

Weather and Fire Behavior Training
Southeast Australia
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Course Description

Fire weather in NSW is most serious when hot dry wind blow from the inland, particularly from the northwesterly direction. The normal course of anticyclones in spring is such as to bring much of NSW under the influence of these winds. Fire danger then reaches a critical level if the fuels are abundant and dry, as is the case in the northern coastal districts. In the drought periods this danger is likely to vary from high to extreme in spring along the whole of the coast and tablelands and sometimes along the western slopes.

Fire danger seldom reaches the level experienced in Victoria in summer, except in southern districts occasionally, when anticyclones follow a course in summer similar to their normal spring route, as happened on 6 to 10 January 1994.

Australian fire falls into broad classes

1. That behavior can be predicated with reasonable accuracy, taking account of terrain and weather factors.
2. And that behavior is erratic.

Majority of fires are type one, due to low intensity seldom exceeding 1000 BTU/sec/foot. (Note: BTU unit of heat equal to 1055 joules.)

By contrast, fire type two is of high intensity and usually large and very destructive, the term BLOW UP being applied to them. This type of fire sometimes appears suddenly on smaller fires. The intensity of BLOW UP fires can reach to 20,000 to 30,000 BTU/sec/foot of the fire front.

The geometry of the two types of fires:

1. The type one (predicated behavior) is a two-dimensional due to convective activity over the fire being restricted of the order of some ten's of feet.
2. The BLOW UP fire is three-dimensional nature with vertical structure extending to many 1000 of feet. Occasionally a large BLOW UP may reach an energy output comparable with that of thunderstorms.

Weather Hazards:

What makes the difference between a day with inconvenient weather and one that ends in a disaster depends on two main components:

- The type and severity of the fire weather.
- The vulnerability of the community, which depends on environmental and community features and the extent to which your community is prepared

You cannot control the first component, but you can be better prepared by understanding the weather conditions that lead to hazardous weather events and how to use the forecast products to anticipate them. You also cannot control some things, like geology and geography, that would reduce your community's vulnerability to bad weather. But you and other decision makers in your community do have control over many of the risk factors that can make a real difference in reducing threats to life and property.

Who Should Attend

- Fire brigades, rural fire brigades
- The NSW Rural Fire Service
- Rural Fire Service volunteer cadet programs.
- NSW State Emergency Service (SES)
- NSW State Emergency Services Volunteers Association
- Local Government-Bush Fire committee members
- Westpac Helicopter Rescue organizations
- Media.

Key Topics:

Module-1

Fire Environment - Weather

- Weather is the most variable component of the fire environment.
- Weather elements can change rapidly due to changes in air masses, the diurnal cycle (night-times to daytime), and local influences such as topography.
- Also, conditions change spatially, so you may not experience the same weather at different locations on a fire. The weather elements that influence fire behavior are:

- Temperature
- Relative humidity
- Atmospheric stability
- Wind speed and direction
- Local winds
- Precipitation
- Topographical Factors
- Australian Air-masses
- Thunderstorms and Lightning

Module Objectives

- Identify and describe the characteristics of fuels, weather, and topography that influence wildland fire behavior.
- Describe the interaction of fuels, weather, and topography on wildland fire behavior, fireline tactics, and safety.
- Describe the causes of extreme wildland fire behavior (long-range spotting, crowning, and firewhirls) developing due to fuels, weather, and/or topography.
- Interpret, apply, and document wildland fire behavior and weather information

Module Goal

The goal of this course is to provide a better basis for analysing fire environment variables and understanding how they interact and affect wildland fire behavior for firefighter safety.

Module-2

Introduction to Wildland Fire Behavior.

Module Objectives:

- Identify and discuss the three sides of the fire triangle.
- Identify the environmental factors of wildland fire behavior that affect the start and spread of wildland fire.
- Recognize situations that indicate problem or extreme wildland fire behavior

Module Objectives:

- Describe the fire triangle
- Identify three methods of heat transfer
- List the three environment. elements affecting fire behavior.
- List three fuel factors that affect wildland fire.
- List 3 weather factors that affect fuel moisture
- Describe how wind affects wildland fire spread
- Describe the effect of slope on wildland fire spread 4 topographic factors that affect wildland fire behavior
- Describe the dangerous conditions can develop in a box canyon & steep narrow canyon.

Extreme Fire Behavior



Extreme Fire Behavior

- Extreme fire behavior results when several of the components of the fire environment interact to cause the rate of spread of the fire to increase by 60 times or greater.
- Situations in which abundant fuels with sufficiently low moisture values are located on a steep slope and combine with strong winds and unstable atmospheric conditions can lead to extreme fire behavior.
- Each of the conditions can potentially increase fire behavior, so when all of these conditions occur at the same time, the potential danger increases significantly.
- Extreme fire behavior is generally defined as fire behavior that often precludes methods of direct fire suppression, and usually involves one or more of the following characteristics:
 - High rate of spread and frontal fire intensity
 - Crowning
 - Prolific spotting
 - Presence of large fire whirls
 - Well-established convective column
- Fires exhibiting such phenomena often influence the surrounding environment and create dangerous conditions. Other terms used to describe extreme fire behaviour include "blow-up", "fire storm", "flare-up" and "fire behaviour in the third dimension".

This module provides information about extreme fire behavior.

At the end of this module, you should be able to:

- Describe the four common denominators of fire behavior on wild-land fires.
- Describe extreme fire behavior characteristics and recognize fire environment influences that contribute to extreme fire behavior.
- Describe the three stages of crown fire development and identify the key factors and indicators leading to crown fire development.
- Identify the three factors that contribute to the spotting problem and describe the conditions associated with each factor.
- Define the probability of ignition, describe its use, and determine it using tables.
- Define fire whirls (vortices), the conditions under which they are likely to develop, and their implications to wildland fire behavior.
- Explain the difference between wind-driven and plume-dominated fires