

## Fire Danger Rating, 2009

### Abstract

Fire danger rating is the process of systematically evaluating and integrating the factors that determine the ease of a fire starting and spreading, the difficulty of control, and the resulting impacts based on an assessment of ignition risk, the fire environment (fuels, weather, and topography) and values at risk.

The familiar colour-coded fire danger signs seen in forested areas across Canada provide the public with an easily understood indicator of the risk of fire, from blue for low through to red for extreme hazard.



**Figure 1.** Fire Danger Indicator Road Sign Used in Whitehorse, Yukon

**Source:** Canadian Forest Service, Natural Resources Canada.

The Canadian Forest Fire Danger Rating System, developed by Natural Resources Canada's Canadian Forest Service (Table 1), is used across Canada for assessing fire danger. This system consists of several subsystems, two of which have been used by fire management agencies for a number of years. They are the Fire Weather Index System and the Fire Behavior Prediction System. Two other subsystems are still under development: the Fire Occurrence Prediction System, which relates to the risks of fire, and the Accessory Fuel Moisture System, which relates to weather.

Table 1. Fire Danger Classifications

LOW	New fires are not likely to start. If started, they spread very slowly or may go out on their own (existing fires may continue to smoulder if burning in deep, dry fuel layers).
MODERATE	Creeping or gentle surface fires can start but are easily controlled by ground crews.

HIGH	Vigorous surface fires can start and will require heavy equipment for containment.
VERY HIGH	Intense surface fires and developing tree crown fires can readily occur and will challenge fire suppression forces, which will need to attack the fires with air tankers and water bombers.
EXTREME	Burning conditions are considered explosive, and attempts to control the fast-spreading, high-intensity fires will not be possible until the severity of the situation diminishes.
NIL	No calculations were performed for this region due to snow cover, cold weather or lack of combustible material.
<b>Source</b> : Canadian Forest Service, Natural Resources Canada.	

## Fire Weather Index System

The Fire Weather Index System provides estimates of fire danger based on a continuous record of weather observations taken daily at noon. The continuity of the record is required to track the moisture content of fuels (combustible material). Moisture content is estimated for fine fuels (twigs, leaves and needle litter), duff (loosely compacted organic layers of moderate depth) and drought (deep, compact organic layers). Temperature, relative humidity, wind speed and rainfall are inputs to the system. Wind speed and temperature directly influence a fire the most; however, rainfall is most important in determining fuel moisture. Frequently, the current weather conditions are not a good indicator of the fire hazard. For example, the hazard would be much higher on a hot, windy day after a week of dry weather than it would be on a similar day after a week of rain.

## Fire Behavior Prediction System

The Fire Behavior Prediction System uses fuel type and terrain (elevation, slope and aspect) data, along with outputs from the weather-based Fire Weather Index System, to make predictions of fire spread rate, fuel consumption and fire intensity. Unlike the codes and indices of the Fire Weather Index System, these predictions are quantitative (that is, they are measurable quantities). For example, the spread rate is in metres per minute. The system uses 16 different fuel types, which are distinguished by characteristics of the vegetation and forest floor. Fire behavior is strongly influenced by the size and arrangement of fuels. For example, fine fuels, such as needles and twigs, ignite more readily than heavy fuels, such as tree trunks.

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## Map Sources

### Fire Danger Rating



The Forest Fire Danger Rating map provides estimates of fire danger based on a continuous record of weather observations taken daily at noon, fuel type and terrain data. The fire danger rating in this map is based on the Fire Weather Index (FWI), an indicator of the predicted fire intensity. The Fire Weather Index is a component of the Canadian Forest Fire Weather Index System. It is a numeric rating of fire intensity. It is suitable as a general index of fire danger throughout the forested areas of Canada. (More information about these data is available on the Canadian Wildland Fire Information System website listed here in the Web Sites section of References and Links)

## References

Lee, B.S.; Alexander, M.E.; Hawkes, B.C.; Lynham, T.J.; Stocks, B.J.; Englefield, P. 2002. Information systems in support of wildland fire management decision making in Canada. *Computers and Electronics in Agriculture* 37: 185-198. (This publication can be downloaded from the Canadian Wildland Fire Information System website - listed in the Web Sites section)

Parisien, M.-A.; Peters, V.S.; Wang, Y.; Little, J.M.; Bosch, E.M.; Stocks, B.J. 2006. Spatial patterns of forest fires in Canada, 1980-1999. *International Journal of Wildland Fire* 15(3): 361-374.

Stocks, B.J.; Mason, J.A.; Todd, J.B.; Bosch, E.M.; Wotton, B.M.; Amiro, B.D.; Flannigan, M.D.; Hirsch, K.G.; Logan, K.A.; Martell, D.L.; Skinner, W.R. 2002. Large forest fires in Canada, 1959-1997. *Journal of Geophysical Research* (107,8149,doi:10.1029/2001 JD000484).

Taylor, S.W.; Alexander, M.E. 2006. Science, technology and human factors in fire danger rating: The Canadian experience. *International Journal of Wildland Fire* 15: 121-135.

## Related Web sites (1999 – 2009)

### Federal Government

Natural Resources Canada. Canadian Forest Service. Canadian Wildland Fire Information System

[http://cwfis.cfs.nrcan.gc.ca/en/index\\_e.php](http://cwfis.cfs.nrcan.gc.ca/en/index_e.php)

The Canadian Wildland Fire Information System creates daily fire weather and fire behavior maps year-round and hot spot maps throughout the forest fire season, generally between May and September.



Natural Resources Canada. Canadian Forest Service. Research: Forest Fires  
<http://cfs.nrcan.gc.ca/forestresearch/subjects/fire>

Public Safety Canada. Is your family prepared?  
<http://www.getprepared.gc.ca/index-eng.aspx>

## **Provincial/Territorial Government**

Government of British Columbia. Ministry of Forests. Protection Branch  
<http://www.for.gov.bc.ca/protect/>

Société de protection des forêts contre le feu  
[http://www.sopfeu.qc.ca/index\\_en.php](http://www.sopfeu.qc.ca/index_en.php)

The Société de protection des forêts contre le feu (SOPFEU) is mandated to prevent, detect and suppress forest fires in Québec.

## **Inter-agency**

The Canadian Interagency Forest Fire Centre  
<http://www.cifffc.ca/>

The Canadian Interagency Forest Fire Centre (CIFFC) provides operational fire-control services, as well as management and information services to its Member Agencies.

