PROGRAM B

QUANTIFYING THE EFFECTIVENESS OF FUEL MANAGEMENT IN MODIFYING WILDFIRE BEHAVIOUR

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Context of prescribed burning to modify fuels

1. Key element in fire management of eucalypt forests and woodlands for >4 decades (fuel reduction, hazard reduction)
2. Strong support from fire practitioners and land managers, but public and scientific opinion divided
3. Questions about the scientific basis:
   - where is the experimental data?
   - how strong is the statistical evidence?

Lines of inquiry & sources of evidence

1. Fundamentals of fire behaviour
2. Case studies
   - fire behaviour
   - fire severity
3. Empirical fire behaviour studies
4. Regional scale comparison of fire regimes
   - fire occurrence and area burnt
   - simulation

Fundamentals of fire behaviour

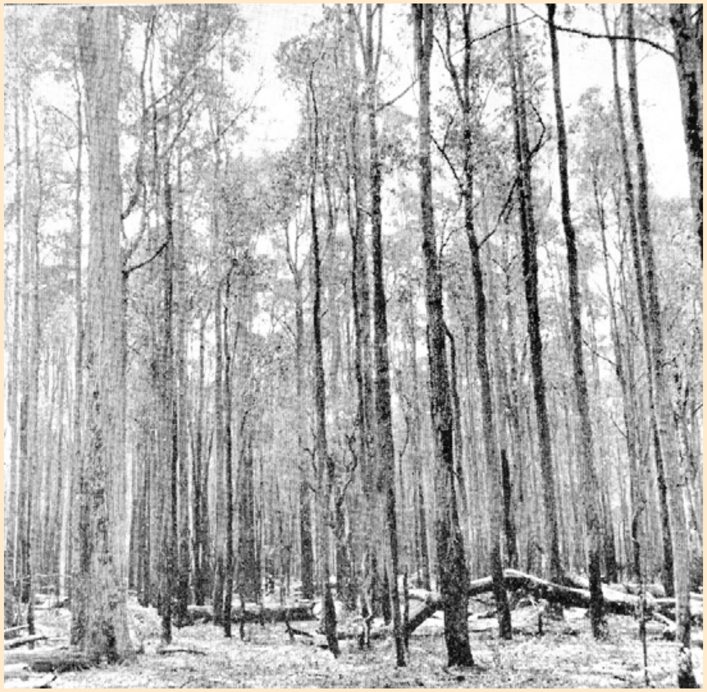
1. Fire intensity I = H w R (units of kW/m)
   - heat yield of the fuel
   - weight of fuel consumed
   - rate of spread
2. Fire intensity correlates with:
   - flame dimensions
   - difficulty of suppression
   - potential environmental impacts
3. McArthur (1962) & Peet (1965) argued that half the fuel load = half the rate of spread = one quarter of the fire intensity

Wildfire case studies

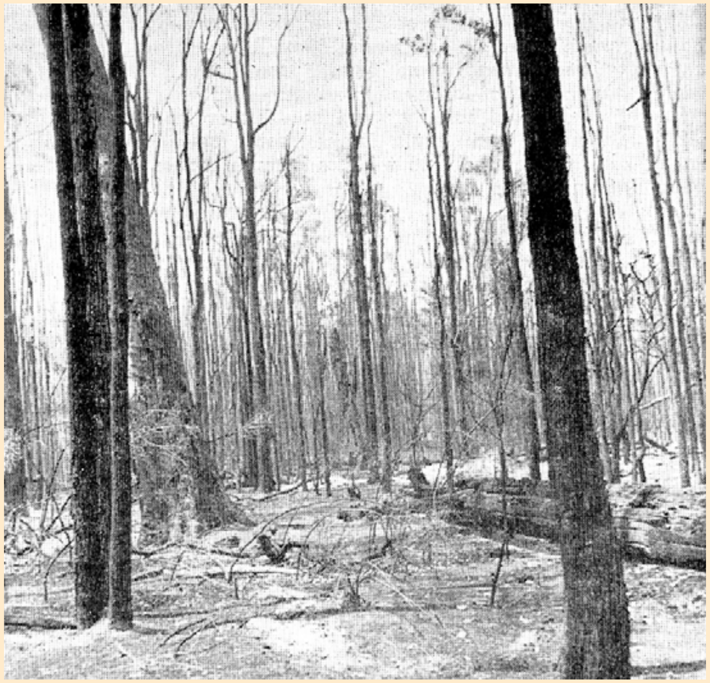
1. Strengths
   - based in reality
   - illustrate changes in fire behaviour and impacts
   - useful for model verification
2. Limitations
   - lack of replication
   - uncertainty about fuels, weather
3. Interpretation
   - how did fuel management affect the final size and shape of a fire?

Dwellingup 1961:
Comparison of wildfire impact in recently burnt and long unburnt forest.

Illustrated in Control Burning Leaflet 80 by Alan McArthur



2 year old fuel



>25 year old fuel

Dwellingup 2007:
Comparison of fire damage in recently burnt and long unburnt forest.

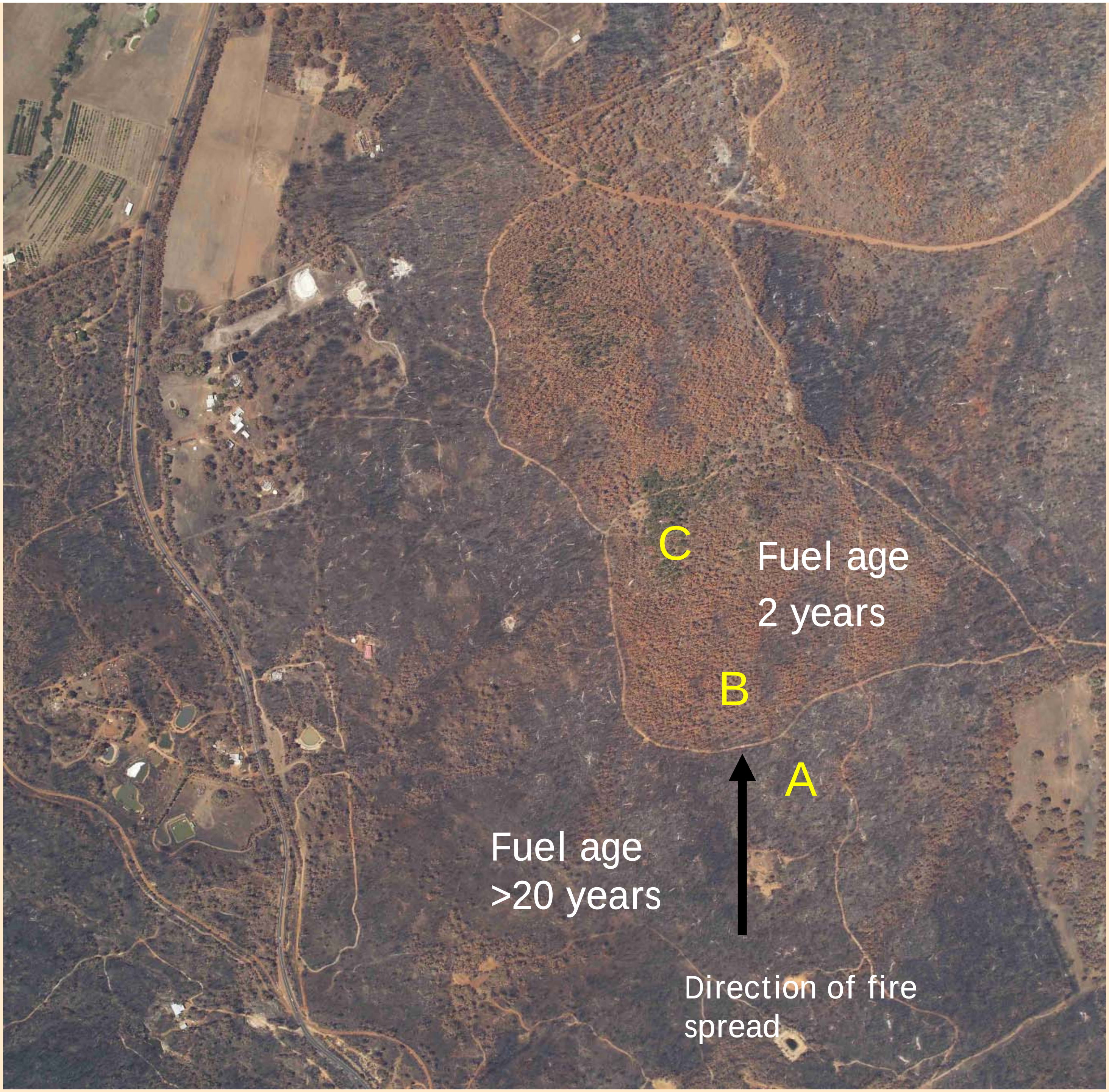
4 February 2007

Temperature 41°C
Dew point 6°C
Rel. humidity 12%
Wind NNW @ 35 kph

Forest Fire Danger Index
60 Extreme

Comparison of fire intensity between fuel ages burnt under extreme fire danger (FFDI =

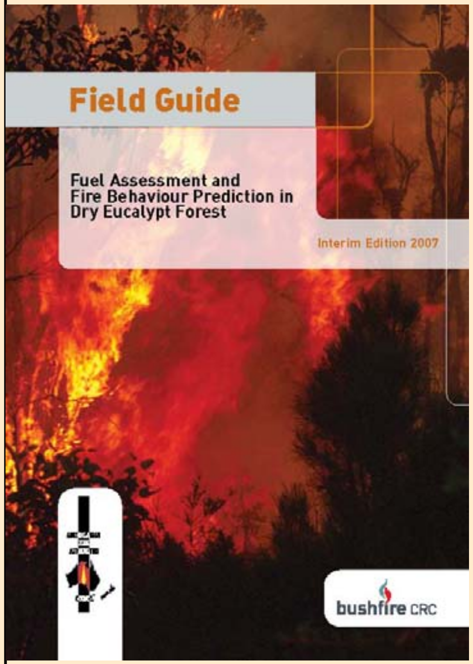
A = head fire in fuel> 20 years old
B = boundary between 20 year old and 2 year old fuel
C = pocket of low intensity within 2 year old fuel


C
Fuel age
2 years
B
A
Fuel age
>20 years
Direction of fire
spread

Fire size and shape can be directly influenced by the existence of fuel reduced areas

1. Easier and safer to work alongside younger fuels for backburning and mop-up
2. Reduced risk of spotfires starting in younger fuels

Project Vesta fire behaviour experiments



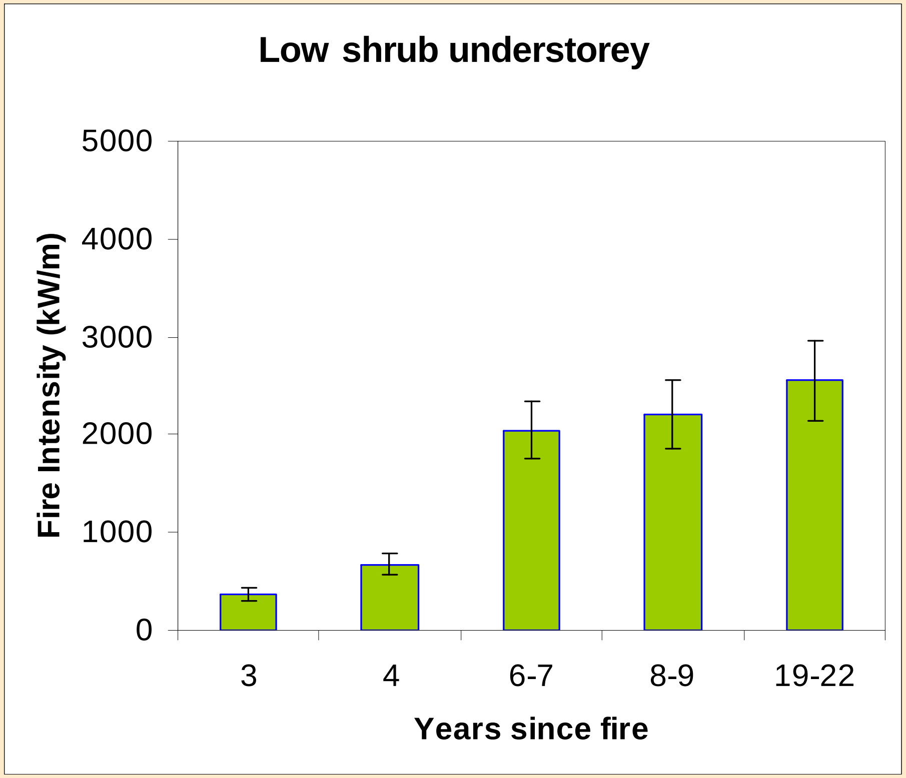
Vesta…

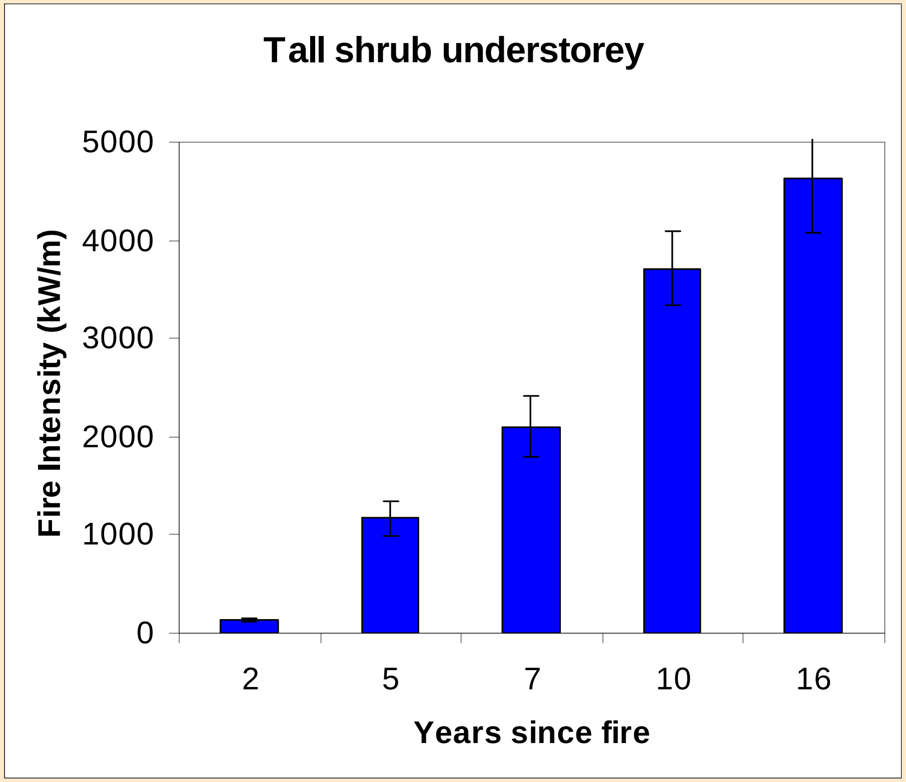
1. *provides a robust and practical system for fuel assessments*

2. *provides a better fire behaviour prediction system to predict the spread, flame height and spotting of wildfires.*

3. *demonstrates the effectiveness of hazard reduction by prescribed burning*

Fire intensity in relation to time since fire for summer fires in dry eucalypt forest (mean & s.e.m)



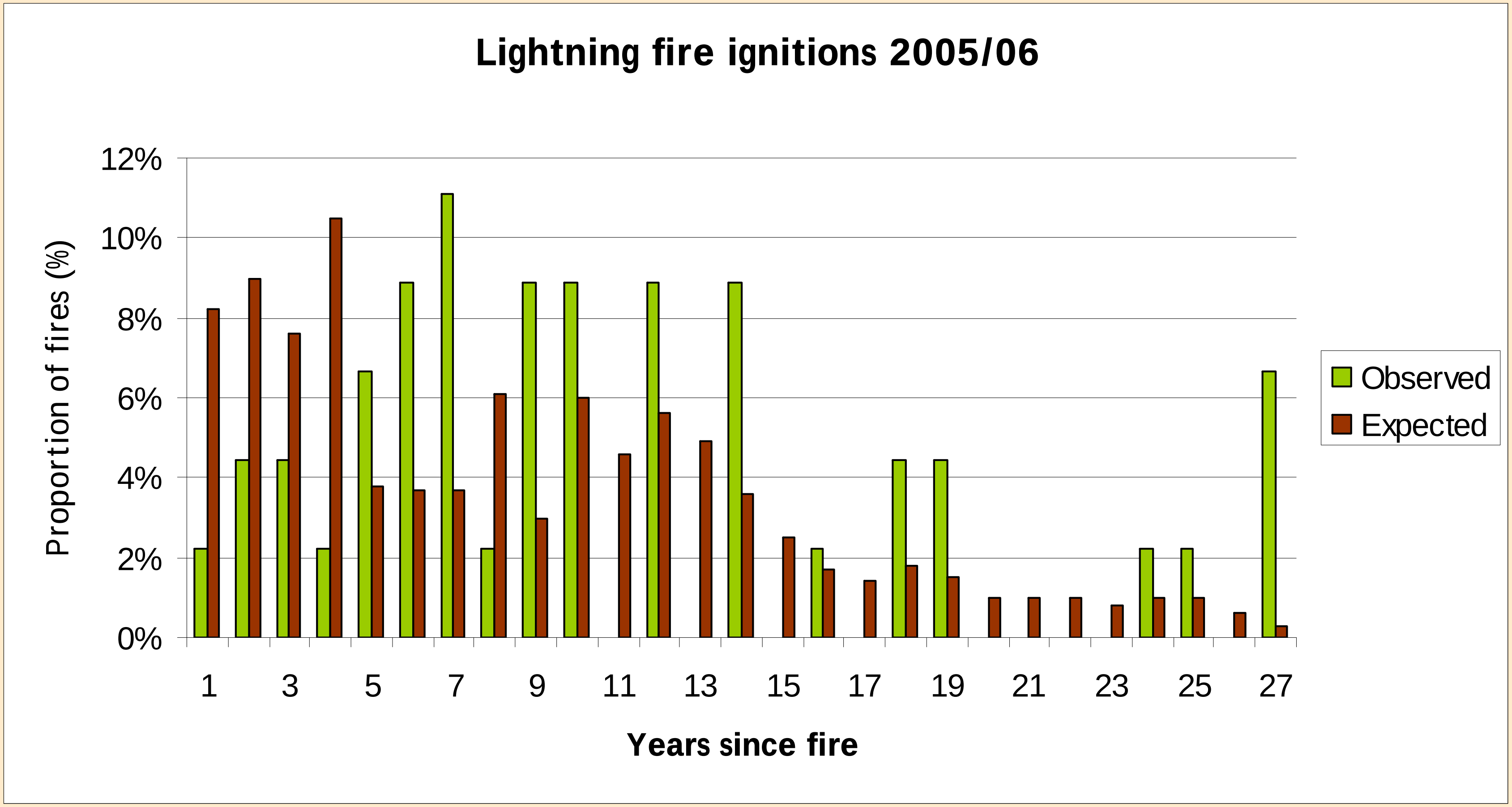


Wildfire impacts after 20 years of fire exclusion in jarrah forest:
- mortality of trees, shrubs and seed stores
- impact on sensitive plant communities (granite outcrops)
- stream sedimentation and erosion

Evidence for effectiveness of fuel management at a regional scale

1. Relationship between area burnt by planned and un-planned fire
2. Simulation studies
   - individual fire events
   - fire regimes
3. Reduced incidence of lightning ignition

Lightning fire ignition in south-west Australian forests: fewer ignitions in fuels < 5 years old



Conclusions

1. Consider multiple sources of evidence
2. Relevant indicators
   - area burnt by planned and unplanned fire
   - fire intensity & severity
   - fire occurrence
   - safety of firefighters
   - cost of suppression versus planned fire
3. Effects of fuel age on fire behaviour better quantified by Project Vesta experiments