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The fire weather forecast and lightning

When and where lightning strikes occur can be some of the most important elements of a fire weather forecast, depending on forest conditions and the time of year. The term “fire weather” refers to weather conditions that can influence wildfire activity, such as wind, humidity, heat, lightning storms, precipitation, etc.

Lightning develops in response to the dynamics of an unstable atmosphere. Thunderstorms need three things to develop:

- a deep layer of instability in the atmosphere
- sufficient atmospheric moisture
- a trigger to kick off vertical development of lightning activity

Rising and falling rain and hail within a storm cloud can generate a charge of static electricity. When the static charge is strong enough, a spark (lightning) discharges to the ground, to another part of the same cloud, or to another cloud. When lightning discharges to the ground, it has the potential to start a wildfire.

If fire weather forecasters believe there is a threat of lightning, they will use data from a variety of sources to determine the probability of lightning and “dry lightning” occurring, and where lightning strikes are most likely to occur. Sometimes, pattern recognition based on experience can override what the computer models suggest.

Dry lightning is lightning that occurs when no rain reaches the ground, or so little rain reaches the ground that it has no significant effect on the moisture content of forest fuels. The probability of lightning and dry lightning are forecasted separately because they raise different concerns for the BC Wildfire Service.

The rainfall and higher humidity that accompany some lightning events can decrease the chance of a lightning strike starting a wildfire. However, when rain from thunderstorm cells evaporates before hitting the ground, it is called “virga” and results in “dry lightning”. Dry lightning causes many wildfires in B.C. each year. Dry lightning can also occur when the lightning touches down outside of the shaft of rain coming from the bottom of the thunderstorm.

Lightning-caused wildfires in the Coastal Fire Centre

Since April 1, 2018, there have been 153 lightning-caused wildfires in the Coastal Fire Centre. The 10-year average for lightning-caused wildfires at this time of year is 78. The high number of lightning-caused wildfires this year is due to a combination of a high number of lightning strikes and dry conditions in the Coastal Fire Centre.

Fire weather forecast cont.

A dry thunderstorm is potentially more dangerous than a wet thunderstorm, because lightning that strikes the ground has a higher potential to start wildfires. Additionally, the storm's downdraft and outflow winds usually reach the ground, even if precipitation does not. This combination of burning dry fuel and strong, gusty winds can be disastrous.

However, a thunderstorm doesn't have to be dry to cause problems. A storm will often pass through a region without starting a detectable fire, because of the associated rain. However, if conditions are drier in the days following the storm, a "holdover fire" can occur. This is when a lightning strike starts a fire but it goes undetected until hotter, drier and/or windier conditions cause it to flare up.

The lightning prediction component of the fire weather forecast is important because it can help determine the types and number of firefighting resources to make available for fire response and where they should be located.

Environment Canada maintains the Canadian Lightning Danger Map (CLDM). The red areas in this map represent the areas that are at the greatest risk of being struck by lightning in the next 10 minutes. As you can see in the screenshot to the right, there is a chance of lightning in some areas of northern B.C. as of 12:20 on August 31. Check out the map for yourself and make sure to refresh your browser to ensure you have the latest map, as it updates every ten minutes.
https://weather.gc.ca/lightning/index_e.html

When lightning strikes

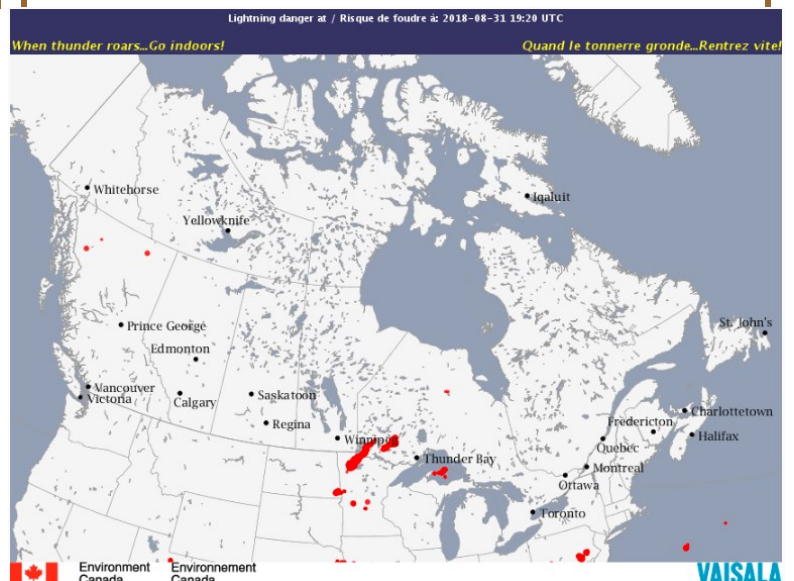
The expertise of fire weather forecasters is vital to help the BC Wildfire Service predict where and when lightning likely will strike. However, no weather forecaster can predict the exact locations where lightning strikes will occur.

The BC Wildfire Service uses data from The Canadian Lightning Detection Network (CLDN), which is provided by Environment Canada. This system consists of a network of direction finders and each direction finder consists of antennas and microcomputers to detect the electromagnetic pulse generated by a lightning strike.

Lightning data is then triangulated and the exact location of the lightning strike can be determined. After the triangulation is completed, the data is sent to a large, mainframe computer. The system can record a lightning strike in just 60 milliseconds.

Fire managers use information from this system to route and schedule air patrols to detect new wildfires and to help determine where to position firefighting resources.

The benefits of using the Canadian Lightning Detection Network include quick detection of new fires and fast initial attacks on those fires, which can help reduce firefighting costs and fire-related damage.



“Lightning alleys” in the Coastal Fire Centre

Most of British Columbia experiences weather that originates over the Pacific Ocean. As these systems hit the coast, they push winds along valleys and over mountains in a relatively predictable way. This activity can create “lightning alleys” in coastal areas.

If low-pressure systems move into southern B.C., the counter-clockwise rotation of the winds around them will direct wind to the east side of the Coast Mountains. If other conditions are favourable, the Coastal Fire Centre may experience lightning in the Fraser Canyon and in the mountains near Pemberton. Instable systems can also travel from the mainland across the Salish Sea and produce lightning along the mountainous spine of Vancouver Island.

If such a low-pressure system moves further north, it can produce lightning storms across the southern end of Vancouver Island and across the Lower Mainland, as it passes from west to east.

Unfortunately, the pattern is often not that straightforward. Processes in the mid-atmosphere and upper atmosphere often override the effects of factors at ground level, such as mountain ranges. The Coastal Fire Centre has experienced several events like this so far this year. Processes in the mid-atmosphere and upper atmosphere also help explain why lightning can strike over water when there are mountain ranges close by. These effects can override lightning’s tendency to strike more often at higher elevations than at sea level.

A fire weather forecaster’s knowledge of these “lightning alleys” (and also recognizing when they won’t follow the usual pattern) can give the BC Wildfire Service a good idea of where lightning is more likely to occur.

The 500 mb chart

During the wildfire season, the BC Wildfire Service’s weather forecasters provide regular weather briefings to staff. Of all the graphics, charts and computer weather models that are commonly used in these briefings, the “500mb chart” is one weather map that will always be part of them.

Air pressure is often measured in millibars (mb) and at sea level, the air pressure is about 1,000 mb. Air pressure decreases as elevation increases, so the point where the air pressure is 500mb is generally between 5,000 and 6,000 metres above sea level. The actual height of the “slice” of the atmosphere featured in the 500mb chart can change from day to day, but the chart usually focuses on what’s happening between 5,000 and 6,000 metres.

Looking at weather maps at that elevation is useful because it’s high enough that mountains don’t interfere with the flow of weather systems, but low enough that it reflects weather conditions that field staff will likely experience on the ground. Ridges and troughs on the 500mb chart can tell us things about the atmosphere at that altitude, plus the relative temperature and stability of the air mass.

The orientation of the contours on this map and the distance between them can indicate wind speed and wind direction. The “570 line” is a special contour line that can provide a good, first-glance assessment of the general weather pattern. Since Pacific storm systems often track parallel to (or close to) the 570 line, areas south of that line on the map are often hotter and drier than areas to the north of it. However, the location of the 570 line is not a guarantee of good weather in those areas south of this line, since other factors can greatly influence the kind of weather that we experience.

If you’d like to learn more about the 500mb chart, watch this video produced by a BC Wildfire Service fire weather forecaster: <https://www.youtube.com/watch?v=c6K87cRUy>

Safe target placement

With the core hunting season right around the corner, we'd like to remind gun users of the wildfire risks associated with target shooting and explain how to mitigate those risks.

- Many bullets today are made with higher proportions of steel or copper than in the past, which can create sparks.
- Regardless of the type of bullet, the hot metal fragments and sparks produced when a gun is fired can cause wildfires.
- To help mitigate this risk, set up your target in an area that does not contain vegetation or woody debris.
- Avoid shooting toward rocks, since sparks can form when a bullet hits them.
- Keep a sharp eye out for any signs that a wildfire has started. Before leaving the area where you were shooting, carefully walk through it and around the target area to ensure that no fires have started that you might not have noticed from where you were shooting. If a fire has started, attempt to extinguish it if practical to do so. Report any wildfire to the BC Wildfire Service by calling 1 800 663-5555 toll-free, or *5555 on a cellphone.

Binary exploding targets are homemade or commercially pre-packaged explosives that are used for firearms practice. They enable a shooter to see from a distance when the target has been hit. If a binary exploding target falls into dry grass, logging slash or other flammable material, it can start a wildfire.

Binary exploding targets can pose a significant wildfire risk, so their use is banned whenever a Category 2 open burning prohibition is in effect. People wishing to use binary exploding targets must first check that their use is not prohibited in the region where they're shooting. As of August 31, 2018, the Coastal Fire Centre's current prohibitions include a prohibition on using binary exploding targets.

Off road vehicles and hunting

The start of hunting season can see more off-road vehicles, such as all-terrain vehicles (ATVs), driven into forested areas. If you're using an off-road vehicle, avoid driving or parking in tall, dry grass and other fine fuels. Hot parts of the vehicle can easily spark a wildfire if conditions are right and they come in contact with dry fuels.

Off-road vehicles can also cause wildfires by generating sparks. By law, all off-road vehicles must have a spark arrestor installed to reduce the possibility of a spark from an exhaust system landing in forest fuels.

ALL-TERRAIN VEHICLES CAN CAUSE WILDFIRES

- RESPECT THE FOREST**
Being careful about how and where you drive your all-terrain vehicle (ATV) will help protect the forests and grasslands of B.C.
- EXHAUST SYSTEMS CAN GET VERY HOT**
Hot mufflers and exhaust residue can ignite grass and other flammable material.
- BE AWARE OF WILDFIRE RISKS**
Carry enough water and a hand tool to put out any fire that you start, including campfires.
- STAY ON ESTABLISHED TRAILS AND ROADS**
Do NOT operate an ATV in tall grass or other vegetation when weather conditions are hot and dry.

Report wildfires, unattended campfires or violations of regulations by calling *5555 on a cell or 1 800 663-5555 toll-free.

BC Wildfire Service | BCwildfire.ca | @BCGovFireInfo

BRITISH COLUMBIA | BC Wildfire Service

Fires to Date

Total 279

Lightning 153

Person 125

Number of fires since last Newsletter (August 17)

Total 19

Lightning 26

Person 10

Fire Danger Rating today



Current Prohibitions (within BCWS jurisdictional area)

All open burning, including campfires, is prohibited throughout the Coastal Fire Centre's jurisdiction, with the exception of the 'fog zone.' Campfires are permitted in the 'fog zone.' A map of the 'fog zone' can be found online: <http://www.bc30.ca/>. For more information, visit gov.bc.ca/wildfirebans

Wildfire news

Coastal Fire Centre

About Coastal-August 31

Similar to the rest of BC, the Coastal Fire Centre area has seen a high number of wildfires this year. Since April 1st there have been 279 fires in the Coastal Fire Centre, compared to the 10-year average of 198. The storm that passed over northern Vancouver Island and the mid-coast area on August 11th resulted in a large number of lightning caused fires particularly on northern Vancouver Island (56 of which are currently active). Many of these lightning-caused fires continue to require the work of firefighting crews and resources. Many of these fires are in unstable and steep terrain and will be active in the weeks ahead.

Lightning also caused many fires on the mainland and some of these are being treated as modified response fires. The BC Wildfire Service works with land managers and stakeholders regarding objectives for specific areas as outlined in fire management plans. Because fire is a natural component of ecosystems, the objectives in some areas, such as parks and ecological reserves, may specify that natural fire is beneficial in certain areas.

Accordingly, when a wildfire does occur in these areas careful consideration is given to potential wildfire spread and impacts on identified values. When it is determined that allowing the wildfire to burn is appropriate, a modified response strategy may be utilized. Wildfires represent a potential mechanism for plant and ecosystem renewal. Some of the benefits include:

- Reduction of the litter layer, which in turn reduces risk of catastrophic wildfire.
- Fire can increase light infiltration and capture by reducing both over-story and litter layers.
- Fire can promote plant health and understory development, which has value for wildlife and livestock.
- Fire can improve access to forage for both wildlife and livestock.

See the following website for more information on fire ecology: <https://www.for.gov.bc.ca/hra/Ecology/fire.html>

Weather-issued at 12:15 pm on August 31

SYNOPSIS: Winds increase across the region today and temperatures should hover near seasonal normals again this afternoon under sunny skies or a mix of sun and cloud inland; mainly cloudy for western & northern Vancouver Island and coastal sections of the Mid Coast. Isolated to scattered showers push into the Mid Coast mid to late afternoon (greater coverage and amounts out west). The tail end of a weakening cold front brushes southeastward over the region tonight to potentially deliver the odd minor shower to the North Island and upslope areas of the Sunshine Coast. Saturday should be a near repeat of today in most areas: near normal temperatures, slightly lower humidities, variable cloud, and less wind while the next upper trough brings thickening cloud and a few showers or rain to Haida Gwaii and the outer Mid Coast.

OUTLOOK: The next upper trough and associated cold front passes over the region Sunday and Sunday night bringing strengthening winds to all

zones. The cold front may become positioned SW to NE over roughly Port Hardy to the upper Klinaklini Sunday afternoon with scattered showers and cooler temperatures to the north; isolated showers to the south. Bands of frontal moisture tied loosely to the cold front should bring patchy mid and high level cloud and near or slightly below seasonal temperatures to the majority of the rest of the region while areas south of roughly Nanaimo to Squamish to Boston Bar may remain mainly sunny with one more day of near or slightly above seasonal temperatures and moderate humidities. Gusty winds continue in many areas Sunday night. Monday and Tuesday should see warmer and drier conditions. Light outflow conditions should develop Monday night/ Tuesday morning to help bump temperatures throughout parts of each zone up into the 24 to 26 degree range with a good chance of humidities dipping below 25% in spots. Generally light winds should dominate under increasingly sunny skies each afternoon.