Smoke Management

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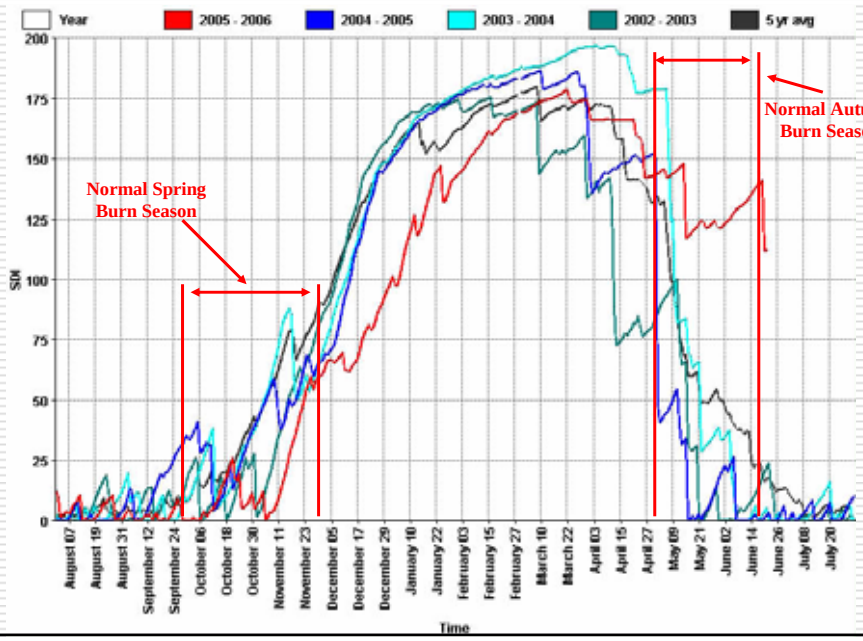
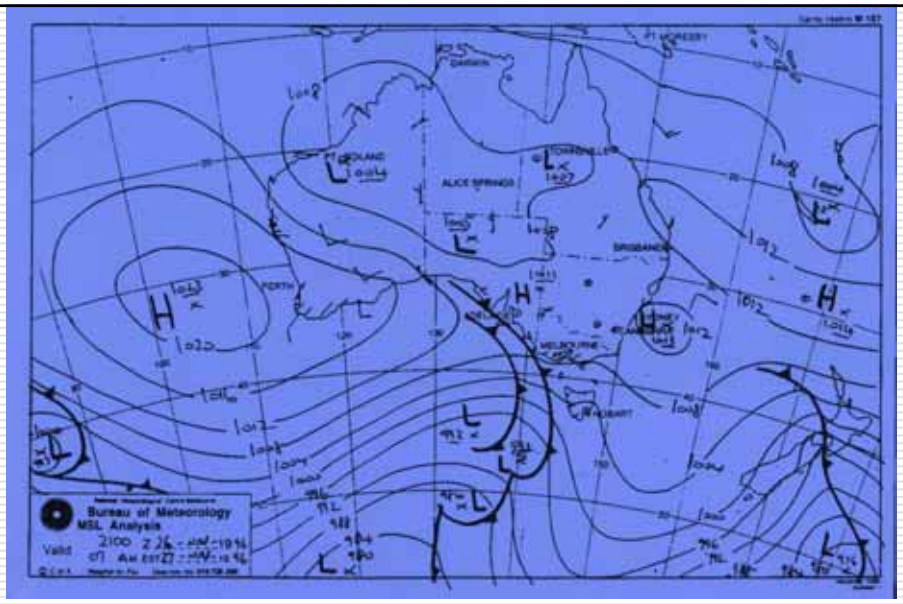
Western Australian wooded vegetation are highly fire prone.

Severe wildfires occur each year that threaten life, property and ecological values.

The key to reducing the fire hazard is prescribed fire: low intensity, slow moving fires that create a mosaic of burnt and unburnt forest/woodland areas.

Spring & Autumn Burn Periods compared with Soil Dryness Index





Normal Synoptic Situation for Safe and Effective Prescribed Burning in South West forests

Prescribed burns under stable atmospheric conditions/ inversion that can trap smoke in residential areas, highways, airports and vineyards

Need for Accurate Smoke Forecasts

- Maximise opportunity for prescribed burning with minimal smoke impacts on society.
- Reduce risk to safety of traffic, and respiratory health of community.
- Maintain public and political support for prescribed burning and the Land Management Agency.
- Ensure NEPM Air Quality Standards are met.
- Minimise unnecessary impacts on grapes and other agricultural products.
- Maintain good neighbour relations with local communities and main population centres.
- Keep the Department out of the court on smoke related claims.

Accurate Smoke Forecast Requirements

- Accurate fire behaviour and simulation models.
- Accurate high resolution weather forecast models that allow for subtle changes in wind due to terrain, sea and land breezes etc.
- Good understanding by Fire Managers of basis for weather and smoke forecasts
- Good understanding of Weather Forecasters on fire management needs and constraints

Accurate Smoke Forecast Requirements

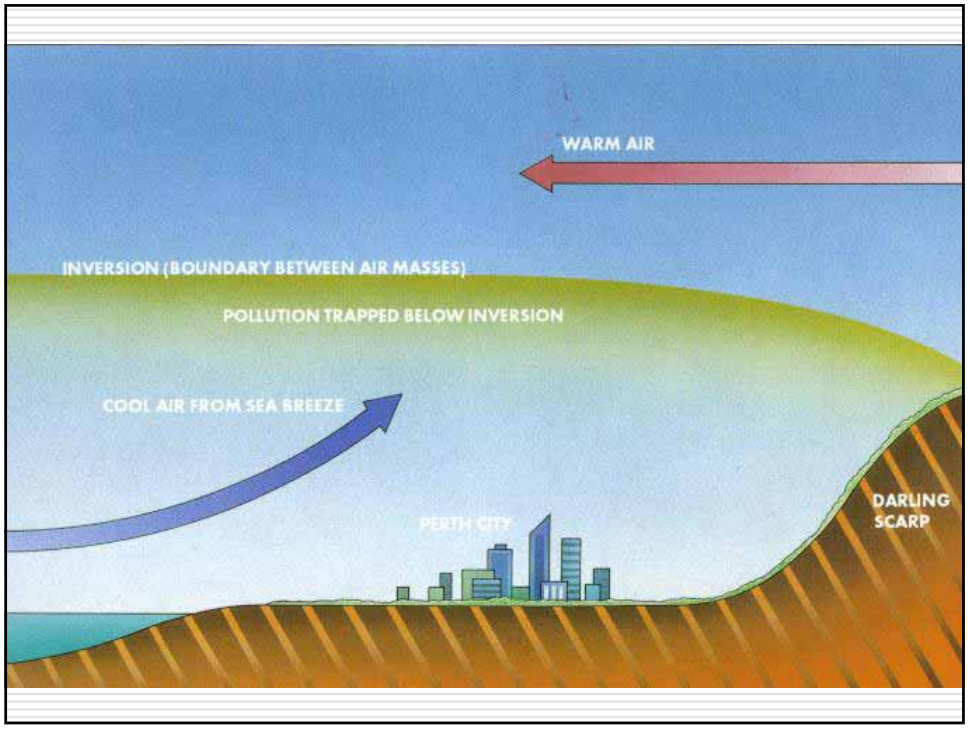
- Smoke Model that is flexible enough to incorporate:
  - Different emission rates from different fuel types;
  - Changes in emissions over time;
  - Different smoke plume levels (mixing layer);
  - Variable time frames, upto 4 days ahead;
  - Pre-burn smoke conditions;
  - Accurate particle concentration levels within plume and over time

Need for Ongoing Research and Development to Achieve Effective Smoke Management

- Better Fire Behaviour Prediction Models
- Better smoke trajectory and fire weather models
- Better smoke emission models for different fuel types and different fire behaviour situations
- Knowledge on relationship between smoke emissions (duration, concentration) and Wine Grape development and Wine quality.
- Better understanding on relationships between smoke emissions and exposure, dosage and health effects on fire fighters and general public.

Main Factors Affecting Smoke Haze Incidence

- Atmospheric stability (temperature inversion)
- Synoptic situation
- Total area burnt in a day
- Burn concentration (dispersal)
- Wind direction (< 1000 M)
- Scheduling of burns and burn duration



Smoke Management Decision Processes

- **Pre-conditions Factors**
  - Presence/absence of smoke "in the system" (previous burns/wildfires)
  - Burns started that will require follow-up lighting
  - Burn security (ie: risks of escape)
  - Political sensitivity
  - Commitment to wildfires, burn mop-up and patrol
  - Availability of resources
  - Burn prescription matches forecast weather, fuel moisture etc.

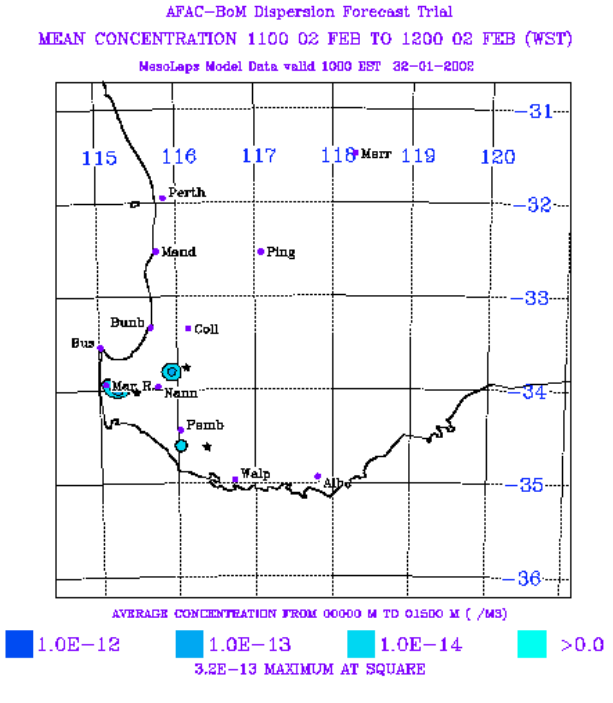
Smoke Management Decision Processes

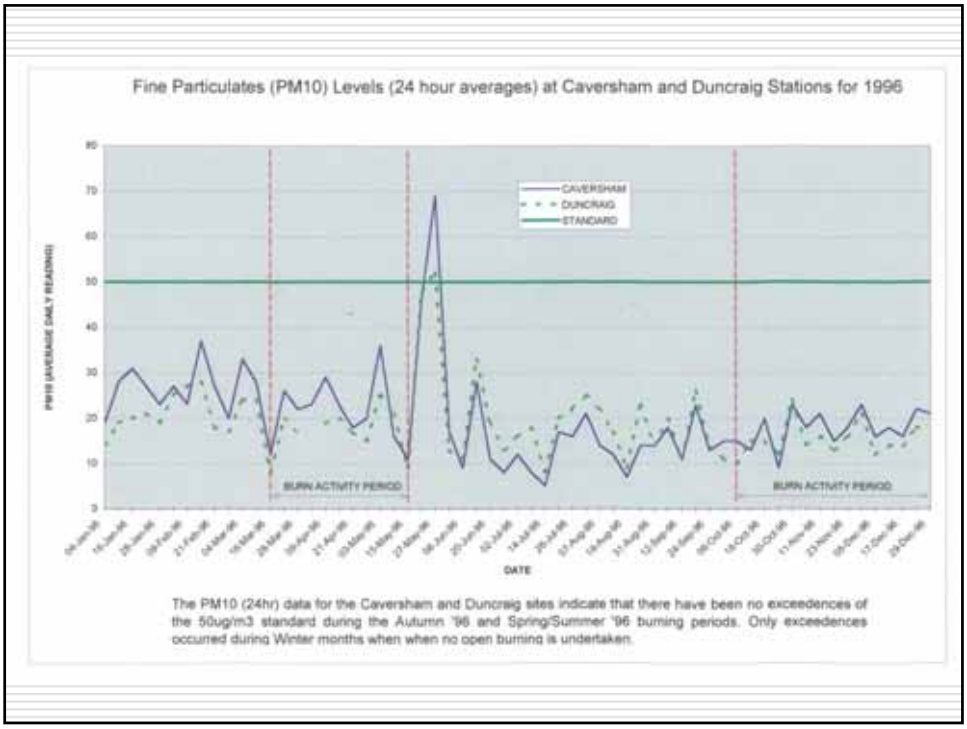
- **Synoptic Analysis**
  - Weather pattern (4 day outlook)
  - Trough information/structure/likely movement
  - Future weather conditions that lead to smoke accumulation

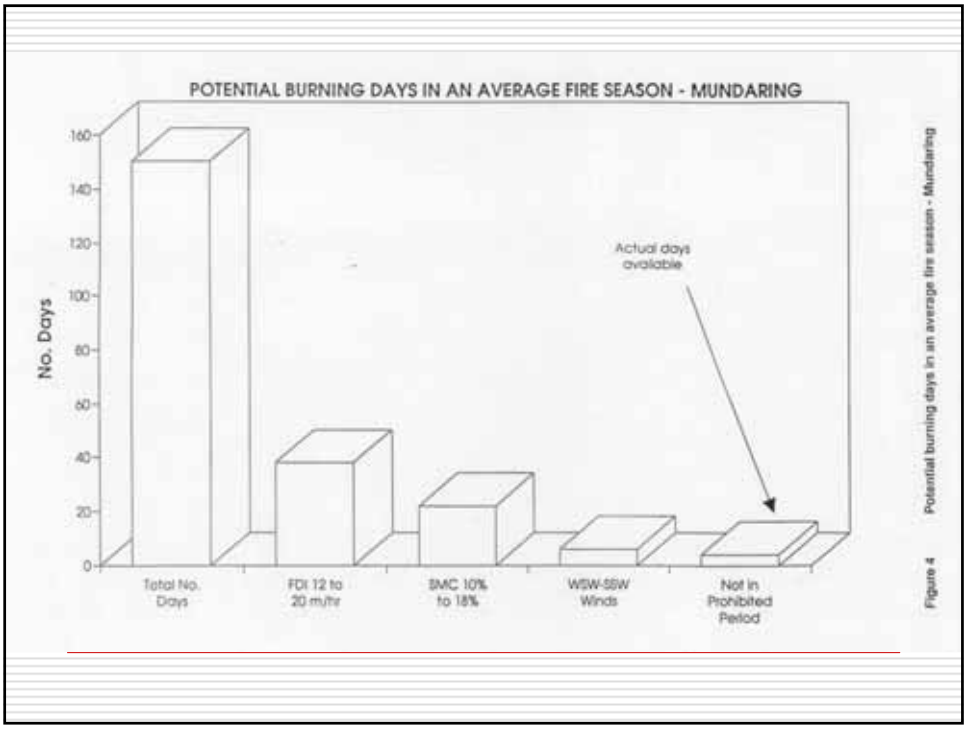
Smoke Management Decision Processes

- **Burn Proposed**
  - Location with regard to Perth/other residential areas
  - Size of burns
  - Concentrations of burns
  - Type of burns (eg: slash, hazard reduction, etc)
  - Time taken to ignite and burn-out time (risk of smouldering)
  - Extent to proportion of areas already burnt
  - Risk of burn delay to safety
  - Importance of burn to community safety
  - Will burning require follow-up lighting in current period

Smoke / Weather Decision Model
Swan Region (<100km South of Perth)




Fine Particulates (PM10) Levels (24 hour averages) at Caversham and Duncraig Stations for 1996
CAVERSHAM
DUNCRAIG
STANDARD
BURN ACTIVITY PERIOD
BURN ACTIVITY PERIOD
DATE
The PM10 (24hr) data for the Caversham and Duncraig sites indicate that there have been no exceedences of the 50ug/m3 standard during the Autumn '96 and Spring/Summer '96 burning periods. Only exceedences occurred during Winter months when when no open burning is undertaken.


POTENTIAL BURNING DAYS IN AN AVERAGE FIRE SEASON - MUNDARING
No. Days
Actual days available
Total No. Days
FDI 12 to 20 m/hr
SMC 10% to 18%
WSW-SSW Winds
Not in Prohibited Period
Figure 4 Potential burning days in an average fire season - Mundaring

SYSTEMS ANALYSIS
Prescribed Burning
Scheme 8 – Smoke Management