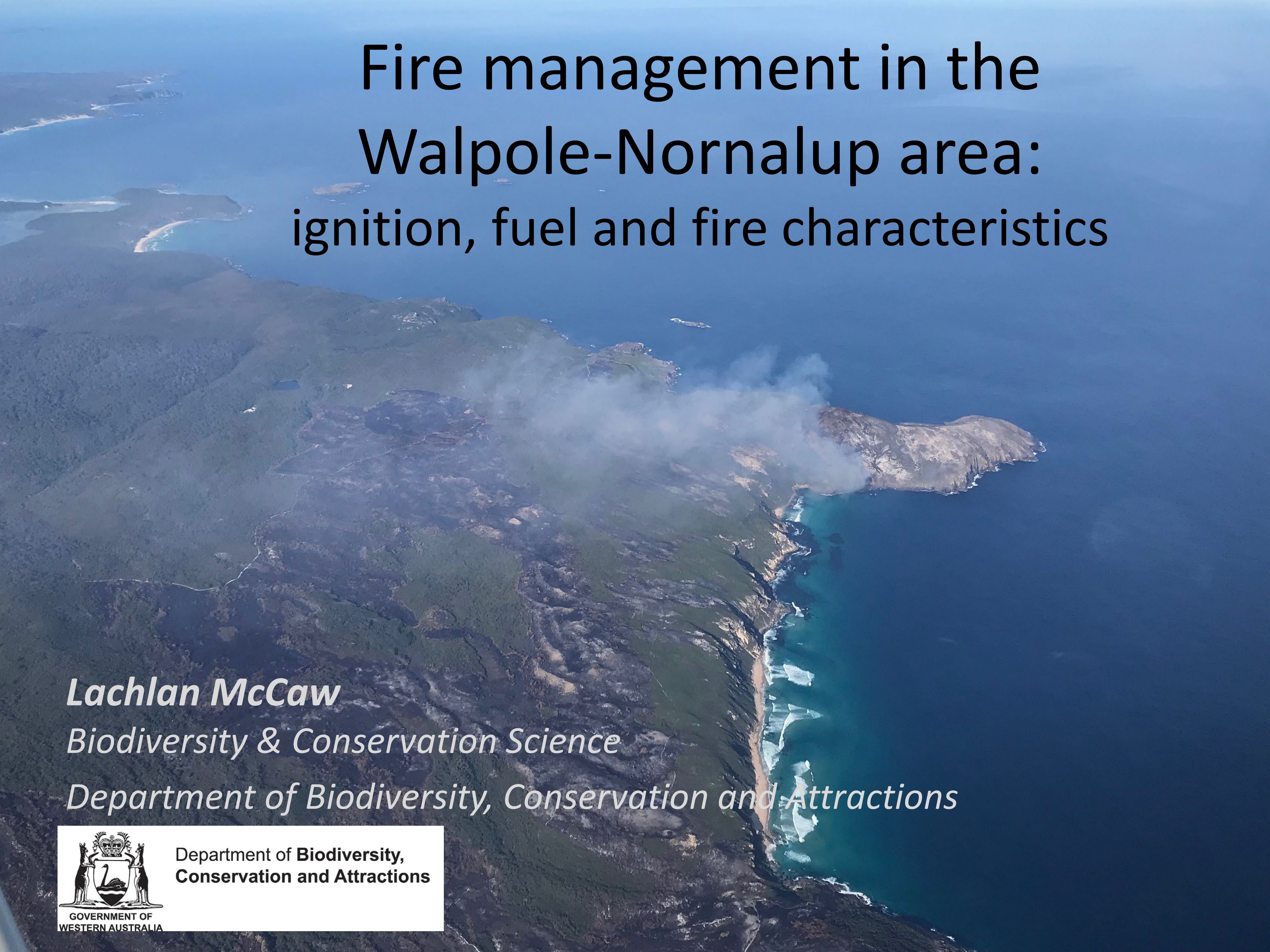


Fire management in the Walpole-Nornalup area:

ignition, fuel and fire characteristics

Lachlan McCaw

Biodiversity & Conservation Science

Department of Biodiversity, Conservation and Attractions

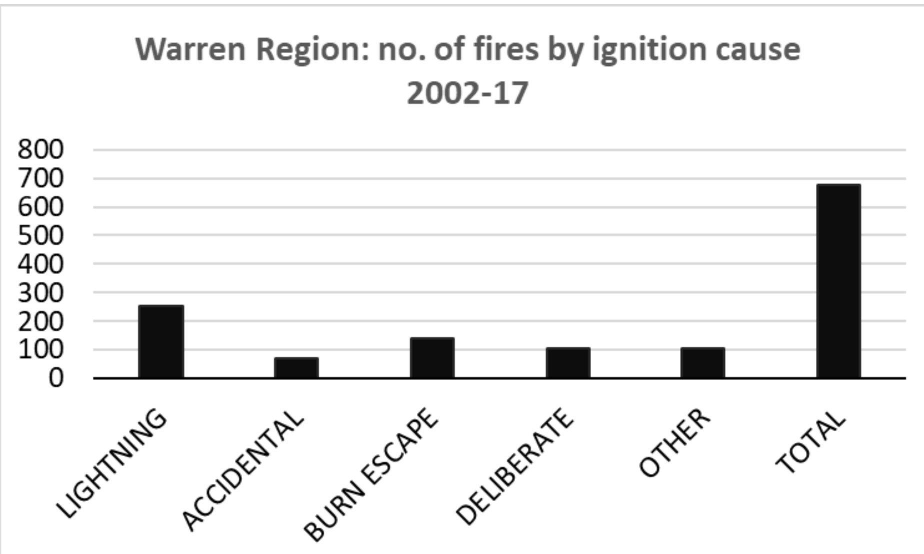
Department of **Biodiversity, Conservation and Attractions**

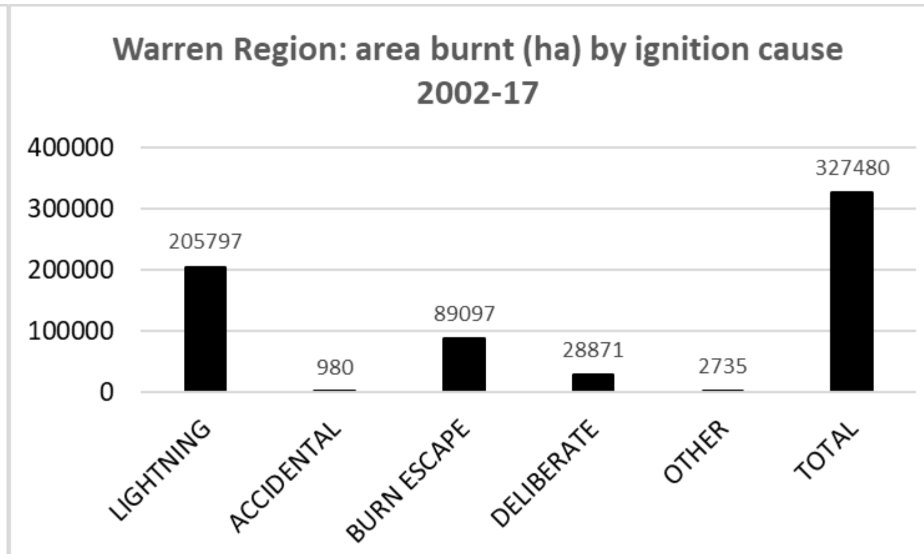
GOVERNMENT OF WESTERN AUSTRALIA

Outline of presentation

- Bushfire in the Warren Region: cause & extent
- Trends in lightning ignition over 40 years
- Lightning ignition in the Walpole area
- Fuel dynamics in tall eucalypt forest
- Learnings from the 2001 Nuyts bushfire
- Planned fire or unplanned fire?

Bushfire cause and extent in the Warren Region

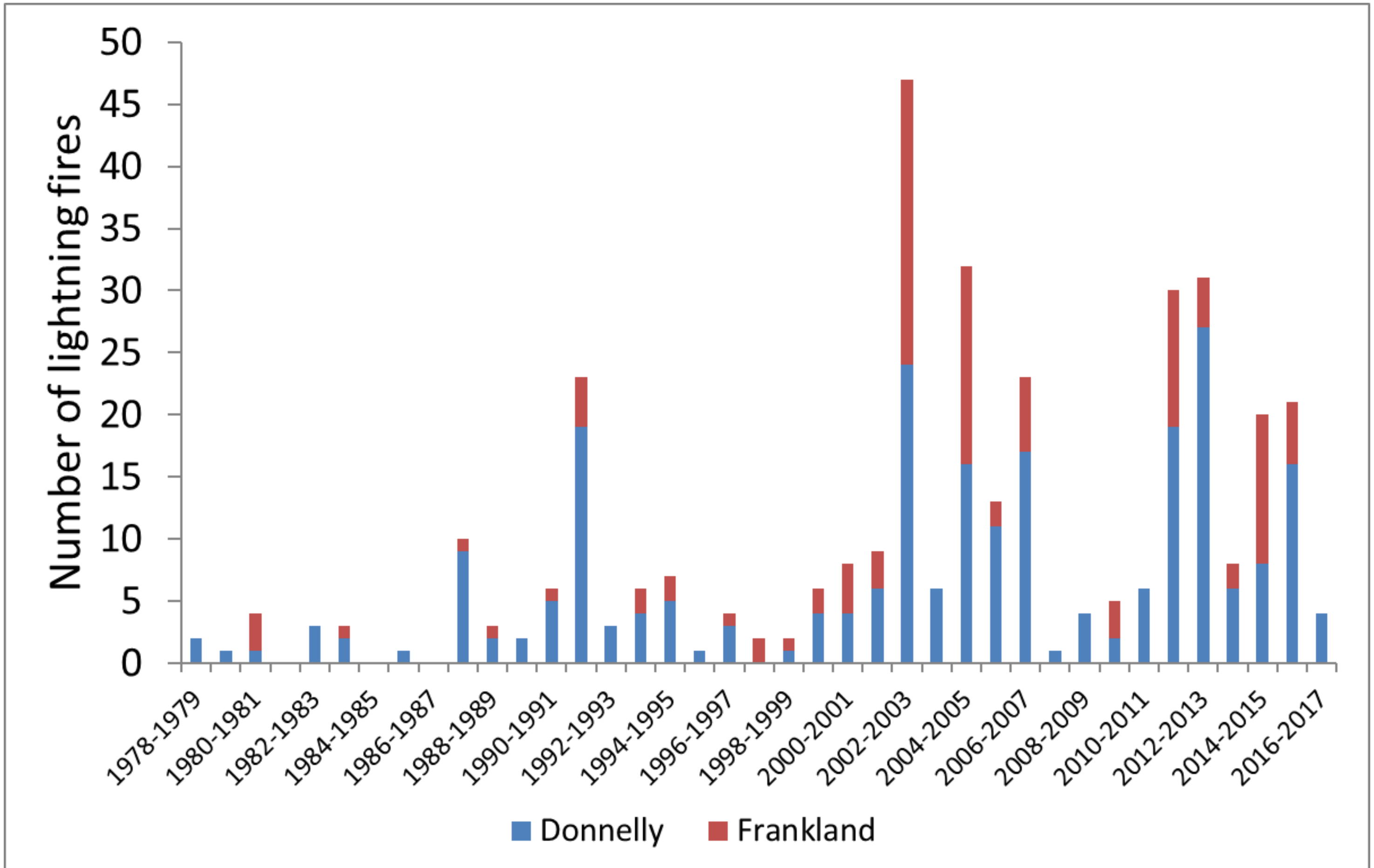




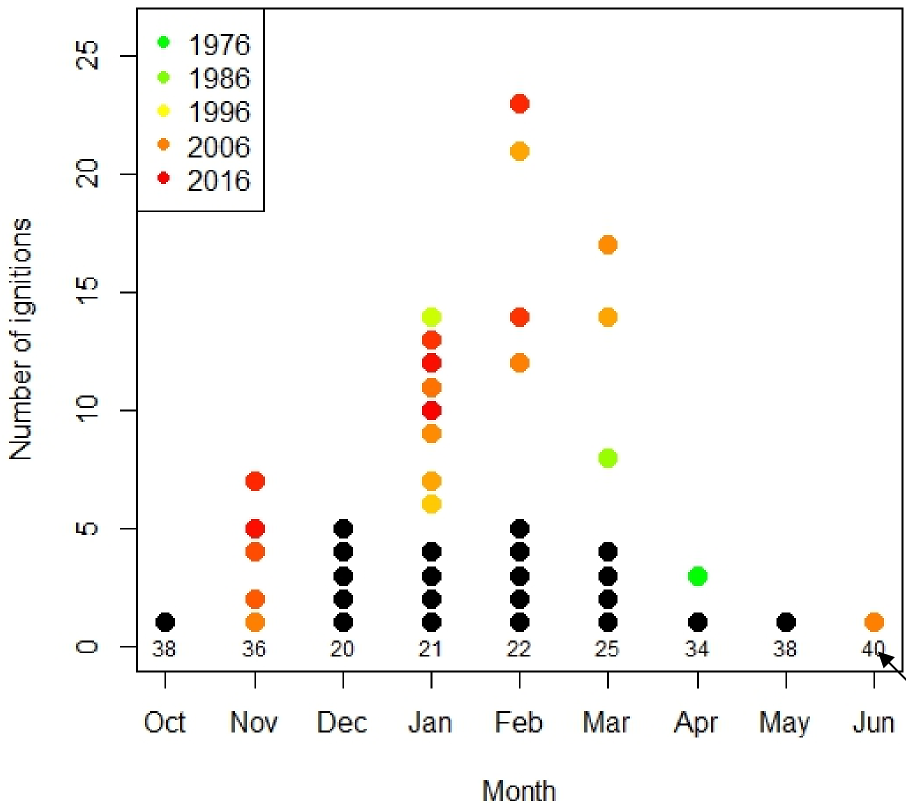
GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

Trend in number of fires ignited by lightning, Warren Region 1978-2017



Monthly occurrence of lightning ignition in the Warren region 1978-2017



Source:
Bates, McCaw & Dowdy (2018)
J Env. Manage. 225, 336-345

Figures indicate number of seasons with no ignition

Lightning ignitions around Walpole 2012-2017

How different fuel layers contribute to fire behaviour

Low intensity fire burning in surface fuel of leaf litter and fine twigs

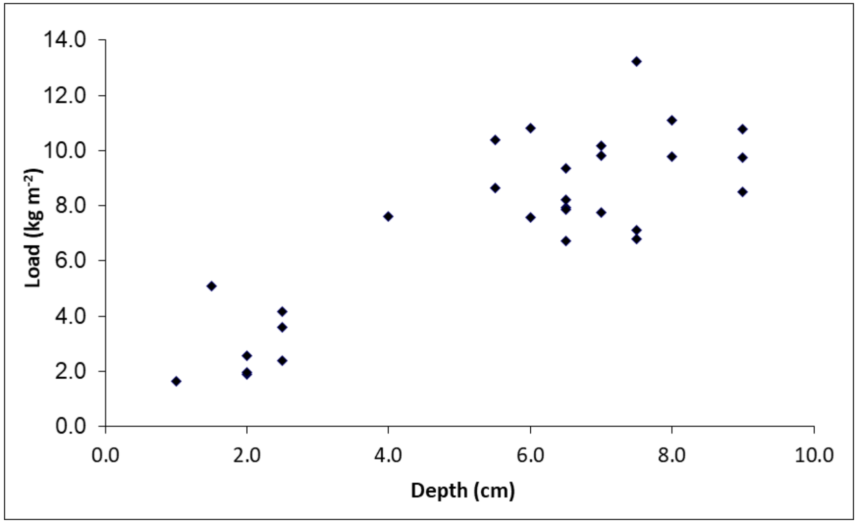
High intensity fire spreading in near-surface fuel with flames extending into elevated fuel and bark

Karri-tingle forest fuels

Shrub layer density reduces with time after fire

A deep surface layer of compact leaves and bark develops after several decades without fire

Deep surface fuel will burn away completely under dry summer conditions



Karri-tingle forest fuels

Unburnt since 1937

Nuyts bushfire March 2001

Photos taken one month and 8 months post fire

Karri and Red tingle forest following prescribed fire

Photos taken 24 months post fire

NORNALUP FIRE MANAGEMENT FORUM - 6 OCTOBER 2018

SLIDE 1 - Title

Thanks for the invitation to be part of todays fire forum. Local communities have an important role in working with management agencies such as DBCA to achieve positive outcomes for both the community and the environment.

By way of introduction I have lived and worked in the Warren Region for 35 years and have been involved in fire research and management for most of this time, including a number of research projects in and around Walpole and Nornalup.

SLIDE 2 – Outline of presentation

My presentation this morning aims to provide a background to fire management in the Warren Region, with a focus on the Walpole Nornalup area. This will include a brief overview of:

- Cause & extent of bushfires across the region;
- Trends in lightning ignition over the past 40 years;
- Lightning ignition around the Walpole area;
- Fuel dynamics in tall eucalypt forest;
- The 2001 Nuyts bushfire and some of the learnings from this event in which I was directly involved.

These are important considerations in how we plan for fire management into the future.

I will also talk about the choice between planned fire or unplanned fire and the different outcomes that may result from this.

SLIDE 3 – Bushfire cause and extent

These two charts show information from the DBCA fire report system for the Warren Region over 15 fire seasons between 2002/13 and 2016/17. The Warren Region spans the area between the catchments of the Donnelly and the Hay river systems north to the Blackwood River and includes the towns of Manjimup, Pemberton, Northcliffe, Walpole, Denmark and a number of smaller settlements. DBCA manages about 650 000 ha of land in this region.

- On the left is the number of bushfires (ie. unplanned fires) attended by DBCA for the period, a total of 680. Lightning is the cause of the largest number of fires (255 ignitions). Lesser number of fires are caused by deliberate arson, accidents and escapes from planned burning which include burning by DBCA and private landholders
  (recent examples of private burn escapes: Nut Rd May 2018, Sunny Glen November 2016)
- On the right is the area burnt according to ignition cause. Lightning is again the dominant cause and accounts for a bit more than 60% of area burnt. This includes large fires in 2015 (O' Sullivan), 2012 (Babbington), and 2003 (Denbarker, Unicup, Broke Inlet)
- These data highlight the importance of lightning as a factor driving fire regimes in the Warren Region.

SLIDE 4 – Lightning ignition over 40 years

This chart shows the annual incidence of lightning caused fires attended by the Department and its predecessor agencies in the Donnelly and Frankland districts of the Warren Region over a forty year period. The area of land being managed and the fire detection system based on spotter aircraft and lookout towers have remained relatively stable over this period.

The notable feature of this chart is the increased incidence of lightning ignition from 2002 onwards, and the large peaks of lightning ignition in some subsequent years.

Reasons for this increase are yet to be fully understood, but are likely due to climate drivers (ENSO) and possibly greater receptivity to ignition of some fuel types in the dry years that have been typical of the past 15 years. Further research into possible climate drivers is being done in partnership with Bryson Bates (CSIRO honorary fellow) and Andrew Dowdy from BoM.

Our expectations around lightning ignition are now quite different to what they might have been in the 1980s and 90s.

SLIDE 5 – Monthly occurrence of ignition

The seasonal pattern of lightning ignition shows a peak in the core summer months of January and February, at a time when the bush is generally at its driest and most receptive to ignition.

From a fire management perspective, dry lightning storms in summer pose a particular challenge because they often result in multiple ignitions (eg. 15 fires in Feb 2012) spread across the landscape, and in places that may be very difficult to access.

In some years lightning ignition has been recorded as early as October and extends into April, occasionally later. There has been a trend towards more ignition in November in the previous 15 years than observed during earlier parts of the study period.

SLIDE 6 – Lightning around Walpole

Looking more specifically at the area around Walpole and Nornalup there have been nine lightning ignitions in the five seasons from 2012 to 2017. These have occurred in a range of vegetation types including coastal woodland, heathland and tall eucalypt forest.

SLIDE 7 – Fuel and fire behaviour

In a bushfire context, fuel is made up of dead and live organic matter that is dry enough to ignite and burn. This can include:

- Leaf litter and twigs on the forest floor;
- Fallen branches, logs and tree stumps;
- Finer components of living plants, typically less than about 6 mm thickness;
- Dead outer bark on standing trees – important for spotting;
- Standing dead trees, if conditions are very dry.

The amount of fuel that burns varies according to its arrangement, size, dryness and the environmental conditions under which the fire is burning.

SLIDE 8 – Fuels in karri tingle forest

Understorey species composition changes with time since fire with an initial pulse of regeneration of Acacia, Hazel and other shrubs from soil-stored seed followed by a transition to fewer but larger individuals.

Some mid-storey trees including *Allocasuarina* and Peppermint may persist from previous understoreys if a fire is low intensity.

A deep surface layer of compact leaves and bark develops after several decades without fire, and may be more than 10 cm thick. The amount of surface litter is generally proportional to its depth, as illustrated in the chart – in this example the compact surface layer represents about 10 kg m^{-2} or 100 tonnes ha^{-1}.

Deep surface fuel will burn away completely under dry summer conditions

SLIDE 9 – Tingle-karri forest unburnt since 1937

These photos show tall forest of karri and tingle near Monastery Landing and were taken in 2010, making the understorey layer at least 70 years since last fire. The mid-storey is dominated by *Allocasuarina* and occasional *Acacias*, with an understorey of cut-rush, bracken and scattered shrubs.

Typically there are large accumulations of bark, branches and leaf litter around the base of large mature trees, sometimes up to a metre deep. Bark and woody material are resistant to decomposition and can continue to build up for many decades.

SLIDE 10 – Nuyts fire March 2001

This fire was ignited by lightning in early March 2001 following a long dry summer, and dead fuels were fully available to burn.

The fire was inaccessible and couldn't be tracked with bulldozers, while water drops from aircraft were ineffective due to strong winds, dense forest canopy and the heat generated from combustion of deep litter and woody fuels. Weather conditions during the fire were cool but windy.

The fire did its major run overnight spreading about 5 km through a mosaic of tall forest and coastal shrubland, most of it unburnt during the previous 40 to 70 years.

Effects of this fire on the forest and heathland ecosystems included:

- Very high consumption of ground logs and organic matter
- Loss of numerous old trees, particularly hollow-butted tingle
- Death of up to 10% of mature red tingle and 15% of mature marri trees
- Very few patches remaining unburnt – fire burnt downhill to the ocean in some places
- Very high mortality of quokka and other native fauna

SLIDE 11 – Planned fire in karri and tingle

The final point I want to make is that the choice we are making is between planned fire and unplanned fire – realistically there isn't a no-fire option in this environment.

We don't know when the next unplanned fire may occur, although its quite likely it be ignited by lightning during the dry summer months. It may be in 5 years time, or it may be next February. Based on past experience unplanned fire is likely to have adverse outcomes on many things we value about the environment.

The alternative is to use fire in a planned way that provides the opportunity to influence when and how the forest burns, and how much of it burns in a single event. From experience we know that areas where the fuel has been reduced in the previous 10 years will assist in the containment of unplanned fires, and will be less prone to severe impacts from unplanned fires.

This is an important choice that warrants thoughtful consideration.