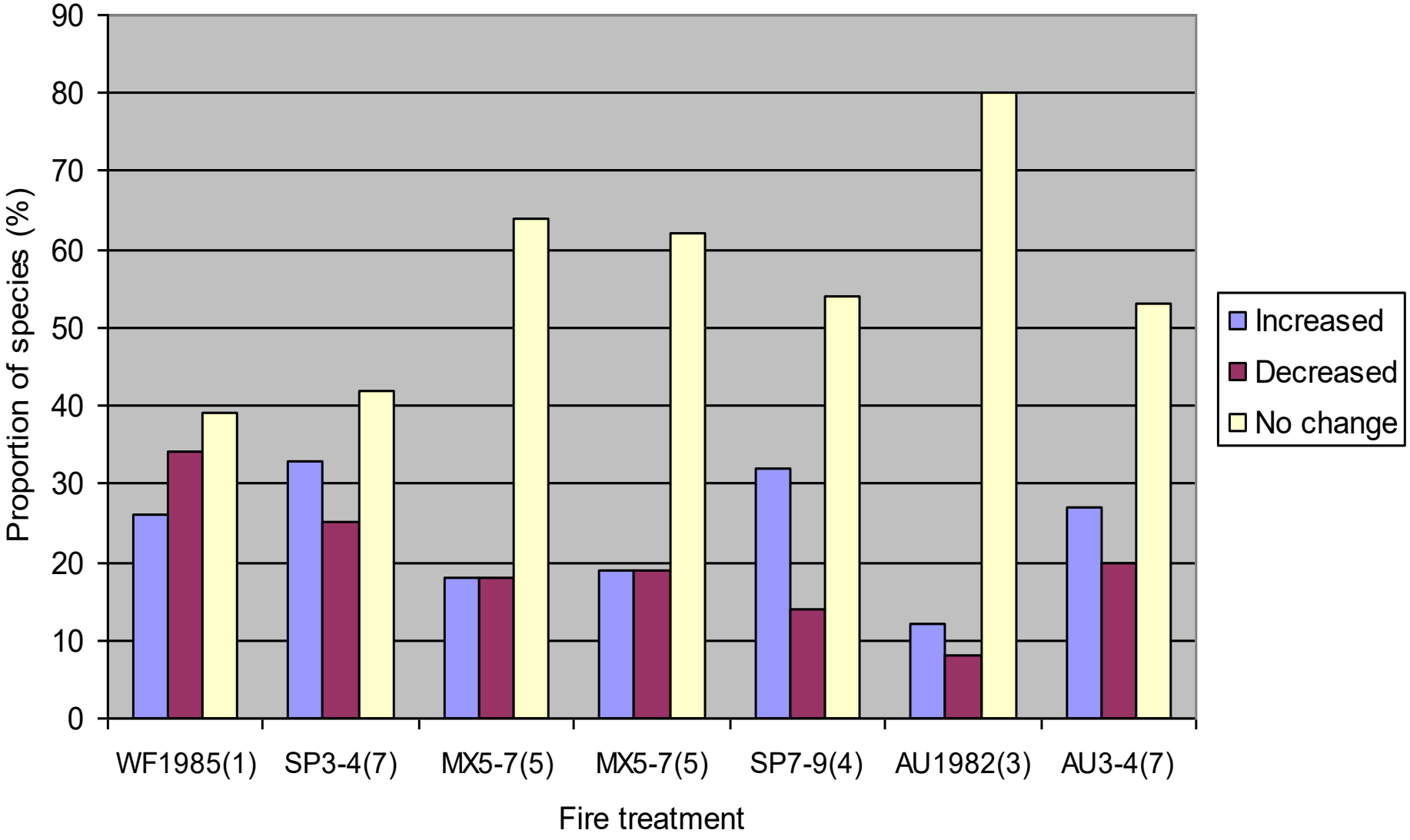
Plant community responses to a fire

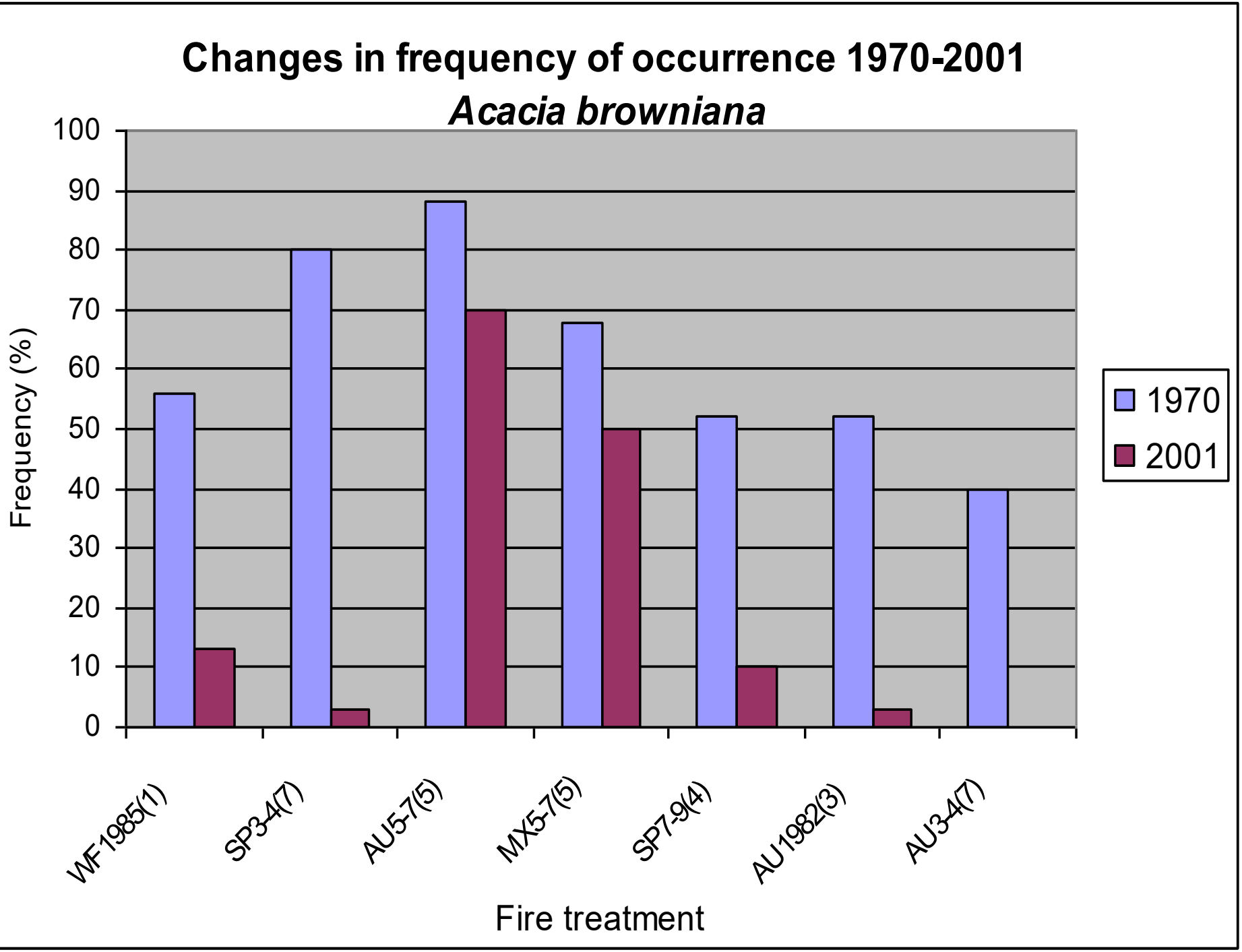
Species richness & abundance with time since fire



Long-term monitoring of fire effects on plants

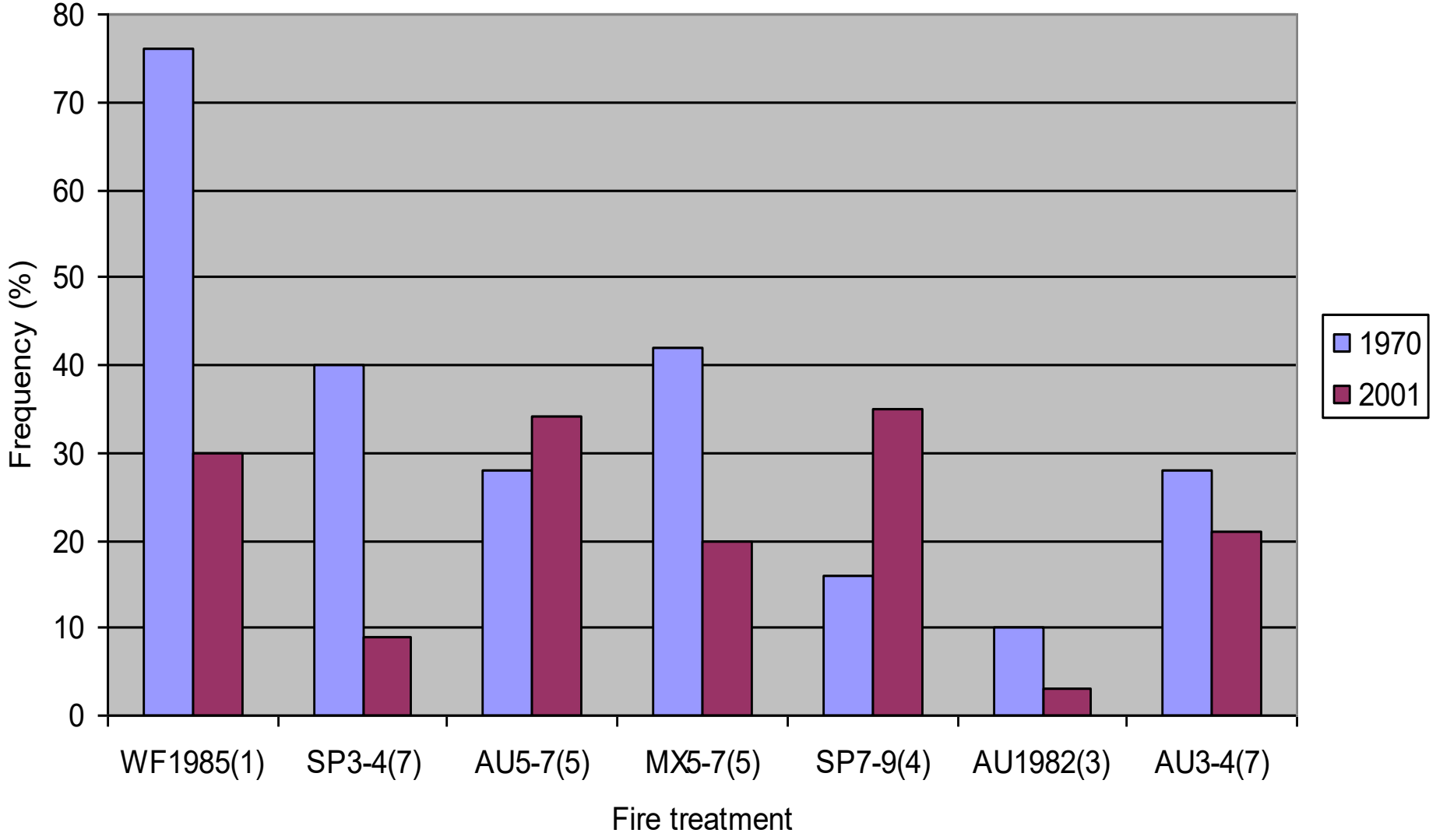
- Southern jarrah forest - commenced 1970
    - Unburnt control (Wildfire 1985)
    - Spring 3-5 yrs (7 fires)
    - Spring & autumn 5-7 yrs (5 fires)
    - Spring 7-9 yrs (4 fires)
    - Unburnt control (Autumn 1982)
    - Autumn 3-4 yrs (7 Fires)


Proportion of species changed in abundance over the period 1970-2001
Proportion of species (%)
90
80
70
60
50
40
30
20
10
0
WF1985(1)
SP3-4(7)
MX5-7(5)
MX5-7(5)
SP7-9(4)
AU1982(3)
AU3-4(7)
Fire treatment
Increased
Decreased
No change


Changes in frequency of occurrence 1970-2001
Acacia browniana
100
90
80
70
60
50
40
30
20
10
0
Frequency (%)
1970
2001
WF1985(1)
SP3-4(7)
AU5-7(5)
MX5-7(5)
SP7-9(4)
AU1982(3)
AU3-4(7)
Fire treatment

Changes in frequency of occurrence 1970-2001

Crowea angustifolia



Fire & weeds

Most vulnerable to weeds:

- Remnant patches
- Road verges
- Forest edge
- Some wetlands & riparian zones

Weed invasion depends on proximity to source of weeds and frequency and severity of disturbance

To Summarise

- Forests are a complex mosaic of plant communities that vary in their response to fire.
- Forest plants display a variety of fire adaptive traits.
- Many (but not all) plants & communities benefit from fire at some stage in their life cycle to stimulate regeneration and reproduction.
- No single fire regime benefits all species.
- Diverse fire regimes at appropriate temporal & spatial scales promotes floristic and structural diversity.