GOVERNMENT OF WESTERN AUSTRALIA
Department of **Biodiversity, Conservation and Attractions**
THE UNIVERSITY OF WESTERN AUSTRALIA

CONFLICTING EVIDENCE

PRESCRIBED BURNING: WHEN 'EVIDENCE' IS NOT THE REALITY

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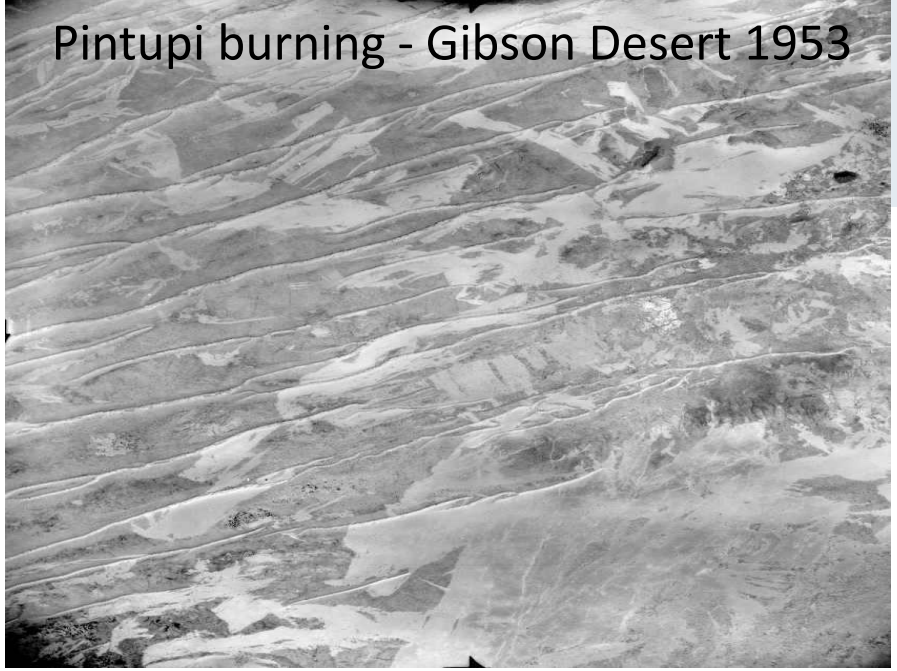
Prescribed burning: Since 60,000 years bp

- Aboriginal people used fire frequently, skilfully and purposefully
- The oldest land management practice by the oldest culture on the oldest continent
- In many landscapes, they were the predominant ignition source
- A new dynamic equilibrium established following their arrival
- Likely a fine-scale mosaic of diverse seral stages (fuel ages)
- Megafires were probably rare events

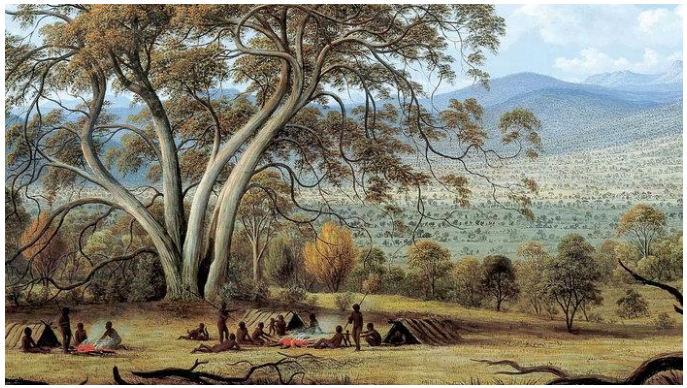

Pintupi burning - Gibson Desert 1953

European colonisation

- Aboriginal people displaced, burning practices disrupted
- Europeans 'pyrophobic'
- First Bushfire Ordinance in Swan River Colony 1847:

  "...boys under the age of 16 and aborigines to be publically flogged with any number of lashes not exceeding 50 for lighting fires..."

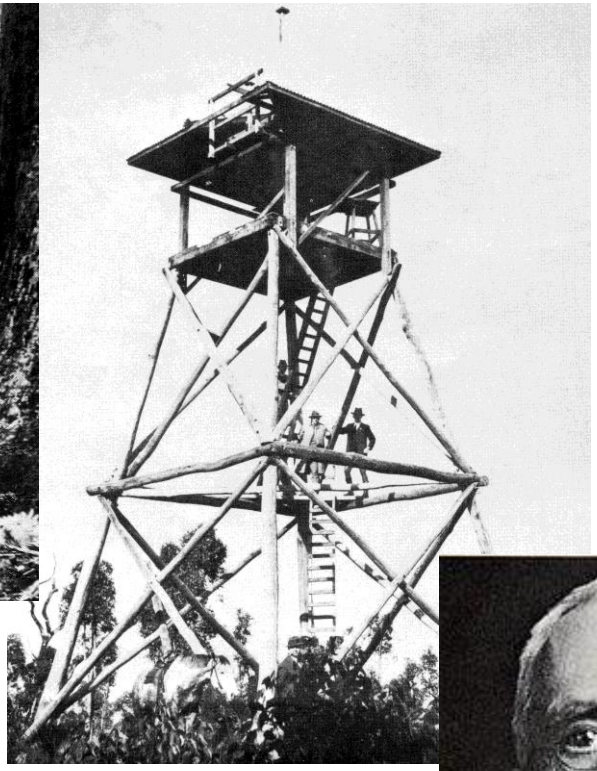
- By 1860s, Aboriginal burning virtually extinguished in southern Australia
- By 1960s, Aboriginal burning in central and northern Australia extinguished or significantly disrupted

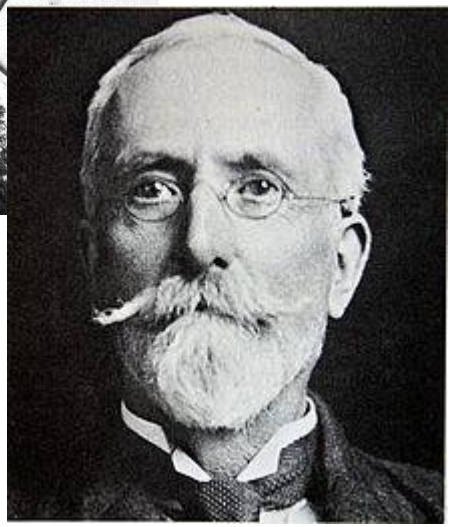


- Fire regimes changed

The European solution – southern Australia

fire exclusion, prevention and suppression policy – early 1900s-1950s





DE Hutchins

1961 - A turning point

1961
WESTERN AUSTRALIA

Report

OF THE

ROYAL COMMISSION

Appointed to Enquire into and Report upon the

Bush Fires of December, 1960 and January, February and March, 1961 in Western Australia.

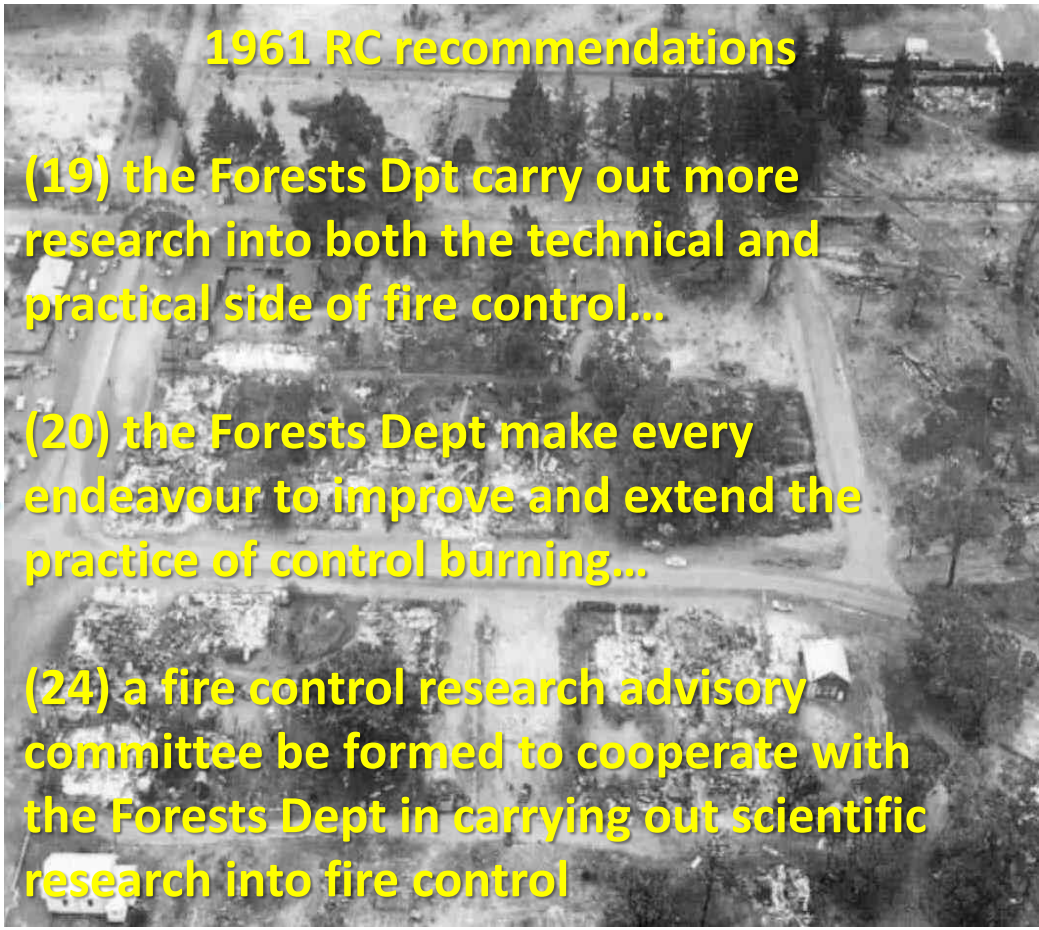
The Measures Necessary or Desirable to Prevent and Control Such Fires and to Protect Life and Property in the Future.

AND

The Basic Requirements for an Effective State Fire Emergency Organisation.

By
G. J. RODGER, Esq., B.Sc.
Royal Commissioner

PRESENTED TO BOTH HOUSES OF PARLIAMENT



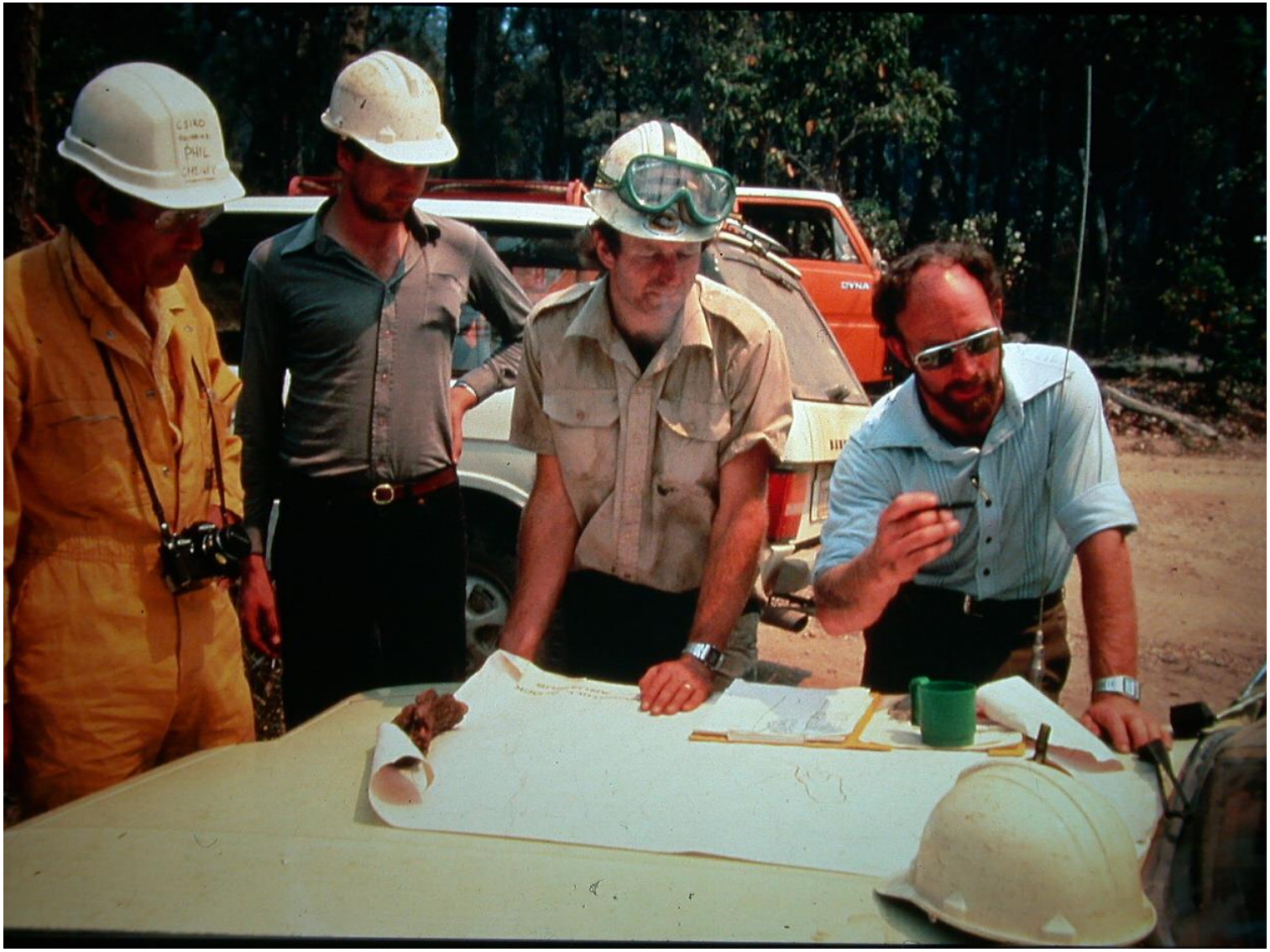
Prevention and suppression policy changes

Includes prescribed burning; recognises that:

- If fuels are allowed to accumulate over large areas, suppression will be dangerous, difficult or impossible under all but mild weather conditions - large, damaging bushfires will result

- Reducing fuel load and flammability reduces the speed and power of bushfire, reducing damage potential and suppression difficulty

- Does not prevent bushfire, but greatly assists in safer suppression and synergises community preparedness


CSIRO
PHIL
CHEWY
DYNA

Conflicting opinions

Pro prescribed burning

Prescribed burning in the broader landscape is critical to managing the bushfire threat.

Prescribed burning for bushfire mitigation is compatible with biodiversity conservation. There is no evidence that prescribed burning in forests has caused any loss of biodiversity.

Old fuels are more hazardous than young fuels; frequent burning reduces landscape flammability and buffers the bushfire cycle.

Fuel load directly effects firefighter safety and suppression success, even under severe fire weather conditions.

Anti prescribed burning

Burning within 100 m of the urban fringe can have a strong protective effect, but burns away from communities have little or no protective effect.

Burning for bushfire mitigation is incompatible with biodiversity conservation. Frequent burning in eucalypt forests and woodlands can eliminate native species.

Old fuels are less hazardous than young fuels; frequent fire increases landscape flammability and creates a bushfire cycle.

Fuel load is irrelevant to suppression success under severe fire weather conditions

The conflict

(media report following bushfires in the Albany region earlier this year)

"A group of WA university professors has called for a total overhaul of the State's prescribed burning program, claiming the practice of broad-scale burn-offs was endangering biodiversity and lives."

"Professor …claimed the "industrial scale" burning cost about $50 million a year and delivered no scientifically proven benefit in controlling the extent and intensity of wildfires".

"Professor … said the Government needed to look at other options such as creating green belts and parklands around key towns and assets, strategic irrigation lines and discrete prescribed burning around assets that needed to be protected, instead of large-scale burns".

Conflicting evidence

For

- Fire behaviour science
- Operational experience
- Historical evidence and case studies
- Biodiversity – fire ecology studies (space-for-time studies, monitoring, long term longitudinal studies)

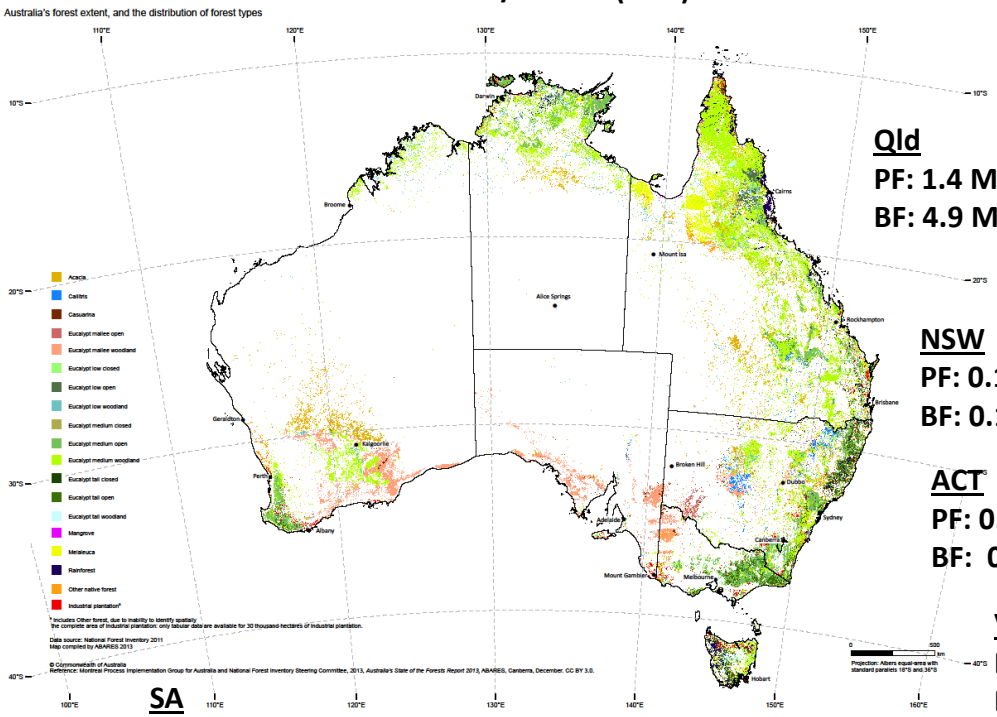
Against

- Computer simulations of prescribed burn scenarios and bushfire mitigation effects
- A case study (s-e Australia)
- Biodiversity – some fire ecology studies, PVA modelling and computer simulations based on plant life histories and vital attributes

Mean annual forest / woodland area burnt by prescribed fire (PF) and bushfire (BF) by jurisdiction (2006-2016)

(source: Australia's State of Forests Reports - ABARES)

NT
PF: 1.6 M ha / annum (10.5%)
BF: 4.5 M ha/annum (29%)



Qld
PF: 1.4 M ha/annum (2.7%)
BF: 4.9 M ha/annum (9.6%)

NSW
PF: 0.12 M ha/annum (0.5%)
BF: 0.16 M ha/annum (0.7%)

ACT
PF: 0.0028 M ha/annum (1.6%)
BF: 0 ha / annum (0%)

Vic
PF: 0.13 M ha/annum (1.6%)
BF: 0.22 M ha/annum (2.7%)

WA south-west
1953-2016
PF: 0.22 M ha/annum (8.9%)
BF: 0.02 M ha/annum (0.9%)

(2006-2016)
PF: 0.128 M ha (5.5%)
BF: 0.08 M ha/annum (3.1%)
(DBCA)

SA
PF: 0.02 M ha/annum (0.4%)
BF: 0.13 M ha/annum (2.9%)

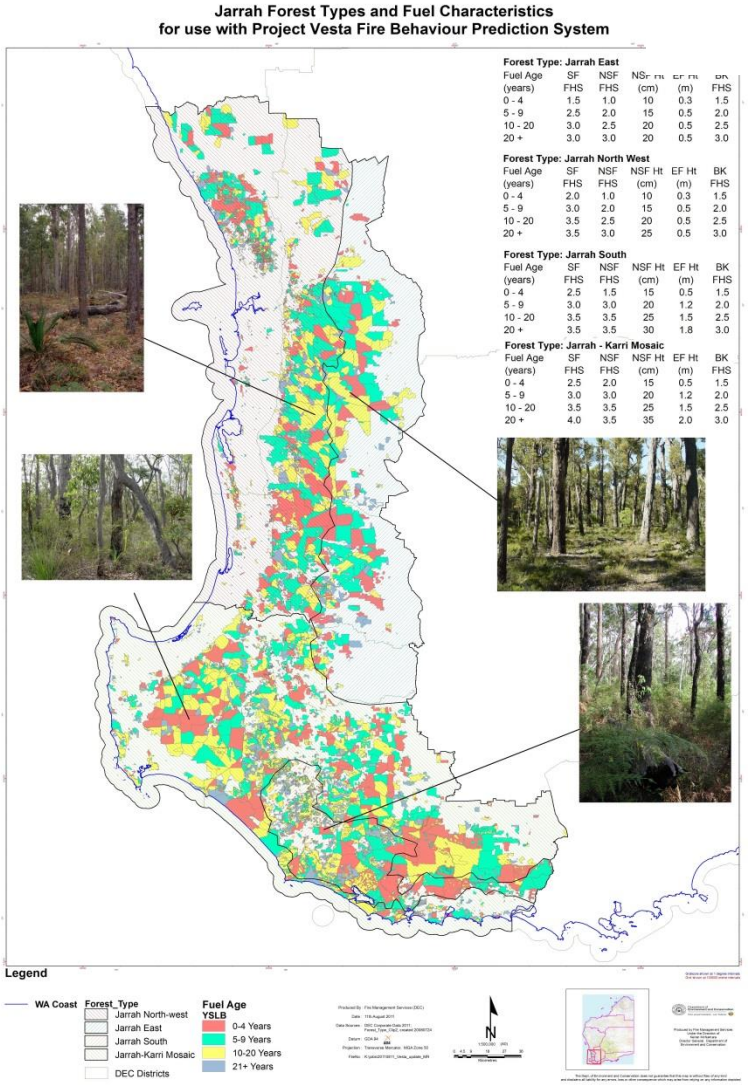
Tas
PF: 0.013 M ha/annum (0.4%)
BF: 0.025 M ha/annum (0.7%)

The claim:

"In forests, prescribed fire intervals less than 4 years, the juvenile period of fire sensitive plants, will result in local extinctions. Prescribed fire intervals greater than 4 years will not mitigate the wildfire threat. There is a clear conflict".

The reality:

- Burning ~8% per annum equates to 12 a year rotation, sufficient time for fire sensitive plants to recover
- About 50% of the landscape carries ≤ 6 yo fuels and about 33% ≤ 4 yo fuels
- Low intensity fires under mild weather conditions are patchy and are unlikely to adversely effect fire sensitive species and habitats
- Smart design of fuel age distribution (not random) has proven to be effective at mitigating bushfires without causing loss of biodiversity
- In addition to compliance with bushfire law regarding firebreaks, fuel on private property, building standards, etc (local government)

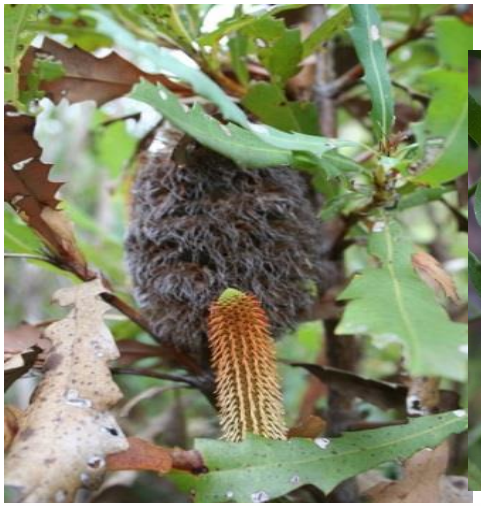


The claim (cont'd):

"In forests, prescribed fire intervals less than 4 years, the juvenile period of fire sensitive plants, will result in local extinctions. Prescribed fire intervals greater than 4 years will not mitigate the wildfire threat. There is a clear conflict".

The reality (cont'd)

- Under mild prescribed burn conditions, it is not possible to *entirely burn out* forests at intervals <4 years
- Fires will be low intensity and very patchy because fuels are sparse and patchy
- Species with long juvenile periods (6 yrs) persisted under an experimental fire regime of introducing fire into the landscape every 2 years because;
  - their habitats did not burn every time fire was introduced, or
  - they survived the low intensity fires



Banksia quercifolia

Lambertia rariflora

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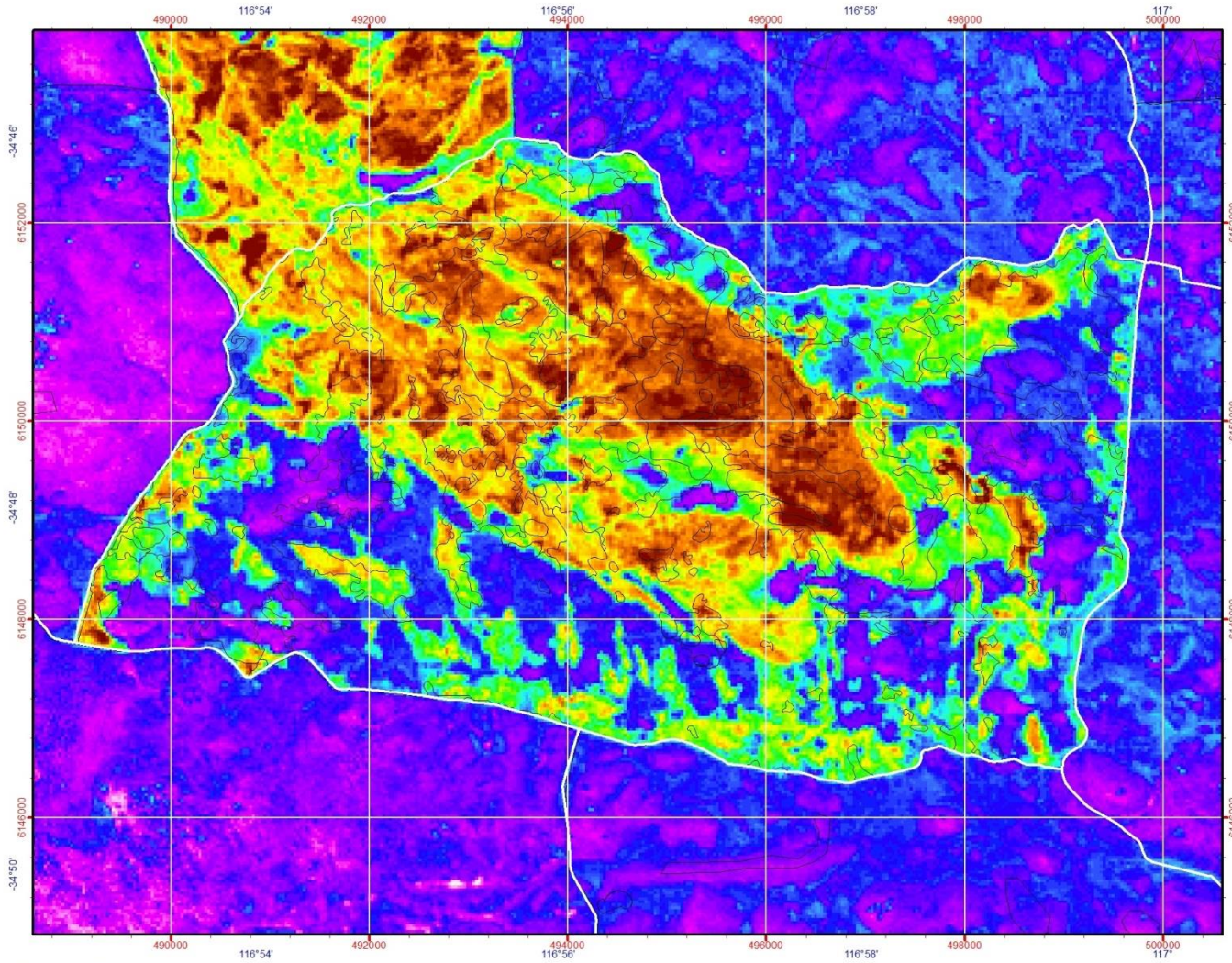


London Block dNBR October 2015

Map produced at 0837, Nov 11, 2015

dNBR 21Oct 2015

Value

Highest

Lowest

Fuel Age

The difference normalised burn ratio (dNBR) was calculated from the Landsat 8 images from the 14 May 2015 and 21 Oct 2015. It is an indication of the proportion of biomass decrease due to a fire event

N

0 0.5 1 2

Kilometres

1:50,000 (A4)

Projection: Universal Transverse Mercator
MGA Zone 50. Datum: GDA94

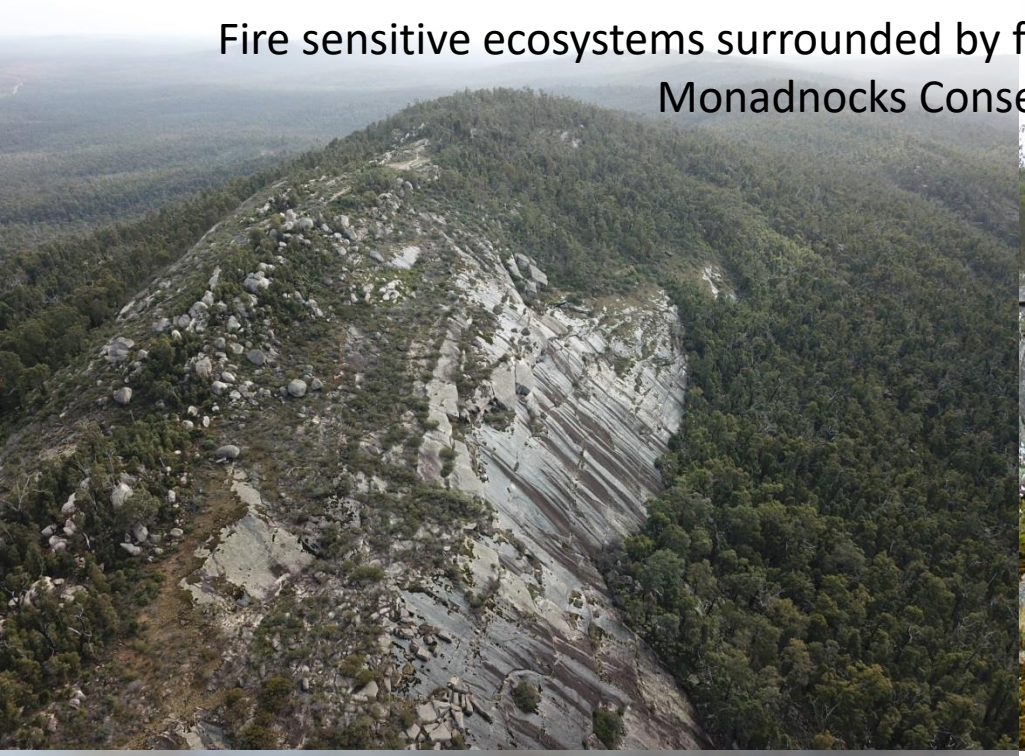
Produced by Paul Rampant, Remote Sensing and Spatial Analysis Section Department of Parks and Wildlife

Graticule shown at 2 minutes intervals
Grid shown at 2000 metre intervals

Department of Parks and Wildlife

Fire sensitive ecosystems surrounded by flammable, fire resilient ecosystems

Monadnocks Conservation Park



Mt Cooke Fire January 2003

Photo Kristian Pollock

Plants with long juvenile periods can survive low intensity prescribed fire, but can be damaged and killed by bushfires (Val Densmore 2018 *in prep.*)

- *B. attenuata* and *B. menziesii* have long juvenile periods and can be killed by intense fire
- Fruits (seeds) important food source for the endangered Carnaby's cockatoo
- Large, intense bushfires damage and kill plants, disrupting seed supply for many years
- Regular low intensity burns don't kill the trees and reduce bushfire severity, resulting in reduced disruption to seed supply

The claim:

Based on computer simulations, prescribed burning is not effective. Under extreme fire weather conditions, fuel load is of negligible importance (because fires exceed controllable intensity).

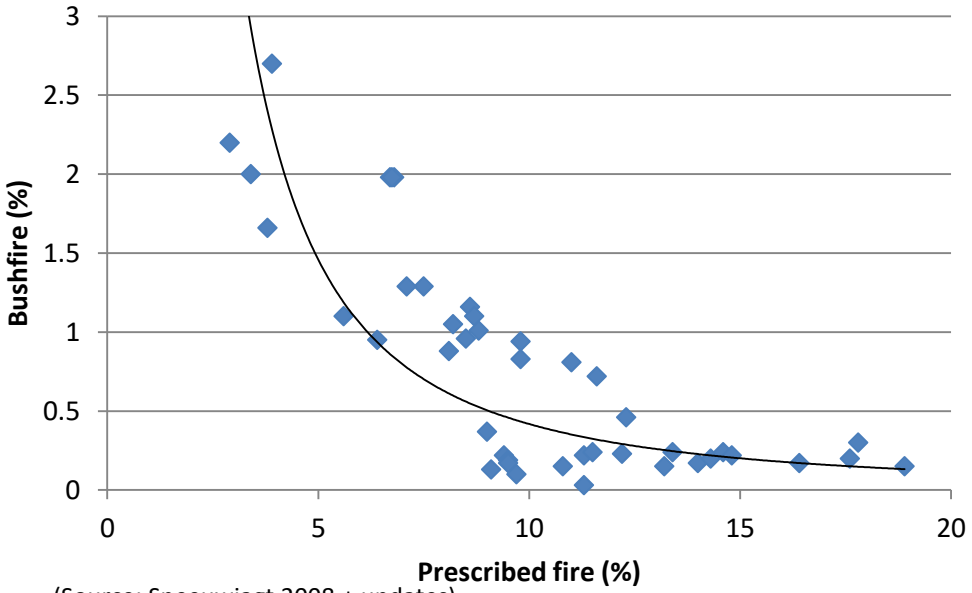
The reality:

Prescribed burning is very *effective if done:

- ❑ At appropriate temporal and spatial scales
  - ❑ Large cells
  - ❑ At least 8% treated each year
  - ❑ At least 45% ≤ 6 years old
- ❑ To appropriate standards of fuel reduction
- ❑ In the right places

(*effective: <1% per annum burnt by bushfire, acceptable residual risk, acceptable losses)

Proportion of SW forest region (2.5 M ha) burnt by prescribed fire (mean of 4 yrs) with proportion burnt by bushfire (mean of succeeding 4 yrs)



(Source: Sneeuwjagt 2008 + updates)

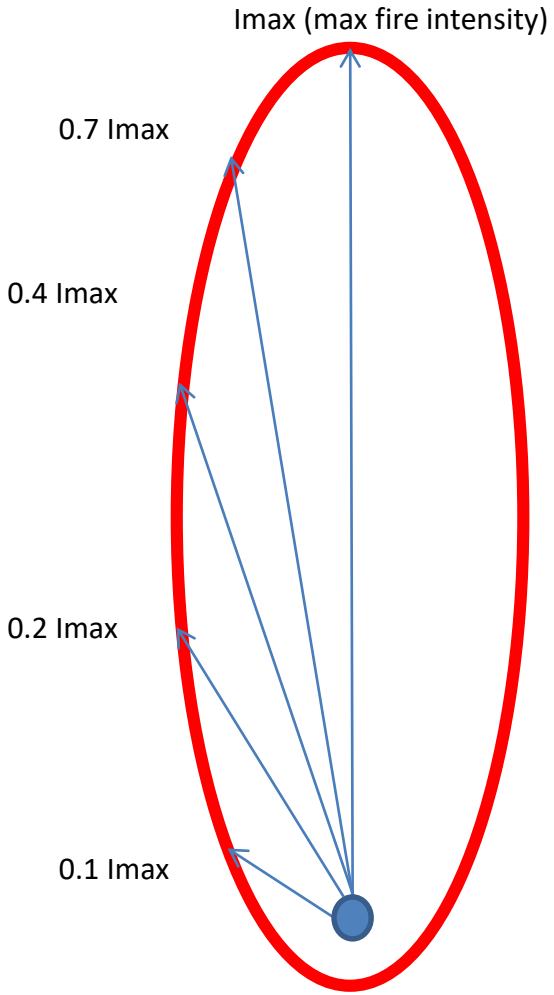
The claim (cont'd):

Based on computer simulations, prescribed burning is not effective. Under extreme fire weather conditions, fuel load is of negligible importance (because fires exceed controllable intensity).

The reality (cont'd)

Prescribed burning greatly assists fire suppression and synergises community preparedness under. Computer simulations are simplistic in this regard:

- Fuel load / age have a major direct effect on fire speed, growth rate and fire intensity around the perimeter, hence on safer suppression options
- Simulations don't consider the variety of available suppression strategies and windows of opportunity provided by spatial and temporal variability of fire intensity. These windows widen in a landscape that has adequate prescribed burning
- Simulations don't account for the many advantages that low fuel areas in the landscape provide to firefighters
- Slower fires, lower intensity fires buys time for fire fighters and the community



Catchpole et al. 1992

Fuel load does matter

- Fuel load directly influences fire intensity around the perimeter and windows of opportunity for safer suppression.
- In forest fuels, doubling fuel load results in a four-fold increase in fire intensity
- Fuel load burning behind the flame zone is critical because total heat output acts in a number of ways that impacts suppression difficulty and firefighter safety.
- Other computer simulation shortcomings:
  - Unrealistic ignition pattern
  - Unrealistic spatial arrangement of fuel management/ prescribed burning

The claim 3:

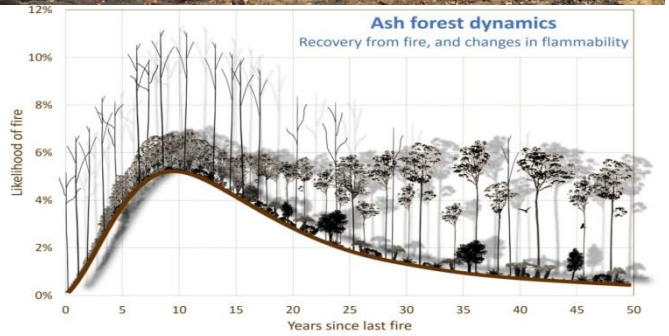
The least flammable parts of the (alpine) landscape are mature, long unburnt ash forests. Therefore we should minimise fire occurrence in these landscapes

The reality

- Big difference between post fire recovery of vegetation and fuel structure following severe bushfire and low intensity prescribed burn
- Unlike bushfires, low intensity prescribed burns produce relatively small changes in stand structure
- Prescribed burns lower the flammability of mature forests by reducing dead fuel load
- Prescribed burns reduce the risk of severe, stand replacement fires
- Regular prescribed burns can buffer the bushfire cycle

Bushfire

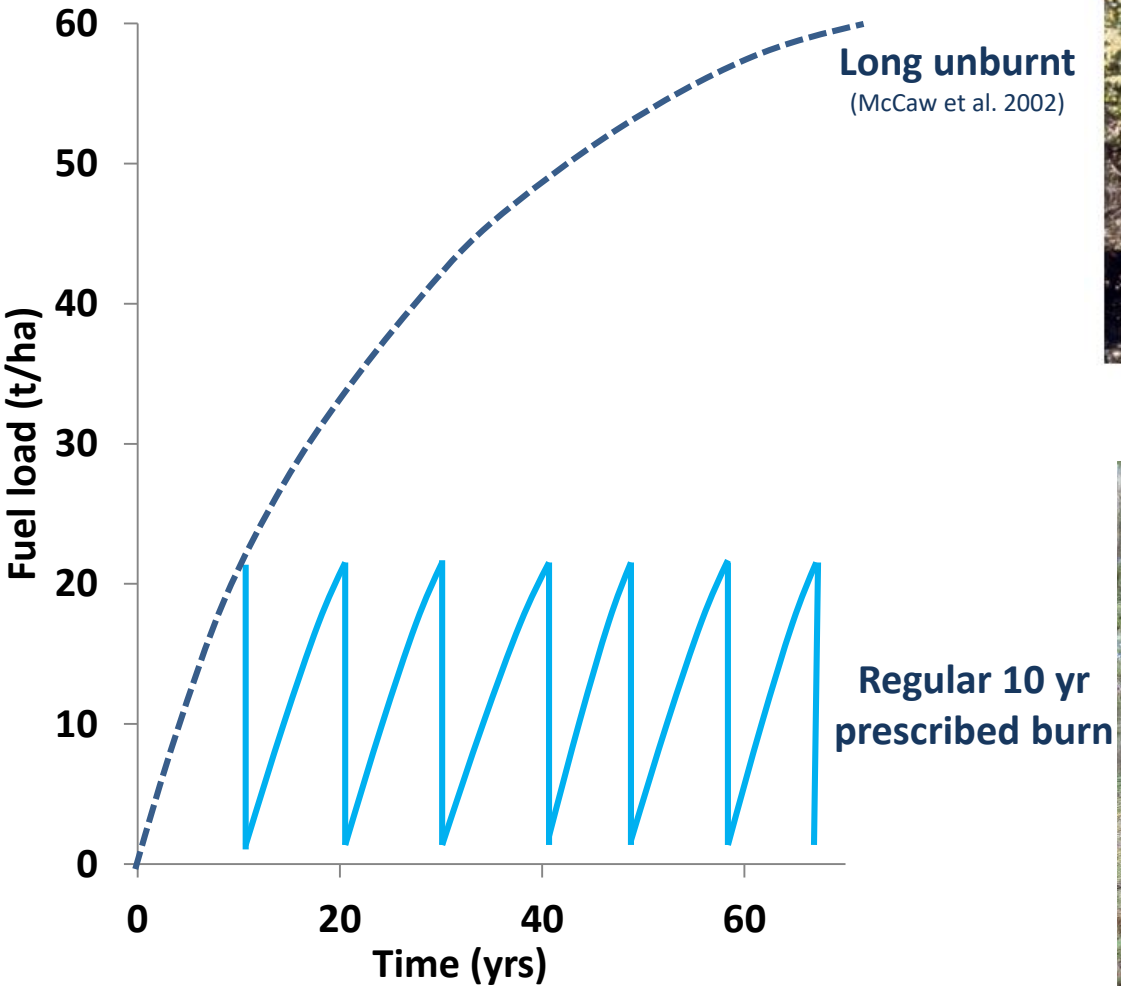
Bushfire recovery



Graphic from - The Conversation; Ecological Society of Australia

Prescribed fire

Dead fuel load with time since fire - karri forest



The claim:

It is only necessary to reduce fuel hazard in the immediate vicinity of the urban fringe (100 m) - broad-area burning beyond this is ineffective.

The reality:

- A system of 100 m buffers (5-chainers) was tried in sw-WA last century and failed
- Buffers would need to be > 1 km deep to be effective
- Buffer system ignores values outside the urban fringe beyond the buffers
- Endangers firefighters and the community
- Is it feasible?
- Need to manage the fuel hazard around settlements / homes AND in the broader landscape.

Photo Mark Giblett

Assets beyond the buffers at risk

- Areas of transient population density
- Threatened species and ecological communities with low resilience to bushfire.
- Critical infrastructure of state or national significance without redundancy
- Rural industries and infrastructure.
- Other significant built, natural or cultural assets

Concluding remarks

- ‘Evidence’ against prescribed burning arises out of a lack of understanding of, or a lack of ability to adequately model;
  - fire behaviour variability
  - Relationship between fire behaviour and fuel dynamics
  - prescribed burning
  - fire suppression
- Prescribed burning comes at a cost and it is not without risk.
- But inadequate levels of prescribed burning will be costly in more than dollar terms, and high risk.

Observe bushfire to understand bushfire

watch it, feel it, smell it, hear it, measure it, ponder it

repeatedly and over a long time

Concluding remarks

To bushfire scientists:

- Observe - spend time in the bush
- Understand fire behaviour – its great variability and variable effects on ecosystems and fuel dynamics
- Understand the art, craft and science of prescribed burning and bushfire suppression
- Consult professional fire and land managers

To science journal editors:

- Include professional fire and land managers in the peer review process

To fire and land managers:

- Question the science

THANK YOU

(Prescribed aerial burn, London forest, WA)