

HOTSPOTS FIRE PROJECT

Fact Sheet: Understanding How Fire Behaves



Fuel has many characteristics that will influence fire behaviour.

Understanding fire behaviour helps landholders manage native vegetation and bush fire risk. This fact sheet provides information about the factors that determine fire behaviour.

Fire behaviour refers to how and where a fire burns, how fast it travels, how much heat it gives off and how much vegetation it consumes. The behaviour of fire is influenced by three major factors: Weather, Fuels and Topography.

Weather

It is useful to have a good understanding of local weather patterns, as this helps in understanding fire behaviour.

The most important weather factors when it comes to fire behaviour are temperature, humidity, wind and atmospheric stability.

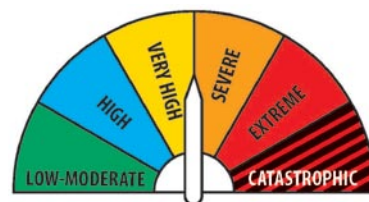
- **Temperature** – high temperatures dry out vegetation, making it easier to ignite and burn.
- **Humidity** – the level of moisture in the air determines how vegetation is consumed in a fire.

If the temperature remains high and the humidity is low, there will be very little moisture gain by vegetation.

- **Wind** – the stronger the wind, the more oxygen supplied to the fire. The speed and direction of wind determines intensity, speed and how fire is controlled.
- **Atmospheric stability** – refers to the vertical movement of air masses. This is important as vertical air motion can affect local wind patterns. In unstable atmospheric conditions (vertical movement of air) fire behaviour is erratic.

Fire Danger Ratings

Fire Danger Ratings are a guide to expected fire behaviour on a given day based on weather conditions such as temperature, humidity, wind and drought. Knowing the Fire Danger Rating for your local area will help you prepare for wildfire and when planning prescribed burns. The higher the Fire Danger Rating, the more difficult fires are to control. For more information about Fire Danger Ratings refer to the NSW RFS Fact Sheet: Fire Danger Ratings at www.rfs.nsw.gov.au.



Vegetation is Fuel

To better understand fire behaviour, it may help to view vegetation as fuel.

Fuel is any combustible material such as wood, leaves, twigs, grass, shrubs, trees etc. Fuel has many characteristics that will influence fire behaviour such as moisture, quantity and arrangement.

Moisture – Fuel that is dry and fine will burn better than heavy fuels that are wet. The moisture content of fuel will affect ease of starting a fire, amount of heat from flames, how quickly the fire moves and how quickly fuel is consumed.



Phil Worner and David Stimson demonstrate the 'leaf test'. This helps determine how much moisture there is in vegetation.



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Quantity (Load) – Fine fuels (leaves, twigs, grasses) are less than 6mm thick and mainly drive the forward spread of fire. Heavy fuels are over 6mm (sticks, branches, logs) and generally take longer to burn after the main front of the fire has passed. The quantity of fuel affects fire behaviour.

Arrangement – Fuels are arranged horizontally and vertically. Fine, loosely-stacked fuels burn quickly and fiercely. A continuous ladder of fine fuel from the ground to the tops of the trees may encourage crown fires.

Fire in Different Vegetation

Under the worst weather conditions fire behaviour varies in different vegetation because of the way fuel is arranged.

	Forest/Bush	Scrub/Scrublands	Grasslands
Intensity	High intensity fire	High intensity fire	Moderate intensity fire
Rate of Spread	Relatively low rates of spread	Moderate to high rates of spread	Very high rates of spread
Time	Long burning time	Relatively short burning time	Short burning time
Spotting	Extensive long distance spotting	Short distance spotting	Limited short distance spotting

Topography

Topography refers to the 'lay of the land', its slope, orientation and elevation. Topography influences fire behaviour through interactions between weather and vegetation. For example, northern and western aspects are warmer and drier and therefore influence the type of vegetation which grows there. Also, the steeper a slope is, the faster a fire will travel (that is, for every 10 degrees of slope, double the rate of spread).

In Summary

Understanding fire behaviour will help when planning to burn and in preparing for wildfire. Knowing what the local Fire Danger Rating is for your area will help with this planning.

Fire behaves differently in different vegetation – getting to know the bush in your local area and on your property will help you understand fire behaviour better.

If you are planning to use fire on your property, start small. Observing small burns in mild conditions will help build your knowledge and experience. Contact your local Fire Control Centre for more information and assistance when planning to burn.

Fire in Practice

For landholder and Captain of Mandemar Brigade Phil Worner, fire is an important part of land management on his 60 ha property situated in the Southern Highlands. His property borders the Nattai World Heritage Area and much of his land is covered by Scribbly Gum Woodland. Phil has managed his property for conservation and lifestyle purposes for over 14 years and has built upon his knowledge and experience with fire through introducing small planned burns on his property, along with attending wildfires through the brigade. He says one of the best ways to learn about fire behaviour is to experience it.

"Think about your senses. Can you feel the heat, is the fire noisy, is there lots of smoke? If you can hear the roar, smell the fire and there is lots of smoke, the fire is likely to be fairly intense."

Before considering burning on your property, some of the things you need to think about are humidity, temperature and wind. If it is hot, dry and windy, these things are the biggest indicators of fire behaviour. Some easy ways to observe these conditions are to look up into the trees, are the leaves and small branches swaying? Are leaves on the ground crunchy underfoot?

You can tell how intense (hot) a fire will be by looking at fuel on the ground and suspended (or vertical) fuel. Anything below the canopy will influence fire intensity. Looking at suspended fuel will also give an indication of how fast a fire will spread. If you have trouble walking through a patch of bush or you can't see through it, the rate of spread will be higher.



Phil Worner explains fire behaviour to landholders on his property.

Acknowledgements

Thanks to Phil Worner.

Reading

- NSW Rural Fire Service Fact Sheet: *Fire Danger Ratings* (www.rfs.nsw.gov.au)
- NSW Rural Fire Service: *Standards for Low Intensity Bush Fire Hazard Reduction for Private Landholders* (www.rfs.nsw.gov.au)

- Hotspots Fact Sheet: *Fire, Vegetation and Climate Change* (www.hotspotsfireproject.org.au)

Further information

The Hotspots Fire Project is managed by the NSW Rural Fire Service (RFS) and the Nature Conservation Council of NSW. For further information contact the Hotspots Coordinator at the RFS on 8741 5555, email hotspots@rfs.nsw.gov.au or visit www.hotspotsfireproject.org.au

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