



Coastal Fire Centre

hot topics in Wildfire on the Coast

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Wildfire news

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Fire behaviour and the burning day

The “burning day” is that part of a 24-hour period in which fire activity is highest and a fire’s spread is generally fastest. In most of Canada, this period is from about 10:00 a.m. to 6:00 p.m. local time, depending on the time of year, the latitude of the fire’s location, and other factors.

In the Northwest Territories and Yukon, the burning day often extends several hours into the evening, due to the extended period of daylight. However, even in areas where there are 24 hours of daylight, the temperature will eventually fall in the evening as the effect of daytime heating diminishes. This allows relative humidity in the area to recover, prompting a decrease in fire activity.

Fire behaviour can increase during the burning day for a variety of reasons:

Temperature:

- During the day, heat from the sun can increase the temperature of forest fuels (combustible materials) and allow them to burn more easily.
- This effect is particularly prevalent during the core summer months and on days when there is no cloud cover, but even a temperature increase of just a few degrees above nighttime temperatures can increase fire behaviour.

Relative humidity:

- Relative humidity (a measure of how much water vapour is present in the air) is closely linked to — and affected by — temperature. During the day, the relative humidity decreases as the temperature increases.
- High relative humidity is associated with decreased fire behaviour, while low relative humidity is associated with increased fire behaviour.
- The lower the relative humidity, the more potential there will be for a “crossover” situation to occur. Crossover is when the relative humidity (measured as a

percentage) is lower than the temperature (in degrees Celsius). When crossover occurs, particularly when the temperature is higher than 30° C and the relative humidity is lower than 30%, there is a greater potential for fire behaviour to increase.

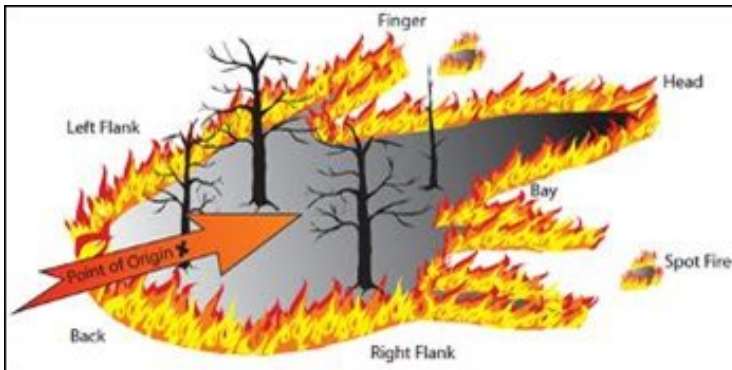
Wind:

- Wind is the single most important weather factor that influences fire behaviour.
- Wind activity can vary greatly, based on: weather systems; the time of day; and whether the wildfire is severe enough to significantly influence the air masses surrounding it.
- The speed of winds associated with a weather system can increase at any time, including at night and outside of the burning day. However, it’s common for wind speed to increase in the afternoon during the burning day, and winds are often stronger during the day than they are at night. Winds associated with daytime heating are due to pockets of air being heated at different rates, which create local wind patterns.
- The topography of an area can also influence wind during the day differently than it does at night. In mountainous terrain, for instance, wind tends to blow upslope during the day and downslope at night.
- In the absence of wind, a wildfire burning on a mountainside will “pre-heat” the fuels located directly above it on the mountainside, since flames extend straight up but the mountain is sloped. When an upslope wind is added to the situation, that wind will drive the fire up the hill and pre-heat the fuels ahead of the flame front even more.
- Any rise in wind speed or a change in wind direction can increase fire behaviour.
- In coastal areas, outflow winds can extend the burning day into the overnight hours.

Fire behaviour and the burning day cont.

Because the burning day in this province typically begins at about 10:00 a.m., the BC Wildfire Service's approach to fire suppression is that every effort will be made to control wildfires by 10:00 a.m. on the day after the wildfire is discovered. This is called "the 10:00 a.m. concept" and illustrates why it's imperative to detect wildfires as early as possible.

By carefully monitoring forest and weather conditions, and preparing firefighting resources accordingly, about 94% of all wildfires that display Rank 1 to Rank 4 fire behaviour in B.C. are contained by 10:00 a.m. on the day following their discovery. More information about ranking fire behaviour can be found on Page 4.



Parts of a forest fire

The anatomical parts of a forest fire are:

Pocket(s) or Bay(s) — A marked indentation in the fire perimeter, usually located between two fingers.

Finger(s) — An elongated burned area(s) projecting from the main body of the fire resulting in an irregular fire perimeter.

Flanks — Those portions of the fire perimeter that are between the head and the back of the fire which are roughly parallel to the main direction of spread.

Head — That portion of the fire perimeter having the greatest rate of spread and frontal fire intensity which is generally on the downwind and/or upslope part of the fire.

Back, Base or Heel — That portion of the fire perimeter opposite the head; the slowest spreading part of the fire.

Island(s) — Area(s) of unburned fuels located within the fire perimeter.

Point of Origin — The location within the fire perimeter where ignition first occurred.

Fire intensity: energy released

In previous issues of *Wildfire News* this year, we've discussed the Canadian Forest Fire Danger Rating System (CFFDRS). The BC Wildfire Services uses this system to analyze weather data as it relates to wildfire and to make predictions about the likelihood of wildfires starting in a given area (and how they will behave if they do start).

The Fire Behaviour Prediction System is a component of the Canadian Forest Fire Danger Rating System. One of the Fire Behaviour Prediction System's outputs is "fire intensity", measured in kilowatts per metre. Fire intensity is a measure of the amount of energy released while a fire is burning. By predicting the intensity of a particular fire, the B.C. Wildfire Service can also predict how rapidly that fire will consume fuel and get an indication of its potential fire behaviour. This information allows firefighters to choose the most suitable firefighting tactics and also make appropriate plans to keep workers safe.

The Canadian Forest Fire Danger Rating System allows calculations of fire intensity to be made for both the head of the fire and for the back of the fire (see diagram showing the different parts of a fire on this page). The head fire intensity gives firefighters an indication of the most extreme kind of fire behaviour they could expect to see and allows them to plan their suppression tactics accordingly. Even if work is planned on the back or flanks of a fire, the head fire intensity should be taken into account, since (depending on the level of containment, weather conditions and other factors) a shift in wind patterns could quickly turn a flank of the fire into its head (the leading edge of the fire).

Fire intensity: energy released cont.

In order to easily compare different fires and make comparisons over time, the Canadian Forest Fire Danger Rating System uses six classes of fire intensity. Intensity Class 1 is the least intense and Intensity Class 6 is the most intense.

Intensity Class	Fire intensity (kilowatts per metre)	Typical fire attributes
1	less than 10	Fire starts are not likely to sustain themselves; control is easily achieved
2	10-500	Fuels are receptive to sustain ignition; fire is relatively easy to control
3	500-2000	Control is more difficult, heavy equipment can be effective
4	2000-4000	Direct attack* is ineffective; intermittent crowning** and short range spotting*** can occur
5	4000-10,000	Control is extremely difficult; moderate range spotting can occur
6	more than 10,000	Serious control difficulties and extreme fire behaviour; long-range spotting can occur

* **Direct attack** is a suppression tactic that includes constructing containment lines directly adjacent to the fire perimeter.

** **Crowning** refers to the movement of a fire through the crowns (tops) of trees.

*** **Spotting** refers to embers or chunks of burning material exiting the fire perimeter and starting new fires.

The intensity class of a fire is calculated by considering factors such as the Build-Up Index (BUI), Initial Spread Index (ISI) and fuel type.

We discussed the Build-Up Index in the July 6 edition of *Wildfire News*. It's calculated by considering the moisture content in fuels with a diameter greater than two centimetres and in organic material in the soil at depths over two centimetres. The Build-Up Index indicates how much those fuels could burn in the fire.

The Initial Spread Index indicates how the fire will spread immediately after ignition. This index is composed of the Fine Fuel Moisture Code (which we covered in detail in the June 22 issue of *Wildfire News*) and the effective wind speed. The Fine Fuel Moisture Code represents the amount of moisture in small fuels and those up to two centimetres deep in the earth. The effective wind speed is a measure of the wind that also takes the slope of the terrain into account.

An emergency notification system on Bowyer Island

Bowyer Island is a small island near Lions Bay, B.C., north of Vancouver. A few years ago, a resident of an 18-unit cabin community discovered a small wildfire and had great difficulty contacting other people to ask for help, even though it was the middle of summer and many other residents were at their cabins.

Since then, this cabin community has implemented a notification system that uses air horns, a wind-up siren and cell-phones. Now, if emergency assistance is needed in a remote area where sound doesn't travel well (such as in a forest), residents can attract the attention of others.

Richard Bland is the fire marshal for the Bowyer Island cabin community. He feels that their cellphone emergency group notification system is important to the area's residents, who can use it for all types of emergencies. It could be a good solution for other small communities that have cellphone service.

Flame development and spread

When wildfires start, the initial flame length is usually short and the fire will initially spread slowly from the point of origin. Depending on conditions, the flames may remain small, the fire may continue to move slowly, and it may only be capable of consuming small fuels. The fire could also go out on its own.

If conditions are conducive to burning, however, the length of the initial small flames may rapidly increase, with the fire spreading and consuming fuel more quickly. If the fire started as a surface fire, the larger flames allow the fire to start spreading into trees and eventually become a crown fire (where the uppermost part of the tree is on fire). The most intense fires are those that involve entire trees, as well as surface and subsurface fuels.

When communicating with the wildfire co-ordination centre, firefighters use the Fire Intensity Rank System to paint a picture of the kind of fire they are seeing.

Although the Fire Intensity Rank System and the Intensity Class sound similar, they serve two distinct functions for describing the attributes of wildfires.

In the rankings below, an organized flame front refers to the head of a fire that is burning consistently along its length. A disorganized flame front or disorganized crown involvement refers to a fire that is burning differently at different points along the head or only occasionally reaching up into the crowns of trees.

Rank 1: no open flame, white smoke, smouldering ground fire

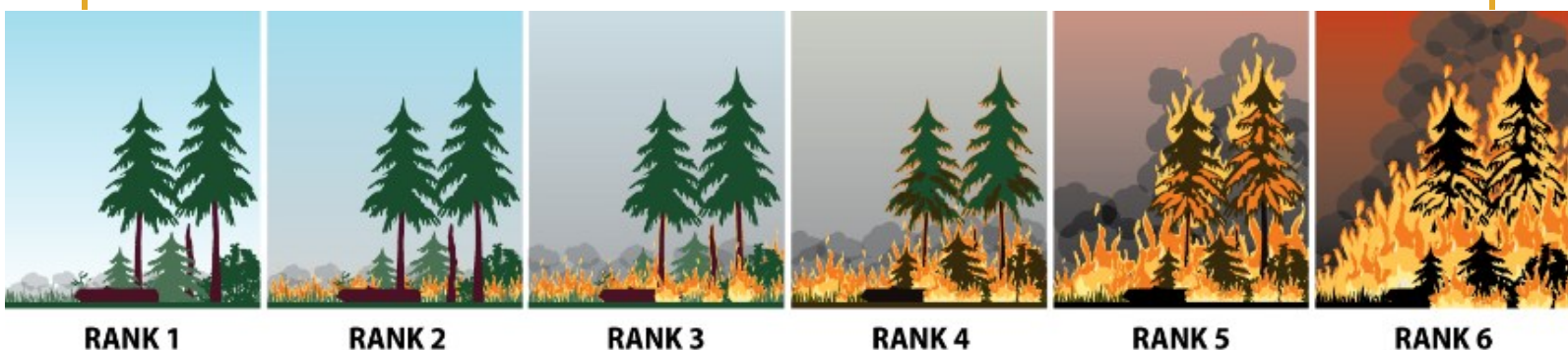
Rank 2: visible open flame, white smoke, surface fire only

Rank 3: organized surface flame front, white to grey smoke, vigorous surface fire with a moderate rate of spread

Rank 4: organized surface flame front, disorganized crown involvement, grey to black smoke, moderate to fast rate of spread, short to moderate range spotting

Rank 5: organized crown fire front, copper to black smoke, moderate to long range spotting, independent spot fire growth

Rank 6: organized crown fire front, copper to black smoke, moderate to long range spotting, independent spot fire growth, presence of fire balls and fire whirls



RANK 1

RANK 2

RANK 3

RANK 4

RANK 5

RANK 6

Fire spread: ember storms

Phenomena known as “ember storms” can cause fires to grow very quickly. During an ember storm, a large number of embers become airborne and are carried by winds generated in the atmosphere or by the fire itself. In some cases, wind can carry these embers a great distance into areas containing unburned fuel.

Ember storms can start new fires well ahead of the main fire. They may burn as new, independent “spot fires” or they may later merge with the main fire and fuel its growth.

Ember storms can contribute to rapid wildfire growth because they introduce sparks to an area of unburned fuel. Depending on site and weather conditions, an ember could start a fire that then spreads into areas of unburned fuel that the main fire couldn’t reach, due to a natural barrier (such as a river) or a constructed fire control line.

Most wildfires that the B.C. Wildfire Service responds to do not create ember storms. That scenario requires a unique set of conditions that include a certain level of fire behaviour and air movement, whether through atmospheric wind or air movement generated by the fire itself.

The link below is to a video that shows an ember storm that occurred during the Horse Lake wildfire in Alberta in 2016. This wildfire resulted in large-scale evacuations and impacted structures in Fort McMurray. The ember storm lasts from approximately 1:20-1:50 in this video. <https://www.youtube.com/watch?v=aC2iPvXAggM>

Stages of Control

2017 Season Onwards	Definition of New Stage of Control
Out of Control	Describes a wildfire that is not responding (or only responding on a limited basis) to suppression action, such that the perimeter spread is not being contained.
Being Held	Indicates that (with the resources currently committed to the fire) sufficient suppression action has been taken that the fire is not likely to spread beyond existing or pre-determined boundaries under the prevailing and forecasted conditions.
Under Control	The fire has received sufficient suppression action to ensure no further spread of the fire.
Out	The fire has been extinguished.

Report Wildfires
Call *5555 or
1 800 663-5555

Report wildfires and open burning violations to one of the above numbers. For the latest information on current wildfire activity, burning restrictions, road closures and air quality advisories, go to bcwildfire.ca

Fires to Date

Total 94

Lightning 29

Person 64

Number of fires since last Newsletter (July 6)

Total 15

Lightning 7

Person 8

Fire Danger Rating today



To see a map of the fire danger rating across B.C., visit gov.bc.ca/wildfiredanger

Wildfire news

Coastal Fire Centre

Open fires prohibited in the Coastal Fire Centre



As of noon on Wednesday, July 18, 2018, all open burning (including campfires, Category 2 and Category 3 fires) are prohibited within the Coastal Fire Centre's jurisdiction, with the exception of Haida Gwaii and the area known as the "Fog Zone" (<http://ow.ly/bCJc30calul>). A map of the affected areas is available online at: <http://ow.ly/j94230kZQgz>.

The following activities are also prohibited:

- open fires that burn woody debris in outdoor stoves

- the use of stoves and other portable campfire apparatuses that are not CSA-approved or ULC-approved
- the use of tiki torches, fireworks, fire-crackers, sky lanterns, chimineas, burning barrels or burning cages of any size or description
- the use of binary exploding targets (e.g. for rifle target practice)

The prohibitions apply to all public and private land unless specified otherwise, for example in a local government bylaw. Please check with local government authorities for any other restrictions before lighting any fire. These prohibitions will and remain in effect until Oct. 19, 2018, or until the public is otherwise notified.

Weather

ISSUED: July 20 12:00

SYNOPSIS: A drier westerly flow means much of the Island will see mainly sunny skies and warmer & drier conditions than previously expected. Meanwhile, limited moisture and a more unstable atmosphere should lead to a mix of sun and cloud for much of the Sunshine Coast, Pemberton, and Fraser zones this afternoon with isolated convective showers and a risk of the odd thunderstorm (favouring Pemberton & northern Fraser zone).

Progressively cooler & wetter conditions should be seen in the Mid Coast, especially north of Highway 20. Occasional rain or light rain should continue into the night in and around Tweedsmuir Park with a few isolated showers potentially lingering over eastern sections of mainland to the south. Good recoveries in all areas & elevations by Saturday morning with patchy fog and low cloud to start the day in parts of the north & west. The upper low moves off into Alberta by Saturday but a trailing upper trough should maintain generally cooler & cloudier

conditions over much of the Fraser zone and southern & eastern reaches of the Pemberton zone with isolated showers favouring (but not limited to) higher terrain. Meanwhile, a drier northerly flow developing over the Island, Sunshine Coast, Mid Coast and Haida Gwaii should bring sunnier skies with temperatures rebounding to or slightly above seasonal normals.

OUTLOOK: Temperatures by Sunday afternoon reach the high twenties to low thirties throughout the warmer sections of the Island and Mainland with humidities dipping below 25% in spots. Light outflow should continue through at least Sunday night and potentially through Monday night as well to bring hotter temperatures and low or very low humidities to all zones Monday and Tuesday afternoons. Winds should remain generally light each afternoon.