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How forest fires can start, spread and move into the Wildland-Urban Interface

In the June 22 issue of the *Wildfire News*, we looked at how wildfires can start. (Essentially, enough heat must reach organic material that is dry enough to catch fire.)

The Fine Fuel Moisture Code is part of the Canadian Forest Fire Danger Rating System (CFFDRS). It is a measure of the moisture content of small forest fuels (such as dried grass and twigs) and of organic material in the top two centimetres of earth and is an indicator of how likely it is for a fire to start.

Many factors can dictate how a fire spreads once it has started. These include Canadian Forest Fire Danger Rating System variables such as: the moisture content of larger fuels and those located deeper underground (the Duff Moisture Code and the Drought Code); weather conditions; fuel types; and topography.

In order for a fire to spread to other forest fuels or to structures, there must be a large enough transfer of heat to ignite the unburned fuel. There are three ways for this to occur in a wildfire situation:

1. Wildfire spreads directly into adjacent fuel or into flammable parts of adjacent structure

When wildfires spread through a forest, how they spread depends partly on the horizontal and vertical spacing of fuels. Horizontal spacing indicates how “continuous” or “patchy” flammable materials (fuels) are in the area. A wildfire will be able to move more easily through a continuous stand of trees, as opposed to an area in which fuels are broken up by rocky terrain.

Vertical spacing refers to the distances between surface fuels and fuels above ground level. The term “ladder fuels” describes fuels that can help a fire spread from the ground up to the crown of a tree (the uppermost part) and can include tree branches, shrubs and bushes.

Fires that start on the ground can become crown fires more easily when tightly spaced ladder fuels are present. For instance, it is generally easier for a ground fire to become a crown fire in a thick spruce forest (since spruce trees have tightly spaced branches) than it is for a ground fire to become a crown fire in a Douglas fir forest, where there are fewer low-hanging branches on mature trees and the branches have fewer needles and are not as tightly spaced.

The same principle applies in situations where a wildfire spreads directly to a structure such as a residence or an outbuilding. The fire may be able to spread right up to the structure by burning through tall, dry grass and then directly ignite flammable siding or wooden lattices that are sometimes used to block off spaces under porches.



Top: An example of patchy horizontal spacing. Fuels (trees) are interspersed with large areas of rock.

Bottom: An example of continuous horizontal spacing.

How forest fires can start, spread & move into the Wildland-Urban Interface cont.

2. The wildfire emits embers or chunks of burning material that are carried into new areas of unburned fuel

Burning embers or other flaming material from a wildfire can be carried by the wind to start new spot fires in areas of unburned fuel. It's quite common for burning embers that are thrown ahead of the leading edge of the fire (the "flame front") to allow wildfires to "jump" fuel-free barriers such as highways or bodies of water.

It's often not the actual flames crossing the barrier that starts a new fire in an area of unburned fuel (although that can happen), but rather an ember. The wind can carry embers a long distance and they can maintain enough heat to ignite flammable material when they land. It's not uncommon for embers to travel up to two kilometres from the main wildfire. Embers can ignite structures in a number of ways. For example, they can ignite leaf litter or other organic material that's accumulated on roofs or in gutters, or they can enter open eaves or vents.

3. The wildfire ignites nearby fuel or structures through a transfer of radiant heat

Wildfires can produce an extraordinary amount of heat that is capable of igniting other flammable material nearby, without the flame front directly spreading into that fuel and without embers igniting it.

Radiant heat from a wildfire can melt vinyl siding, ignite structures and even break windows. This type of extreme heat can originate from flames that are up to 30 metres away from the structure.

<p>HOW WILDFIRES SPREAD</p>	<p>SPARKS/EMBERS</p> <p>This is the burning debris that can be thrown up to two kilometres ahead of a wildfire. Sparks and embers can ignite materials on or near your home, causing severe damage.</p>	<p>EXTREME HEAT</p> <p>Radiant heat from a wildfire can melt vinyl siding, ignite your home and even break windows. Extreme heat can come from flames within 30 metres of your home.</p>	<p>DIRECT FLAME</p> <p>As wildfires spread toward homes, they ignite other flammable objects in their path. Breaks in this path, especially close to your home, can help reduce this threat.</p>
<p>The illustration depicts a wildfire spreading towards a residential area. On the left, a house is shown with sparks and embers being carried by the wind towards it. In the center, a house is shown with arrows indicating radiant heat from a nearby fire. On the right, a house is shown with a direct flame front approaching it. The background features trees and a fire front moving from left to right.</p>			

Understanding how a wildfire can spread through a forested area into an area containing structures can be helpful when you're considering how to apply FireSmart principles to your home. If you don't have wood piles or trees within 10 metres of your home, for example, the chances of a fire spreading directly to your house may be lower. However, if your roof is made of cedar shakes and your gutters are full of leaf litter, the chances of an ember from a wildfire igniting your home could still be quite high. Using FireSmart principles to help protect your home can take time, but many of FireSmart activities are easy to start and cost little or nothing to complete.

When a wildfire enters an area that has a high structure density (e.g. a residential neighbourhood where homes are closer together), the fire can spread in different ways and create different concerns. In those situations, structural firefighters (not wildland firefighters) are the experts. A fire can spread easily in such areas, particularly if FireSmart principles have not been applied to help protect those structures.

Depending on the type of structures and how the land is used in that area, there may be explosive materials present. They can make the situation more volatile and dangerous, and increase the potential for a fire to spread between structures in that area.

For more information about the FireSmart program, visit gov.bc.ca/FireSmart or check out the FireSmart Canada website at www.firesmartcanada.ca

What else can be prohibited along with open fires?

If you take a look at the “current bans and restrictions” section of the “Fire Bans and Restrictions” page of the BC Wildfire Service website (gov.bc.ca/wildfirebans), you’ll notice that the information is organized into three categories: open fires; campfires; and forest use. Although restrictions on open fire use and campfire use often feature prominently in news stories when an open burning prohibition is implemented, it’s important to realize that other activities are also prohibited when campfires and Category 2 open fires are prohibited.

When **campfires** are prohibited, the following are also prohibited:

- chimineas
- tiki torches
- stoves and other portable campfire apparatuses that are not ULC-approved or CSA-approved

When **Category 2 open burning** is prohibited, the following are also prohibited:

- burn barrels
- burn cages
- fireworks (including firecrackers)
- air curtain burners
- sky lanterns
- exploding binary targets

When **Category 3 open burning** is prohibited, no other activities are typically prohibited.

Whether a particular activity is prohibited when Category 2 fires or campfires are restricted depends on its potential to start a wildfire. As discussed in the June 22 issue of *Wildfire News*, the ability of a given heat source to start a wildfire depends on the moisture content of forest fuels.

Activities that are prohibited when Category 2 open burning is restricted have a similar potential to start a wildfire. Burn barrels and burn cages consume a significant amount of material at one time and have the potential to emit embers into surrounding fuels. Air curtain burners use high-velocity air to reduce the possibility of embers escaping, but they also burn large amounts of material and produce a significant amount of heat.

Fireworks, sky lanterns and exploding binary targets are concerns when Category 2 open burning is restricted because the user has little to no control over where the heat source goes or what kind of material it may contact. In the case of fireworks and sky lanterns, the user often does not know where the firework or sky lantern ends up, and therefore has no way of knowing if it starts a wildfire.

The risk of a chiminea, tiki torch or stove that is not ULC-approved or CSA-approved starting a wildfire is lower than the risk posed by activities prohibited when Category 2 open fires are restricted. That’s because they’re not released or set off in an uncontrollable way and because they produce less heat than burn barrels, burn cages and air curtain burners.

Senior BC Wildfire Service staff are authorized to use their discretion when implementing prohibitions and may choose to alter the list of prohibited activities if there is justification to do so. This is why it is important to always read the information at gov.bc.ca/wildfirebans to ensure that you understand exactly what is prohibited in your area.

Lightning and Holdover Fires

There is a risk of lightning this weekend for all zones in the Coastal Fire Centre. There is a good chance it will come with precipitation and next week is forecasted to mark the beginning of a period of warm, dry weather. Conditions like these come with a high probability for holdover fires. Holdover fires are fires that start but smoulder in an undetectable way until conditions improve and fuel dries out. The Coastal Fire Centre will be conducting air patrols early next week to look for holdover fires.

The Build-Up Index: a more effective tool for making decisions about open burning prohibitions

In the past, BC Wildfire Service staff used Danger Class Ratings as indicators of forest conditions when deciding whether to implement open burning prohibitions. While the Danger Class Rating provides valuable information, BC Wildfire Service staff recognized that the criteria used to calculate the Danger Class Rating can change rapidly and can fluctuate on a daily basis, depending on local weather conditions (the wind and relative humidity in particular).

In 2017, a BC Wildfire Service task team looked at alternatives to Danger Class Ratings to help guide decisions about prohibitions and determine when best to implement them. Like the Danger Class Rating, the Build-Up Index (BUI) is a code calculated by using the Canadian Forest Fire Danger Rating System. However, the BUI doesn't fluctuate as much as the Danger Class Rating, which helps make prohibition decisions easier. It is also based on information about fuel types and the amount of fuel available for burning, which align more closely with fire behaviour predictions.

The main reasons why the Build-Up Index was selected as an indicator include the following:

- It's a solid indicator of seasonal drought conditions.
- It's calculated from weather station readings and is monitored daily.
- It takes into account the extended effect that weather conditions can have on an area.
- It provides a more stable timeframe for making prohibition decisions.

During trials conducted in 2017 (when the Build-Up Index was considered in conjunction with the Danger Class Rating), the task team found that the Build-Up Index was a more effective indicator for deciding when to implement or rescind open burning prohibitions.

BC Wildfire Service staff who decide when and where open burning prohibitions should be implemented consider a variety of factors in addition to the Build-Up Index (including current and forecasted wildfire activity) before making those decisions.

More on some of the devices prohibited with Category 2 open fires and campfires

Sky Lanterns

A sky lantern also known as a Chinese lantern, is a small hot air balloon made of paper, with an opening at the bottom where a small fire is suspended. It is a floating open flame. These devices are 17-18 inches wide by 30 inches high in size or larger.

When a Category 2 prohibition is enacted it will often include sky lanterns as they can not be controlled or put out easily once released.

Sky lanterns have already been banned in Nova Scotia, Newfoundland, Prince Edward Island and in several municipalities across the country.



Tiki Torches

If you think about how a tiki torch is constructed you will likely agree that during an open fire prohibition having an open flame on a top-heavy structure is probably not conducive to fire safety, particularly when they are marketed for party use.

Tiki torches produce an open flame and are generally included in a campfire prohibition.



Chimineas

Chimineas are devices Information Officers are often asked about.

The first question—what does it burn?

If the answer to the first question is wood, and a campfire prohibition is in place, then use of the device is also prohibited. Burning wood, including wood pellets, during a campfire prohibition is not allowed. Chimineas are generally not ULC or CSA approved and therefore, can not be used to burn charcoal during a campfire prohibition either.



The B.C. Wildfire Service's Forest Fire Reporting Centre

The BC Wildfire Service relies on members of the public reporting wildfires by calling 1 800 663-5555 or *5555 on a cellphone. These calls are answered by BC Wildfire Service staff who ask a series of questions about the fire.

Anyone reporting a fire or smoke can expect the following questions:

- How big is the fire? (If the caller is unsure, the Reporting Centre will ask them to compare it to the size of a campfire, a house or a football field (or larger).)
- What is burning? (People may report that “the forest is on fire”, but it is useful for BC Wildfire Service staff to know more about the type of fuel that the fire is burning, such as grass, brush, trees or slash.)
- What colour is the smoke?
- Is the caller aware of any values (such as structures or infrastructure) that are near the fire?
- Where is the fire located? (This can be tricky if the fire is burning in a remote area or if the caller is not familiar with the region. Reporting Centre staff will try to determine the location by asking if the caller knows the name of the closest town, what the closest road intersection is and if identifiable features such as mountains or lakes are nearby.)

Reporting Centre staff will also ask for the caller's name and phone number, and ask whether the caller will be available to receive a phone call for the next 20 minutes in case BC Wildfire Service staff in the fire centre where the fire is located have any further questions.

A typical day for staff at the Provincial Forest Fire Reporting Centre starts by assessing the current fire situation in the province. It's important for them to know which fires the BC Wildfire Service is already aware of, to help determine whether that day's callers are referring to a new fire or a fire that has already been identified.

The staff member then starts recording reports of new wildfires. Depending on the time of year and number of new fires, their work environment can get very busy. Reporting Centre staff operate as a team and work closely with one another to assess new fires as they unfold. When there's a lot of wildfire activity, they gather as much information as they can from the caller as quickly as possible, to keep each phone call short (but still gather all the necessary details).

While speaking to a caller, the staff member fills out an Initial Phone Report form to organize the information in a way that is consistent and easy to read. Staff will then identify the fire centre where the fire is located and send the Initial Phone Report to the dispatch staff at that fire centre. Dispatch staff are responsible for immediately notifying the Regional Wildfire Coordination Officer or a Zone Wildfire Coordination Officer about the Initial Phone Report.

If the wildfire is burning in a remote area, Reporting Centre staff may only receive a couple of reports. However, if it's in a densely populated area, they may receive hundreds of reports about the same fire. They will continue sending reports to the appropriate fire centre until the staff there feel they have enough information about the fire.

BC Wildfire Service staff who work at the Provincial Forest Fire Reporting Centre need to be good at multi-tasking and enjoy working in a fast-paced environment, since they are often dealing with multiple tasks and maintaining situational awareness of what is going on around them in case the situation changes.

People calling in to report a wildfire may be upset, scared or unsure what to do, so Reporting Centre staff also need to be patient and understanding.

Call 1 800 663-5555 or *5555 on a cell phone to report a wildfire

Fires to Date

Total 79

Lightning 22

Person 56

Number of fires since last Newsletter (June 22)

Total 11

Lightning 2

Person 9

Fire Danger Rating today



Current Prohibitions (within BCWS jurisdictional area)

Category 2 open fires are prohibited in the Coastal Fire Centre except in the Haida Gwaii Natural Resource District and the 'Fog Zone.' Also prohibited in this area are: fireworks, firecrackers, sky lanterns, burning barrels or cages and binary exploding targets.

Campfires are still permitted, if small (no larger than 0.5mx0.5m), situated well, attended at all times, and most importantly—put out COLD when you leave the fire site.

For more information, go to www.gov.bc.ca/wildfirebans

Wildfire news

Coastal Fire Centre

The Tugwell Creek Fire (V60998)

The Tugwell Creek fire (V60998) is located 18 kilometres northwest of Sooke, on southern Vancouver Island. It is currently 85 hectares in size and 70% contained. On July 6, 74 firefighters, five officers, five helicopters, six water tenders and four pieces of heavy equipment are on site. Air tankers were on site earlier this week.

The fire is exhibiting Rank 1 fire behaviour on July 6, meaning that it is a smouldering ground fire.

While good progress is being made on this fire, crews are challenged by a lack of natural water sources in the area and are relying on water provided by water tenders. Water tenders are delivering water to large bladders. Crews have set up hose lays from the bladders to deliver water to the fire.

This fire had been estimated to be 100 hectares in size late in the day on July 4. This estimate included some spotting that had occurred and heavy smoke in the area made it difficult to estimate the size accurately. The smoke cleared somewhat on the morning of July 5, and a more accurate size of 84 hectares identified. The rapid fire growth on July 4 was due to the strong, variable winds in the area combined with hot temperatures.

This area of Vancouver Island has been drier and warmer than many other areas in the Coastal Fire Centre. Tomorrow's forecast for the Tugwell Creek area calls for scattered showers and cooler temperatures than those observed earlier this week, which will aid crews in their suppression efforts.

Weather

ISSUED: 11:45 PDT Friday July 6 2018

SYNOPSIS: An upper trough currently centered just offshore brings scattered showers and possible thundershowers to all zones over the next 24 hours as it pushes slowly inland. The majority of the convective shower and thundershower activity should be confined north of roughly Port Alberni – Sechelt – Pemberton this afternoon but there is still a risk of the odd isolated (potentially drier) thunderstorm to the south. With the incoming showers favouring the northern half of the region, expect cooler temperatures and reduced burning conditions this afternoon while the south (Fraser, Pemberton and south end of South Island zones) see another good burning day with above-average temperatures and elevated westerly or southwesterly winds. Bands of scattered showers should reach the south end of the Fraser and South Island zones overnight tonight. Lingering low-level moisture combined with limited bands of moisture within the prevailing southwesterly flow aloft should lead to more cloud than sun throughout the majority of each zone on Saturday with isolated afternoon showers favouring (but not limited to) higher terrain and upslope areas.

OUTLOOK: A general warming and drying trend should be seen in most areas on Sunday with temperatures in the mid to upper twenties in spots while humidities likely remain above 30% in areas where there are currently fires and those that have taken lightning recently. A few inland valleys of the Mainland could see humidities dipping to or slightly below 25% Sunday afternoon. Risk of the odd isolated shower or thunderstorm on Sunday. Generally light inflow/onshore/upslope/upvalley winds should dominate in most areas Sunday afternoon. Light outflow winds could develop Sunday night or Monday morning. The gradual warming and drying trend should continue in most areas on Monday while the next wave of more organized Pacific moisture holds just west of Vancouver Island until after the peak burning period Monday afternoon. This feature should bring increasing cloud and isolated to scattered showers to less than 50% of the region Monday night or early Tuesday before a drier and more stable westerly flow aloft gains control by Tuesday afternoon.