



# BE PREPARED: CLIMATE CHANGE AND THE QUEENSLAND BUSHFIRE THREAT

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Published by the Climate Council of Australia Limited

ISBN: 978-1-925573-00-8 (print)  
978-1-925573-01-5 (web)

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Be Prepared: Climate Change and the Queensland Bushfire Threat by Professor Lesley Hughes and Dr David Alexander.



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# Key Findings

## 1

**Climate change is increasing the risk of bushfires in Queensland.**

- › Australia is a fire prone country. While damaging bushfires are less common in Queensland than other states in Australia, climate change is now increasing the incidence of extreme heat and making heatwaves longer and more frequent, leading to a higher risk.
- › Record breaking heat and hotter weather over the long term in Queensland will worsen fire weather and the impacts of bushfires.

## 2

**Queensland is experiencing an increase in hot days and therefore an increasing number of days with high fire danger. Communities, emergency services and health services across Queensland need to keep preparing for this risk.**

- › Conditions conducive to bushfires are expected to increase in coming decades in Queensland.
- › Increasing severity, intensity and frequency of fires throughout Australia will strain Queensland's existing resources and capacity for fighting and managing fires.

## 3

**Stronger climate change action is needed to reduce bushfire risk.**

- › Australia's emissions reduction target of 26-28% on 2005 levels by 2030 is not sufficient to protect Australians from worsening bushfires and extreme weather events.
- › Australia must reduce its emissions rapidly and deeply to join global efforts to stabilise the world's climate and to reduce the risk of exposure to extreme events, including bushfires.

# 1. The Nature of Bushfires in Queensland

Extreme fire weather and longer fire seasons have been observed since the 1970s across much of Australia including Queensland, particularly along the east coast (CSIRO and BoM 2014). While bushfires are typically smaller and less damaging in Queensland than in the southern part of the continent (Risk Frontiers 2011), bushfires in the state have caused numerous deaths and losses of property and infrastructure, and have negatively affected agricultural and forestry production (Ellis et al. 2004).

Queensland's most populated region, the southeast (including cities of Brisbane and the Gold Coast) has a medium to high bushfire risk at the rural–urban fringe (city outskirts) (Browne and Minnery 2015), where a large proportion of growth has been accommodated in the post-war period (Low Choy and Sutherland 2010). This fire risk has been increasing substantially in recent decades. More than 50% of Queensland extreme fire days over the period 1945 to 2007 have occurred since 1990, with extreme fire days most prevalent in the southeast of the state (RFS and QRFS 2007).

Fire threats to tropical and subtropical Queensland have also been increasing. Weekly bushfire frequencies in Australia have increased by 40% between 2008 and 2013, with tropical and subtropical Queensland the most severely affected (Dutta et al. 2016). The rainforests in these regions are extremely sensitive to bushfires, and any increase in fire incidence could have severe impacts on biodiversity (AIC 2004).

Fire risk in the arid regions of Australia, including parts of west Queensland, are dependent on fuel availability, which is determined, in turn, by episodic rainfall (CSIRO and BoM 2015). Rainfall is subject to high inter-annual variability, driven by tropical cyclone activity and large-scale El Niño patterns, meaning there is less certainty associated with long-term predictions of fire weather (CSIRO and BoM 2015).

## Impacts

Bushfires in Australia have accounted for more than 800 deaths since 1850 (Cameron et al. 2009; King et al. 2013). Between 1939 and 2009, bushfires resulted in the deaths of 23 people in Queensland (Leonard and Blanche 2012). The main non-human losses from bushfires have been to houses and other buildings, cattle, sheep and plantation timber (Ellis et al. 2004).

The total economic cost of bushfires in Australia is very high, and under current conditions, is estimated to average around

\$337 million per year (Deloitte Access Economics 2014). In Queensland, the cost of bushfires is much lower. There is a 1% chance that a bushfire event will cause an annual residential loss of greater than \$14 million (Risk Frontiers 2011). While bushfires contribute substantially less to disaster costs in Queensland than tropical cyclones, floods and severe storms (Ellis et al. 2004) – on the order of \$16 million or the equivalent of 0.2% of total Queensland disaster costs between 1967 and 1999 (Bureau of Transport Economics 2001) – climate change is significantly increasing the potential for higher costs in the future.

Figure 1: An intense fire in the north of Australia.



# 2. Climate Change is Affecting Queensland Bushfires

Queensland is experiencing an increase in extreme heat with seven of the state's ten hottest years on record having occurred since

1998 (BoM 2016a; Figure 2). This is increasing the likelihood of high fire danger weather.

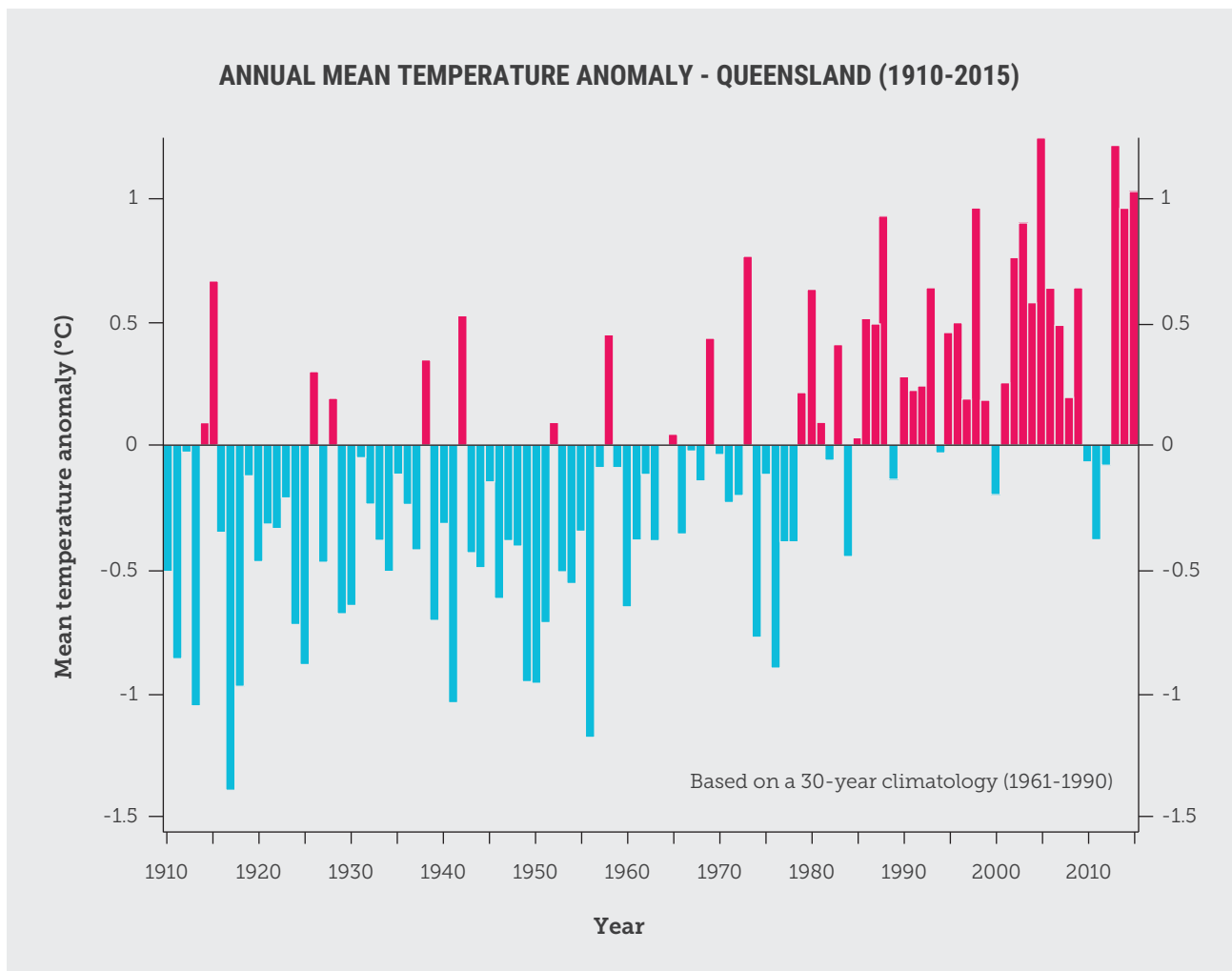


Figure 2: Annual mean temperature increases (red) and decreases (blue) for Queensland from 1910 to 2015, relative to 1961-1990 annual average temperatures (BoM 2016a). Seven of Queensland's ten hottest years on record have occurred since 1998.

## Climate change is driving up the likelihood of high fire danger weather.

A fire needs to be started (ignition), it needs something to burn (fuel) and it needs conditions that are conducive to its spread (weather) (Bradstock et al. 2014). Climate change can affect all three of these components in complex ways (Figure 3), but it is weather on a particular day that is the most crucial determinant of fire spread, intensity and impact. At higher temperatures,

fuel is 'pre-heated' and is more likely to ignite and to continue to burn (Geoscience Australia 2015). Once a fire is ignited, very hot days with low humidity and high winds are conducive to its spread. Any impact of climate change on heat, moisture or wind is therefore going to directly affect the spread and staying power of a bushfire.

### MAIN FACTORS AFFECTING BUSHFIRES

#### 1 | Ignition

Fires can be started by lightning or people, either deliberately or accidentally.

#### 3 | People

Fires may be deliberately started (arson) or be started by accident (e.g. by powerline fault). Human activities can also reduce fire, either by direct suppression or by reducing fuel load by prescribed burning.

#### 2 | Fuel

Fires need fuel of sufficient quantity and dryness. A wet year creates favourable conditions for vegetation growth. If this is followed by a dry season or year, fires are more likely to spread and become intense.

#### 4 | Weather

Fires are more likely to spread on hot, dry, windy days. Hot weather also dries out fuel, favouring fire spread and intensity.



Figure 3: Main factors affecting bushfires: ignition, fuel, people and weather.



**BOX 1: DANGEROUS IMPACTS OF EXTREME HEAT**

The frequency, duration and intensity of extreme heat events and heatwaves, are increasing (IPCC 2014) and this is increasing bushfire risk. Since the 1970s, the number of days with maximum temperatures over 35°C in most of Queensland has increased by about 10-45 days above the historical average, depending on the region (BoM 2016b). The 2016 autumn in Queensland was the warmest on record for mean, maximum and minimum temperatures (BoM 2016c).

More Australians die every year from extreme heat than any other type of natural disaster. Heatwaves also restrict work capacity and decrease the productivity of exposed workers, as well as having significant impacts on infrastructure and essential services (Figure 4). For example, the financial losses from the 2009 heatwave in southeast Australia were an estimated \$800 million, mainly a result of power outages and disruptions to the transport network (Chhetri et al. 2012).

## The 2016 autumn was the warmest ever recorded in Queensland.



**Figure 4:** Extreme heat can cause severe impacts on infrastructure and essential services, including disruptions to electricity networks.

# 3. Bushfire Outlook for Queensland

**Hotter, drier conditions in Queensland will cause an increased likelihood of extreme fire weather days in 2016 and over the coming decades.**

## 2016 Outlook

The mid- to late-2016 bushfire season will be influenced by one of the strongest El Niño events on record (Bushfire and Natural Hazards CRC 2016). This El Niño has caused patchy wet season rainfall, record warm temperatures, and suppression of tropical cyclone activity (Bushfire and Natural Hazards CRC 2016). These factors, along with the continuation of drought in many areas of Queensland, has contributed to the prediction of above normal fire potential in the coastal east around Rockhampton and Cairns, inland in the Mt Isa region, and in small pockets at the northern tip of the state (Figure 5; Bushfire and Natural Hazards CRC 2016).

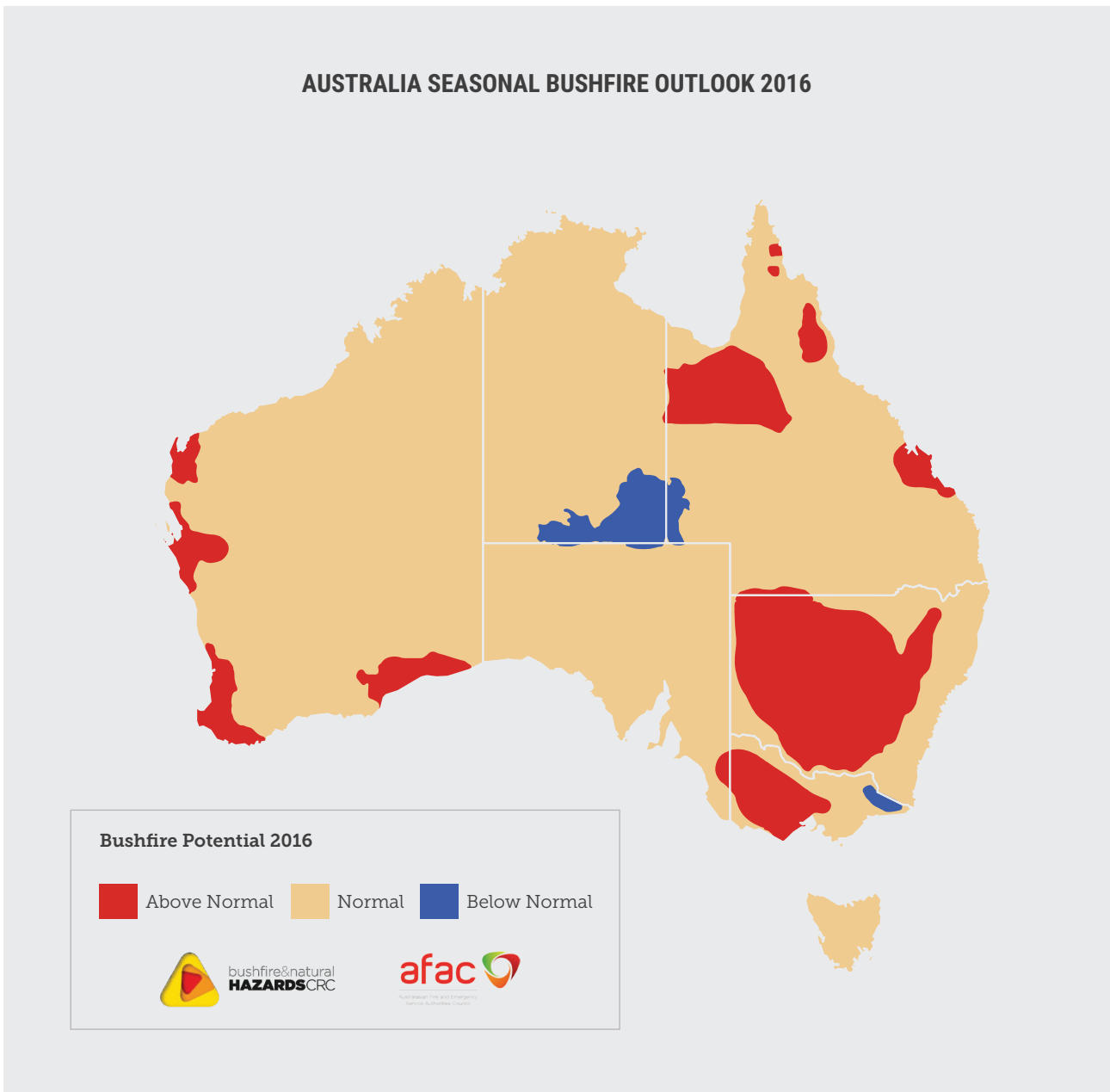


Figure 5: Australia bushfire outlook for 2016 (Bushfire and Natural Hazards CRC 2016). Above normal fire potential conditions exist for some coastal and northern regions of Queensland.

## The Coming Decades

Climate change will continue to increase bushfire risk in Queensland because a combination of decreased relative humidity, increases in the number of hot days, and substantially less rainfall in some areas, are likely to increase the number of high fire danger days (Risk Frontiers 2011).

More specifically, modelling by CSIRO and BoM (2015) shows that large expected declines in rainfall in southeast Queensland are likely in the coming decades, which would lead to higher drought factors (e.g. drier, more ready-to-burn fuels) and an

increase in high fire danger days. While this modelling also indicates that there will be little change in fire frequency across all tropical and monsoonal northern Australia, the frequency of long fire weather seasons has increased significantly since the late 1970s in northern Queensland (Jolly et al. 2015). If the fire season length continues to increase in the future, this region of Queensland in particular will be exposed to a higher fire risk. Changes to bushfire conditions in arid inland areas of Australia, including western Queensland are difficult to determine because fire risk is dependent on the availability of fuel, driven by episodic rainfall (CSIRO and BoM 2015).

Warmer, drier weather in southeast Queensland will increase fire danger.

# 4. Bushfire Preparation

The Queensland bushfire season spans from winter to early summer (BoM 2009), which coincides with the bushfire season in North America. For a number of years, the US and Australia have participated in a resource-sharing arrangement that enables states in either country to request additional firefighting personnel at short notice (NIFC 2002).

Because climate change is affecting bushfire season length, intensity and severity in both Northern and Southern Hemispheres, there is the potential for a decreased capacity to share vital resources, putting greater pressure on firefighting personnel and equipment in Queensland.

The fire season in southeast Queensland overlaps with the peak fire season in northern New South Wales (BoM 2009). Climate change, and the impacts on bushfire severity and the length of the bushfire season in these regions presents a challenge to emergency services, due to the requirement of more resources – both equipment and personnel (Climate Council 2015).

During the past decade, state fire agencies have increasingly needed to share suppression resources domestically during peak demand periods (Bushfire and Natural Hazards CRC 2012). As climate change increases the severity and frequency of bushfires in Australia, firefighting services will be less able to rely on help from interstate and across the world as fires occur simultaneously. This is a major challenge for Queensland.

Increased risk of high fire weather conditions in Queensland is likely to place increased pressure on firefighting services.

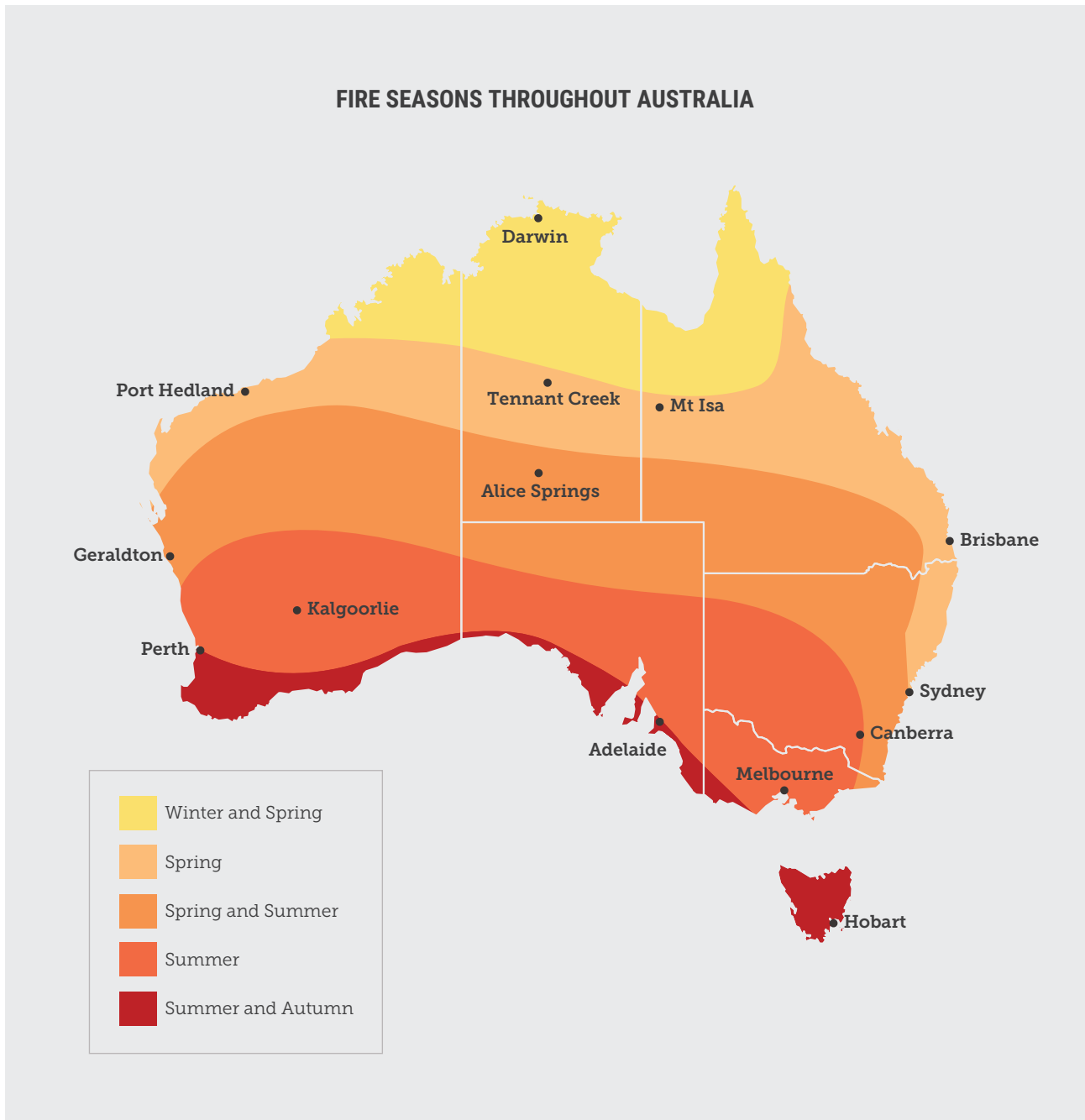


Figure 6: Fire seasons throughout Australia (BoM 2009). The Queensland fire season spans from winter to summer.



**Figure 7:** Elvis – the Erickson Air-Crane fire bomber – dumping about 9,000 L of water to assist Australian firefighters. Specialised firefighting aircraft like this are loaned for the bushfire seasons in both the Northern and Southern hemispheres each year.

# 5. Reducing Emissions Will Ease the Bushfire Threat

The link between climate change and bushfires is clear. More action is needed if we are to limit the severity of bushfires in Queensland and elsewhere.

Yet Australia's emissions reduction target of 26-28% by 2030 compared to 2005 levels leaves Australia lagging behind its major trading allies and partners and is not consistent with effectively tackling climate change. This is the critical decade to get on with the job.

We must cut our emissions rapidly to reduce the impact of future extreme events, including bushfires.



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Page 5: Figure 4 'Extreme heatwave' Jacana Electricity transmission as stormclouds gather' by Flickr user Takver licensed under CC BY SA 2.0.

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# Preparing for a Bushfire

**IN AN EMERGENCY, CALL TRIPLE  
ZERO (106 FOR PEOPLE WITH A  
HEARING OR SPEECH IMPAIRMENT)**

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## What can I do to prepare for a bushfire?



### **INFORM YOURSELF**

State Fire Authorities, listed below, have the resources available to help you prepare for a bushfire. Use these resources to inform yourself and your family.



### **ASSESS YOUR LEVEL OF RISK**

The excellent resources of State Fire Authorities are also available to assist you to assess your level of risk from bushfire. Take advantage of them.



### **MAKE A BUSHFIRE SURVIVAL PLAN**

Even if your household is not at high risk from bushfire (such as suburbs over 1 km from bushland), you should still educate yourself about bushfires, and take steps to protect yourself and your property. State Fire Authorities have excellent resources available to help you to prepare a bushfire survival plan. Look on your State Fire Authority's website to start or review your plan.



### **PREPARE YOUR PROPERTY**

Regardless of whether you decide to leave early or to stay and actively defend, you need to prepare your property for bushfire. Check out the excellent resources and guides available on State Fire Authorities websites. An important consideration is retrofitting older houses to bring them in alignment with current building codes for fire risk and assessing the flammability of your garden.



### **PREPARE YOURSELF AND YOUR FAMILY**

Preparation is not only about the physical steps you take to prepare—e.g., preparing your house and making a bushfire survival plan. Preparing yourself and your family also involves considering your physical, mental and emotional preparedness for a bushfire and its effects. Take the time to talk to your family and to thoroughly prepare yourself on all levels.

## Queensland Fire Authority

Queensland Fire and  
Rescue Service

[www.fire.qld.gov.au](http://www.fire.qld.gov.au)

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