Earth Systems and Climate Change Hub
National Environmental Science Programme

Characterising extreme fire conditions

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Australia has experienced a sequence of severe fire seasons in recent years, leading to the loss of many properties and lives. The seasons have stretched the capabilities of fire services and communities. Understanding if conditions are changing, and how future risks may need to be managed, will help with planning to minimise future losses.

Earth Systems and Climate Change Hub researchers produced a dataset of weather conditions influencing fire activity that extends back to 1950 and is updated daily. The dataset provides the big picture with regards to fire weather in our changing climate, allowing current extreme conditions to be placed in a historical context. This not only aids management decisions now and into the future but also provides a useful research tool for the climate science community.

What's new?

Previous fire weather studies and datasets have been based on model output and station data. Station data are useful for understanding the fire weather at a given point location, but are not as helpful for understanding how fire weather varies across a region. The new research and dataset uses gridded observations of fire weather conditions throughout Australia, allowing us to identify regions with exceptionally dangerous fire weather. This dataset also covers a long period (from 1950 onwards) so unlike previous, shorter datasets, we can now have more confidence in assessing longer fire weather patterns, including natural climate variability from factors such as El Niño and the long-term climate change signal.

How is it used?

The fire weather dataset was primarily developed for the Bureau of Meteorology's Climate Information Services group. This group helps to prepare warnings and other guidance information used by fire agencies to plan for potential bushfire conditions. They are using the dataset to produce maps that show fire weather for a given month in terms of average and record fire weather, as well as map how often, on average, conditions of a particular severity (or worse) occur at a given location.

The dataset shows us that some regions may have extreme fire weather a few times a year, while others may only experience conditions that extreme once a decade. It clearly shows that the severity of fire weather conditions has increased in recent decades in many parts of Australia, as well as showing that fire weather conditions we have experienced in recent years (including for Victoria's Black Saturday bushfires in 2009 and the February 2017 conditions in New South Wales and Queensland) are more dangerous than conditions that fire managers would have faced previously in those regions.

This information alerts fire managers that pre-existing procedures for managing bushfires will need to be modified based on the global warming that has occurred to date and will continue to occur this century.

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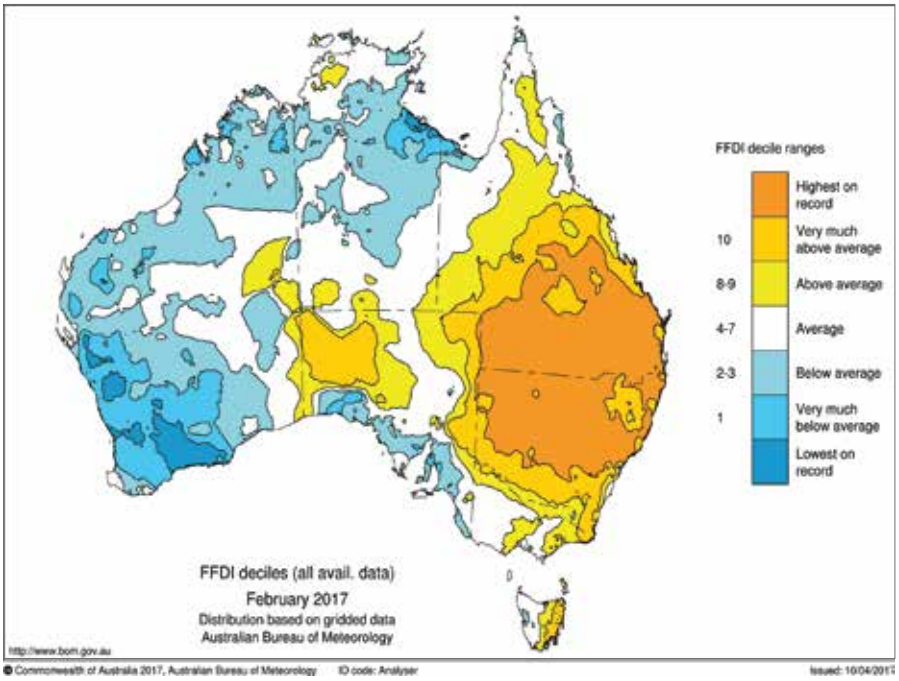
Who benefits?

Bureau of Meteorology Climate Information Services group has benefitted by being able to provide more comprehensive fire weather information to clients including state fire agencies, emergency services and government groups.

Fire agencies and emergency services benefit by being able to place fire weather conditions – which, due to climate change are different from what has been experienced in the past – in the context of events that they have dealt with previously. This helps with planning emergency responses and disaster risk reduction activities, which not only may lead to better response times and resourcing, but ultimately a reduction in the costs and other impacts on people and property.

State and federal government agencies and advisory groups will benefit as results derived from the dataset filter into policy and planning processes. For example, in September 2017 results from the dataset were presented to the Australasian Fire and Emergency Service Authorities Council (AFAC) at their annual conference. The results are also being used in a briefing document for input to AFAC's Climate Change Discussion Paper, which is intended to help provide guidance on planning in relation to the risks of climate change on natural hazards.



This map is an example of the information generated using the dataset. It shows that the Forest Fire Danger Index (FFDI) values in February 2017 were above average for most of eastern Australia, with large regions experiencing the highest FFDI values on record.

Insurance groups benefit from having additional information with which to calculate their exposure to fire-related risk. This has significant economic consequences.

The research community benefits from access to information products derived from the dataset, which can be used for a range of applications, including examining long-term trends in conditions and the influence of climate change, the influence of El Niño-Southern Oscillation and potential of seasonal forecasting applications.

This dataset will help other research currently underway in the Hub, including work on examining projections of future changes in extreme fire weather conditions based on global climate models as well as finer-resolution downscaling methods. CSIRO and UNSW scientists recently used the dataset to assess how well models represent spatial and seasonal variations in gridded fire weather conditions for the current climate. This work will help to improve confidence in projections of future changes in fire weather extremes.

This research was led by ESCC Hub Project 2.8, in collaboration with members of the Bureau of Meteorology Climate Information Services group. The Hub produced the data, and Bureau staff helped ensure that it was in a format compatible with their existing analysis tools.

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