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Environment and Conservation

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Bushfire behaviour in south-west Western Australia - an overview

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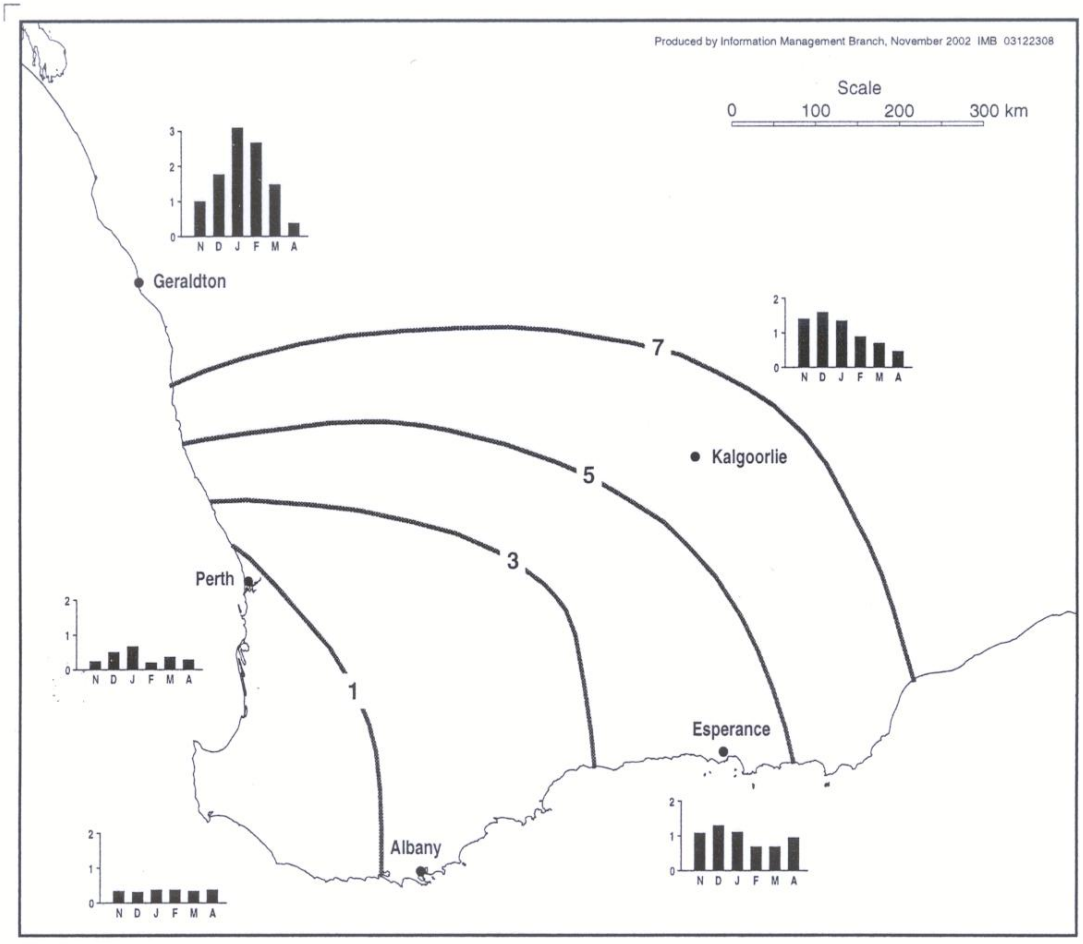
Characterising bushfire behaviour

- rate of spread (distance, area)
- fireline intensity (rate of spread x fuel consumed)
- flames (size, temperature, duration)
- spotting (distance, amount, type)

Fire danger rating

- **Grassland Fire Danger Index** – wind speed, air temp, humidity, curing %
- Forest Fire Danger Index (McArthur) – wind speed, air temp, humidity, drought factor
- WA Forest Fire Behaviour Tables - wind speed, fine fuel moisture content

Frequency of days with Grassland FDI >50



Bar charts show monthly occurrence

- Mid West Jan-Feb
- Perth Dec-Jan
- South Coast Nov-Jan
- Interior Nov-Jan

BoM, Bannister & Hanstrum (1995)

Forest fire behaviour – average summer conditions

- Jarrah forest 16 yr since last fire
- Fuel load 22 t/ha
- McArthur FFDI 10 (Moderate)
- Jarrah spread index 45 m/h (High)
- Fuel moisture content 9%

- Rate of spread 725 m/h
- Fireline intensity 8000 kW/m


FEB 5 1999
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Tall open karri forest – unburnt for 50 yr

- Litter, bark and twigs accumulate heavy fuel loading
- Deep fuels beds dry every summer (December to March)
- Very difficult to contain fires in long unburnt fuels

Fire behaviour – how bad can it get?

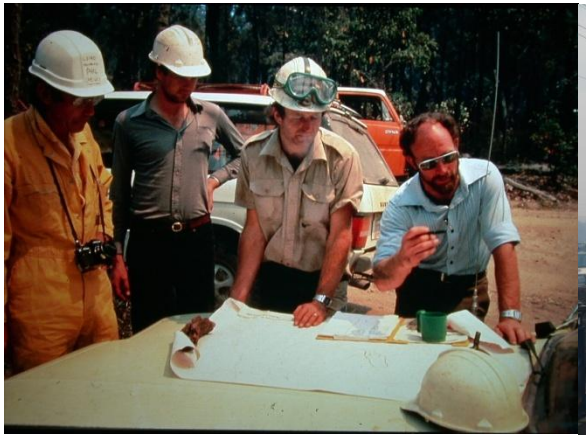
- Forest fire rate of spread 10 km/h
- Fireline intensity >100 000 kW/m
- Spotting
  massive spotting to 5 km
  long distance spotting to 30 km
- Fully developed crown fire
- Suppression impossible by any means

Bald Spur, Kinglake
Victorian bushfires of 7 February 2009

Fire behaviour – shrubland and heath

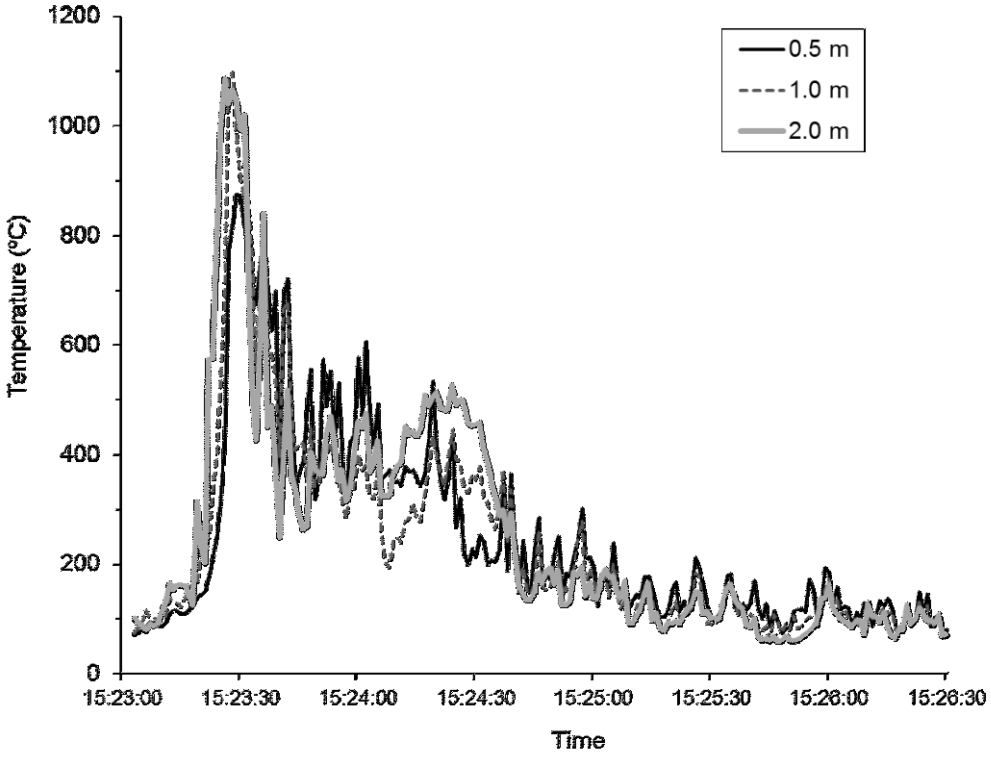
- Forward rate of spread up to 10 km/h
- Flames – up to 20 m tall
- Highly responsive to wind speed and change in wind direction
- Intense fires possible under mild weather conditions, and within a few days of rain
- Spotting 1-2 km ahead of fire front

Fire spreading at 3 km/h will travel from Irwin St to Harvest Terrace in 30 minutes



What can you achieve in this period of time?

Peak flame temperatures in bushfires exceed 1000°C and remain above 400°C for several minutes



Typical time-temperature trace for a fire passing through a 3 m thermocouple tower in 16 year old fuel. Observed flame height at the tower was 10 m.

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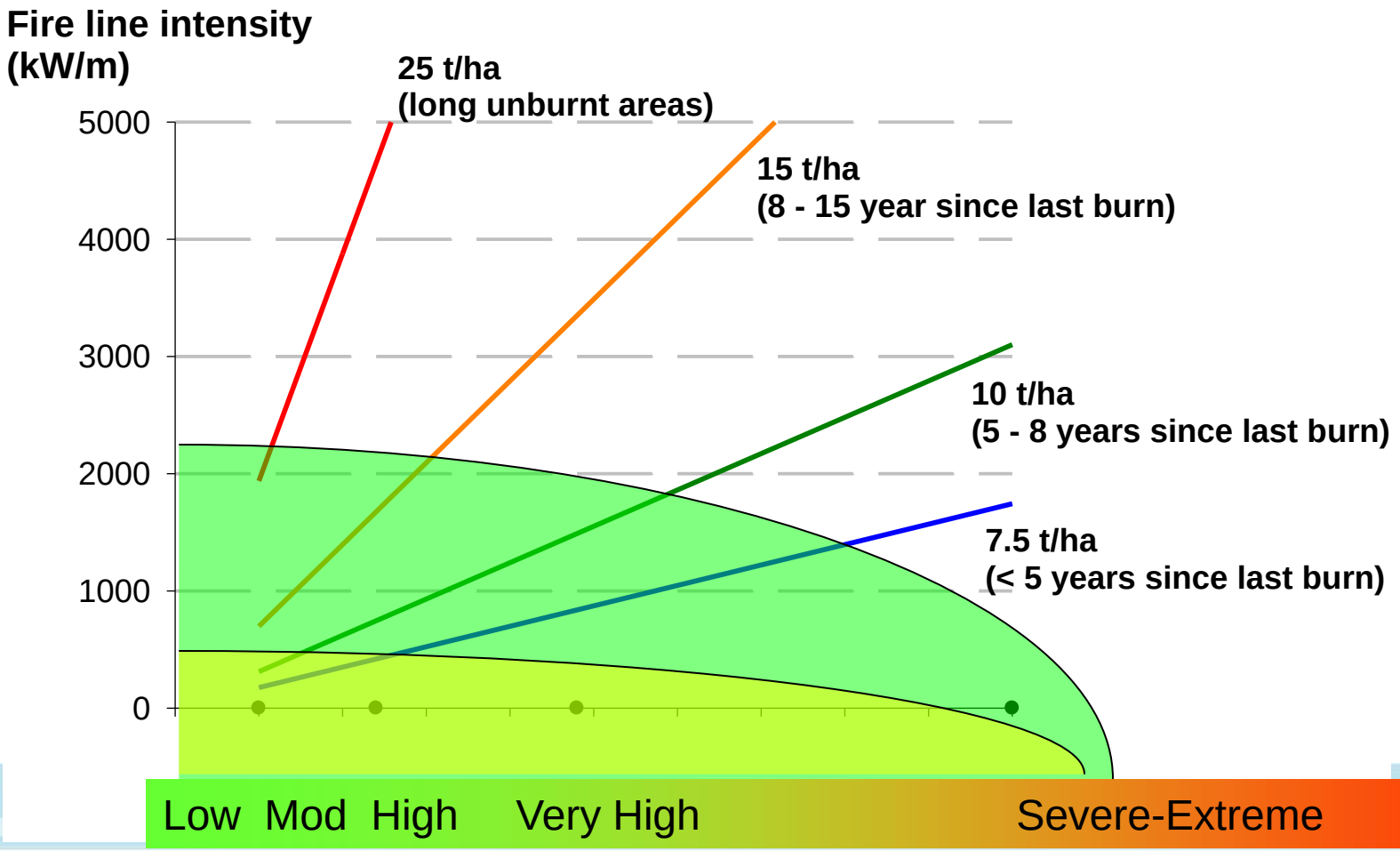
Direct suppression

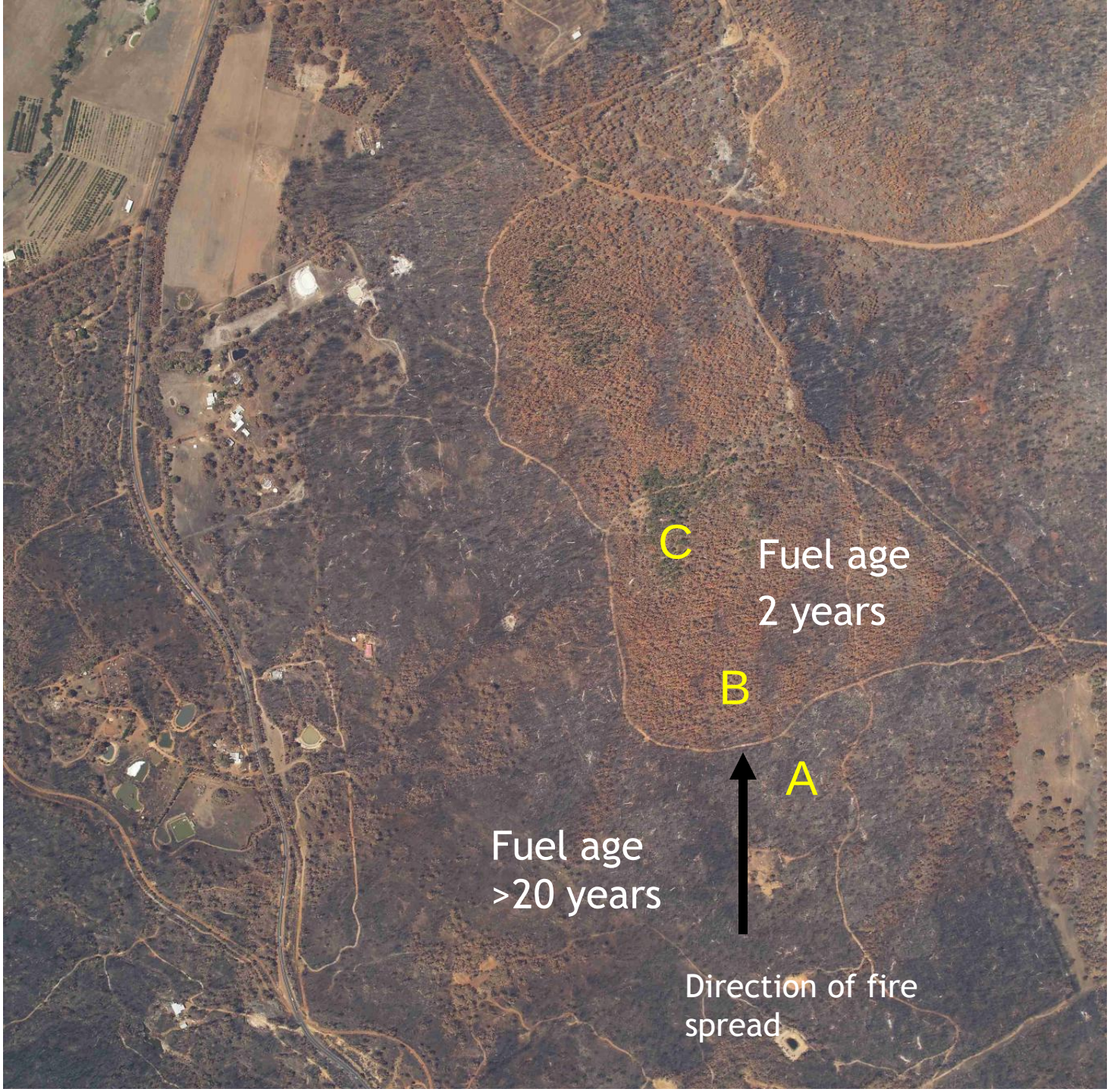
Air tanker - dozer



Effect of fuel age on fire behaviour

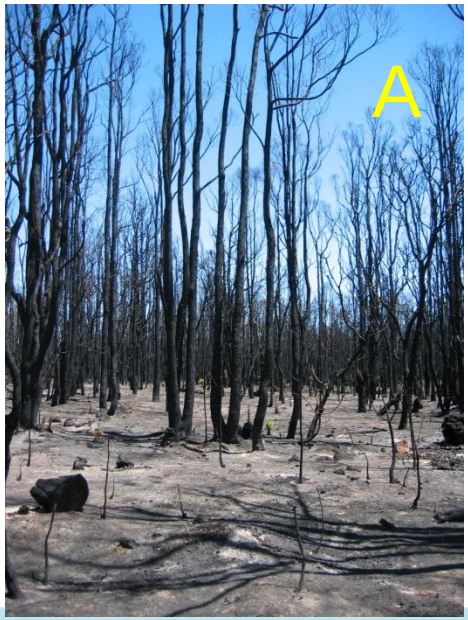
Dwellingup 4 February 2007

- Temperature 41°C
- Dew point 6°C
- Rel. humidity 12%
- Wind NNW @ 35 km/h
- Severe fire danger
- Forest Fire Danger Index 75
- Grassland Fire Danger Index 70


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

Effect of fuel age on fire behaviour

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



Potential for major bushfires - examples

- Easterly winds
  2005 Perth Hills
  2006 Waroona
  2007 Pinjarra/Dwellingup
- North-west winds
  2000 Mt Barker
  2003 Mt Cooke
  2003 Bridgetown/Tenterden
  2009 Bridgetown/Yanchep
- South-west winds
  2009 Julimar/Toodyay
  2013 Blackwood Valley

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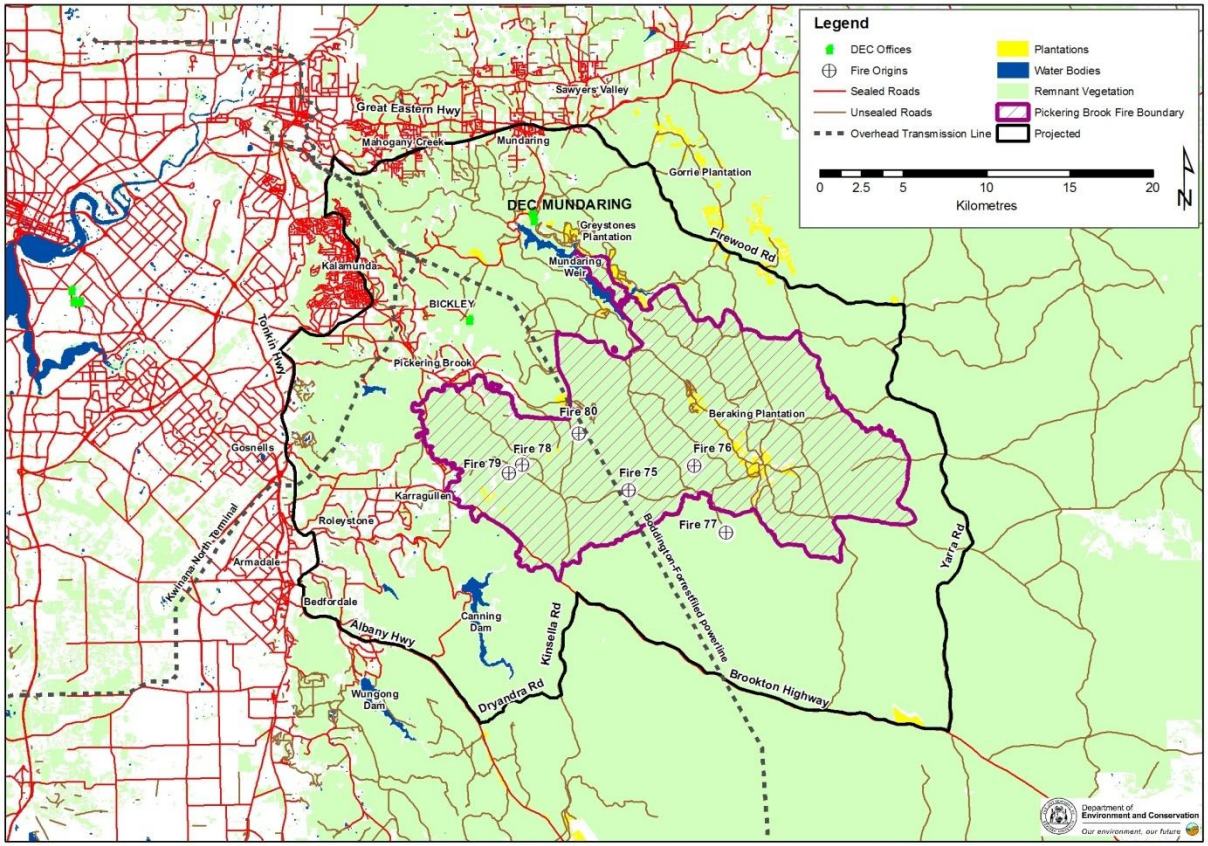
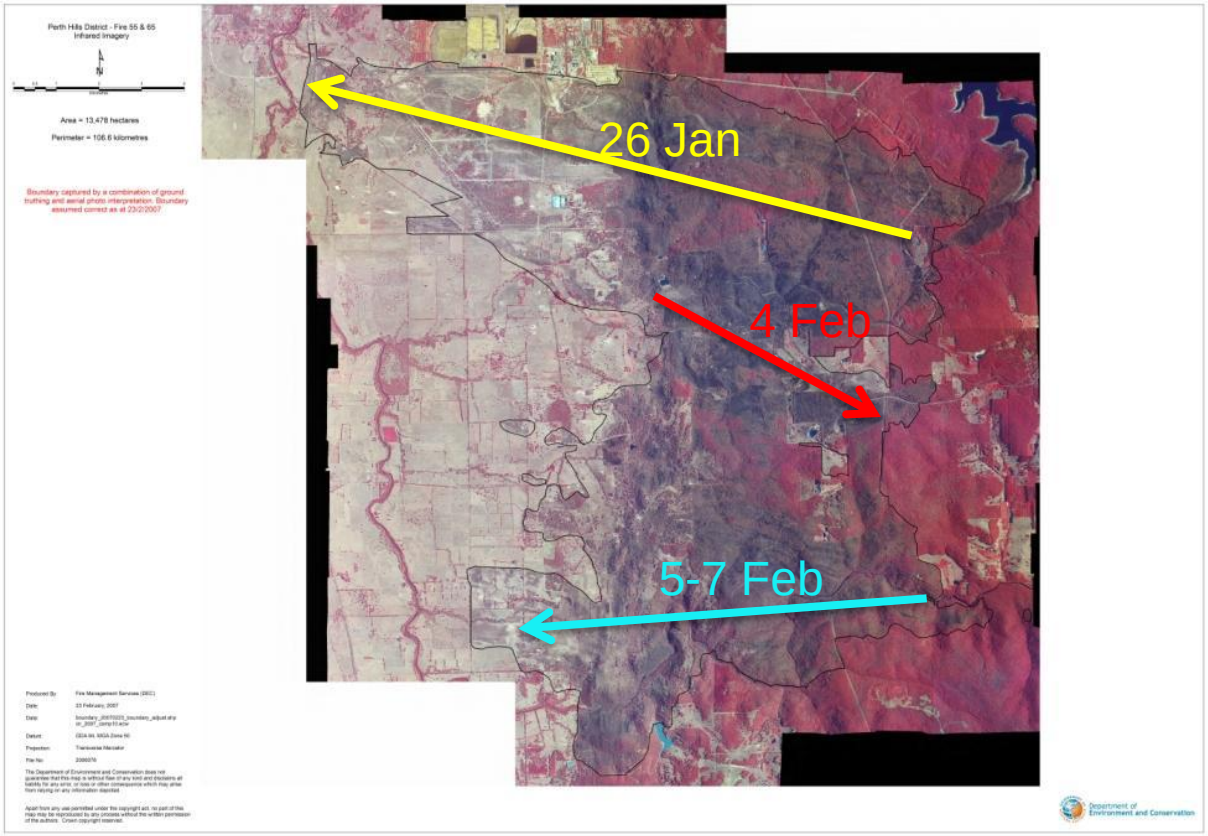
Jan 2005 - Perth Hills



Jan 2007 – Pinjarra/Dwellingup



Summing up

- Weather conditions conducive to damaging bushfires occur every season
- Potential fire behaviour in eucalypt forest and shrubland far exceeds fire suppression capability even with large aircraft
- Multiple fire events may overwhelm the resources of agencies and volunteer bush fire brigades
- Reliable information about the location and behaviour of a bushfire is very difficult to get during a fast moving incident