

Hazard Risk Analysis

Fires

Brush, Bush and Grass Fires
Community Interface Fires
Community Structural Fires
Forest Fires or Wildfires
Peat Bog Fires

Fires

This section introduces a number of types of fires: brush, bush and grass fires; forest or wildfires, peat bog fires, community structural fires and wildland community interface fires. You will note that for most of these fires there are two risk analyses: one is for those that are caused by nature (e.g., lightning) and the other is for those caused by people (human-caused). When you come to developing resilience strategies for these hazards it is important to understand where the main cause for the hazard lies.

Resources are available to assist you in completing this analysis in the [Risk Analysis Resources section](#).

Brush, Bush and Grass Fires

Definition

Grass, Bush and Brush Fires, are started by lightning or by humans (either by accident or on purpose) and occur in bush or brush areas and on grasslands – including prairie grasses.

Discussion

Certain fuel or forest types such as dry needle-bearing trees and grasses burn more easily than trees which shed leaves every year. Many fires are caused by human activities such as: logging or lumbering activities, recreational activities, railroads, land clearing and bush burning, construction and other industrial operations.

It Happened Here...

On May 3 2009, fires burned on the Montana First Nation, the Louis Bull First Nation, Pigeon Lake south of Camrose and near Bruderheim and Redwater, as well as near Clyde in Alberta. One home in Pigeon Lake and another on the Louis Bull First Nation near Hobbema burned and a number of outbuildings were destroyed. The mayor of Bruderheim (population 1,215) announced that there

were two brush fires about eight kilometres north of town. People living within a kilometre were voluntarily leaving their homes.

Brush fires during May 2010 affected many communities in Quebec and Ontario, including the Wemotaci native reserve (population 1,337) in Quebec. One fire forced the entire Wemotaci native reserve to evacuate for five days. No deaths or injuries were reported.

On December 14, 1997, the Chinook winds came down the mountain sides, picked up flames from burning garbage in a residential burning barrel, carried it through the nearby forest and out onto the plains. Within four hours this fire had burned a path up to 10 miles wide and 30 miles long. It destroyed five houses and a large number of livestock were killed. 350 people were evacuated from the nearby town of Granum, Alberta.

Brush, Bush and Grass Fires - Natural

Hazard Rating				High Risk	<input type="checkbox"/>	Low Risk	<input type="checkbox"/>	Need More Info	<input type="checkbox"/>	Not Applicable	<input type="checkbox"/>
Yes	No	Need More Info	Not Applicable	FACTORS							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Brush or grass fires are more likely to occur again where they have happened before. Have brush/grass fires happened previously in your community?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The risk indicators for brush/grass fires are similar to wildfire. Does your community meet some or all of the wildfire risk factors? (Check the factors in the 'Wildfire' section below)							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Does your community experience hot dry summers?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Grass/brush fires can occur in the springtime before green-up. Do you often have periods of hot dry weather in the early spring, before the new grasses have grown?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Big areas of brush or standing dead grass are a fire risk. Are there large swaths of standing dead grass in or around your community?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Non-native grasses are a greater fire risk than native species. Do non-native grass species grow in or around your community?							

Brush, Bush and Grass Fires Human-caused

Hazard Rating High Risk <input type="checkbox"/> Low Risk <input type="checkbox"/> Need More Info <input type="checkbox"/> Not Applicable <input type="checkbox"/>				
				FACTORS
Yes	No	Need More Info	Not Applicable	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Brush or grass fires are more likely to occur again where they have happened in the past. Have brush/grass fires, caused or started by humans, happened previously in your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The risk indicators for brush/grass fires are similar to wildfire. Does your community meet some or all of the wildfire risk factors? (Check the factors in the 'Wildfire' section below)
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Grass/brush fires can occur in the springtime before green-up and can contribute to spring cleanup fires becoming larger fires. Do you frequently have periods of hot dry weather in the early spring, before the new grasses have grown?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Big areas of brush or standing dead grass are a fire risk. Are there large areas of standing dead grass in or around your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Non-native grasses are a greater fire risk than native species. Do non-native grass species grow in or around your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Scientists have observed that with increasing maximum summer temperatures there will be an increased chance of fires, and also more areas at high risk of fires. Has your community noted higher summer temperatures and has your community been identified to have been at high-risk of fires in the past?

Community Interface Fires Natural and Human-caused

Definition

A Community Interface Fire exists when there is uncontrolled burning in woodlands and the fire (or smoke) may spread to nearby property, homes and infrastructure or threaten human lives.

Discussion

In many communities, residents have moved out of the central area of the community and pushed out into wooded areas – often to appreciate the natural beauty of Canadian forests. Unfortunately, not all businesses and homeowners are aware of the potential for forest fires or wildfires nearby, and make sure to protect their buildings. Once fires start it may not be possible to prevent the buildings from being destroyed.

The section on “Forest Fires or Wildfires contains much of the same information that is also related to community interface fires. The main difference is that it is not just the forests that are burned, but also the homes and businesses of the community. Forest fire fighters fighting, community interface fires need to know the best ways of dealing with structural fires, as well as forest fires.

It Happened Here....

Three communities of the Ts'kw'aylaxw First Nation (near Kamloops, BC) were put on an evacuation alert in May 2012, when a forest fire burnt close to their communities. The blaze was thought to be human caused, and burnt about 140 hectares. Six planes, five helicopters and 41 fire fighters were needed to combat the fire in the steep, and hard to access, terrain.

Community Interface Fires Natural and Human-caused

Hazard Rating				High Risk	<input type="checkbox"/>	Low Risk	<input type="checkbox"/>	Need More Info	<input type="checkbox"/>	Not Applicable	<input type="checkbox"/>
Yes	No	Need More Info	Not Applicable	FACTORS							
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community interface fires are most likely to occur where they have happened in the past. Have community interface fires happened in your community before?			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Community interface fires occur where homes or buildings exist in or next to undeveloped wildlands. Are houses and buildings located in or next to forested areas?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Is your community vulnerable to the risk factors for forest or wildfires? (see Section on Forest Fires and Wildfires)							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fire can spread from homes to forest. Is your community lacking proper structural firefighting capacity?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fire can spread from forests to built-up areas. Is your community lacking proper wildfire-fighting capacity?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Bylaws and building codes can reduce the chance of interface fire. Are bylaws and building codes lacking enforcement in your community?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Building materials that easily burn, such as cedar shingles and plywood, can increase the chance of fire. Is construction with flammable materials encouraged?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A community protection plan and the FireSmart principles (see Risk Analysis Resources) can decrease the chance of interface fire. Is your community lacking compliance with FireSmart principles?							

Community Structural Fires - Human-caused

Definition

A community structural fire is a fire which happens in a residential, commercial or industrial community. Fires occur on a frequent basis in many parts of Canada. Fires of great concern, are those that cause a large number of deaths or injuries, those that are beyond the ability of the local resources to respond, or those that cause severe economic losses.

Discussion

Fires are classified in a number of ways: residential fires, schools, automobile fires, large dollar loss fires and arson. Efforts to reduce fires through fire prevention initiatives and public safety awareness, have not led to a lot less arson fires in Canada since 2005, when 13,315 cases were reported.

It Happened Here...

In January 2014, two young boys lost their lives in a fire in Pelican Narrows, Saskatchewan. Their house on the Peter Ballantyne Cree First Nation reserve burnt down after candles sparked a fire in the attic space. The community faces many problems in fighting fires on the reserve. The only fire truck of the community is in need of repair, and many houses do not have running water.

Community Structural Fires - Human-caused

Hazard Rating				High Risk <input type="checkbox"/>	Low Risk <input type="checkbox"/>	Need More Info <input type="checkbox"/>	Not Applicable <input type="checkbox"/>
				FACTORS			
Yes	No	Need More Info	Not Applicable				
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The possibility of spreading community or structural fire exists wherever human structures have been built. Is your community lacking structural fire-fighting capabilities?			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Is your community lacking fire hydrants in its commercial or industrial areas?			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Buildings that comply with National Building Codes are safer than non-compliant buildings. Are many structures non-compliant with building codes in your community?			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Does your community have old, historic, wood-frame or ply-wood buildings?			

Forest Fires or Wildfires

Definition

Forest fires are started by lightning or by humans (either by accident or on purpose). Wildfire is the general term used to describe when there is uncontrolled burning in woodlands.

Discussion

In Canada, approximately 8,000 wildfires take place annually, burning an average area of 2.5 billion hectares. Forty-five per cent of all fires in Canada are caused by lightning. Fires caused by lightning burn most of the 2.5 billion hectares. Since these fires are often in rural or remote locations and do not threaten communities, they are left to burn.

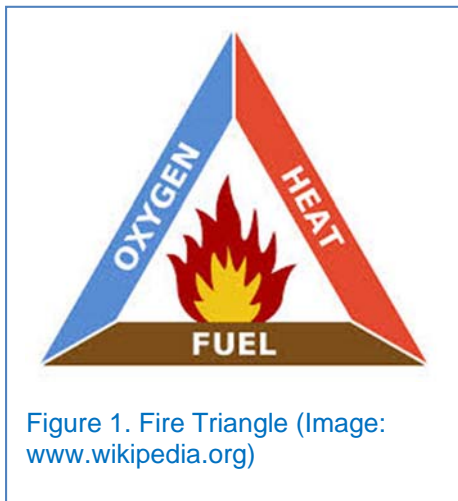


Figure 1. Fire Triangle (Image: www.wikipedia.org)

In a nutshell, fires of all kinds require three main 'ingredients': fuel (wood or grass for example), heat and oxygen. Fire professionals call this the 'Fire Triangle' because all three ingredients are needed for a fire to burn. If one ingredient is removed the fire will collapse (or die out), kind of like the removal of a leg on a three-legged stool. .

- Fuel is the wood, grass or other vegetation.
- Heat is the initial spark that starts the fire, usually coming from lightning or human actions, intended or accidental.
- Oxygen comes from the air and is refilled by the wind.

Firefighters want to remove one or more of the three ingredients to douse an active fire. They can use water, foam or dirt to cut off the oxygen, or air supply, to the fire. This also lowers the temperature of the materials on fire (forest, grass, etc.) below the point of ignition. And firefighters can remove fuel (forest, grass, etc.) in advance, by creating so-called 'fire breaks' or removing dead vegetation before it has a chance to burn.

The **Canadian Forest Fire Behavior Prediction (FBP) System** outlines a number of factors which can be used when calculating forest fire risk and are summarized as:

- **Fuel type and condition:** certain fuel (forest, grass, twigs, leaves) such as dry conifer burn more easily than leaf-shedding forests. Forests that have a lot of dead vegetation, or 'forest litter' are also more likely to burn, than forests that do not have this forest litter. The amount of moisture (or water) within the soil, shrubs and trees is also very important. Forest fire ratings are usually 'high' or 'extreme' when the forests are dry (even when skies are overcast). Low water content happens especially after long dry spells in late spring and/ or summer.
- **Weather:** weather has a great effect on wildfires. Unfortunately it can be very unpredictable and we cannot control it. Long-lasting periods of no rain of course reduce the amount of moisture (or water) within a forest, and thus boost the chance of wild fires. However, winds greatly shape the spread and intensity of a wild fire. Winds can also carry embers away from a wildfire, and start so-called 'spot fires' somewhere else. A wild fire can rapidly grow in such a way.
- **Topography:** Mountain slopes that are South facing are usually warmer and drier, and as such have a higher chance of burning. Vegetation on slopes that are facing the most common wind direction is often also drier. In steep mountainous terrain winds often

move uphill during the day, and as such the winds make an easy path for the fire to travel. The heat from the fires are also carried uphill by winds, and so pre-heats fuel (forest, grass etc.) uphill.

While most forest fires are caused by lightning, a lot of fires however are caused by humans through logging or lumbering activities, recreational activities, railroads, land clearing and bush burning, construction and other industrial operations. In 2003 lightning strikes, human carelessness, and arson all contributed to igniting nearly 2,500 fires, which burned more than 265,000 hectares (ha). Over 10,000 firefighters and support personnel were involved in the dousing of the fires. The cost of the fires was estimated at \$375million..

Several tools are available for fire fighters, residents and tourists to assess the risk of wild fire. You can find an overview of these tools in the 'Risk Analysis Resources' section.

It Happened Here...

A forest fire affected the community of Kleena Kleene, British Columbia (population 808) in June 2004. Residents and tourists were evacuated from the Lonesome Lake and Klinaklini fires in South Tweedsmuir Park. The fire was caused by lightning and grew to 22,745.0 hectares.

On June 15 2009, one of the fires near Grayling Creek and Gregoire Tower, about 45 kilometres south of Fort McMurray Alberta, closed part of Highway 63 to Fort McMurray. Traffic was detoured to Highway 881, with traffic being redirected at the junctions of highways 63 and 881, highways 55 and 63 and highways 55 and 36. Officials estimated the fire at over 2,000 hectares in size.

Forest Fires or Wildfires Natural

Hazard Rating				High Risk	<input type="checkbox"/>	Low Risk	<input type="checkbox"/>	Need More Info	<input type="checkbox"/>	Not Applicable	<input type="checkbox"/>
Yes	No	Need More Info	Not Applicable	FACTORS							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wildfire is likely to occur where it has happened in the past. Have wildfires occurred in or near your community before?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Is your community located in or near forestlands, particularly coniferous (pine-tree) forests?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A long history of fire prevention activities can increase the risk of wildfire, as more fuel such as dead wood and brush will be on the forest floor. Is there a history of wildfire prevention activities in or near your community?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Almost half of the wildfires in Canada are caused by lightning strikes. Is your community in an area that has summertime thunderstorms?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wildfire is most likely to occur during or immediately following long periods of hot dry weather. Does your community experience regular heat waves and minimal rainfall in the summer?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Winds cause fire to burn more intensely. Does your community experience high winds during the summer?							

Forest Fires or Wildfires - Human-caused

Hazard Rating				
High Risk		<input type="checkbox"/>	Low Risk	
		<input type="checkbox"/>	Need More Info	
		<input type="checkbox"/>	Not Applicable	
		<input type="checkbox"/>		
FACTORS				
Yes	No	Need More Info	Not Applicable	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wildfire is most likely to occur where it has happened in the past. Has your community previously experienced wildfires caused by humans?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Is your community located in or near forestlands, particularly coniferous forests?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	A lengthy history of fire prevention can increase the risk of wildfire, as more fuel such as dead wood and brush will be on the forest floor. Is there a history of wildfire suppression in or near your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Wildfire is most likely to occur during or immediately following long periods of hot dry weather and can contribute to small fire becoming larger ones. Does your community experience regular heat waves and minimal rainfall in the summer?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Prevention measures can reduce the risk of wildfire. Does your community lack a fire-preparedness plan?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	About half of all wildfires are started by humans or human activity. Do people camp or use forested areas near your community? Does logging and/ or slash burning occur near your community?
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Scientists have observed that with increasing maximum summer temperatures as a result of climate changes there will be an increased chance and more areas at high risk of fires. Has your community noted increased summer temperatures and has your community been identified to have been at high-risk of fires in the past?

Peat Bog Fires

Definition

Peat bogs can dry out and catch fire (by natural causes or human activities). As the peat runs deep into the earth, the fire can smolder beneath the ground for long periods of time. This creates smoke hazards to surrounding populations.

Discussion

All wetlands can store large amounts of water. Peat bogs can also hold water, as the rotting plant matter has small particles and does not easily drain. Wetland plants hold more water in their roots, leaves and stems than dry land plants. Therefore in times of heavy rain, wetlands absorb water, and by holding the water in the plant roots the chance and severity of flooding lessens. However, when bogs do dry out (after periods of droughts) and catch fire, they are very hard to smother as they can burn undetected under the ground for a long period of time, and suddenly reach the surface.

It Happened Here...

Burns Bog, near Vancouver, BC, is the largest peat dome on the west coast of North America. It has traditionally been important to First Nation communities in the area, who used the plants in the bog for medicinal uses. Burns Bog has experienced many fires in the past, one of the biggest happened in September 2005, when 200 hectares were burnt. Smoke from the fire covered the Lower Mainland of British Columbia, and was blown as far away as Nanaimo on Vancouver Island.

Peat Bog Fires - Natural

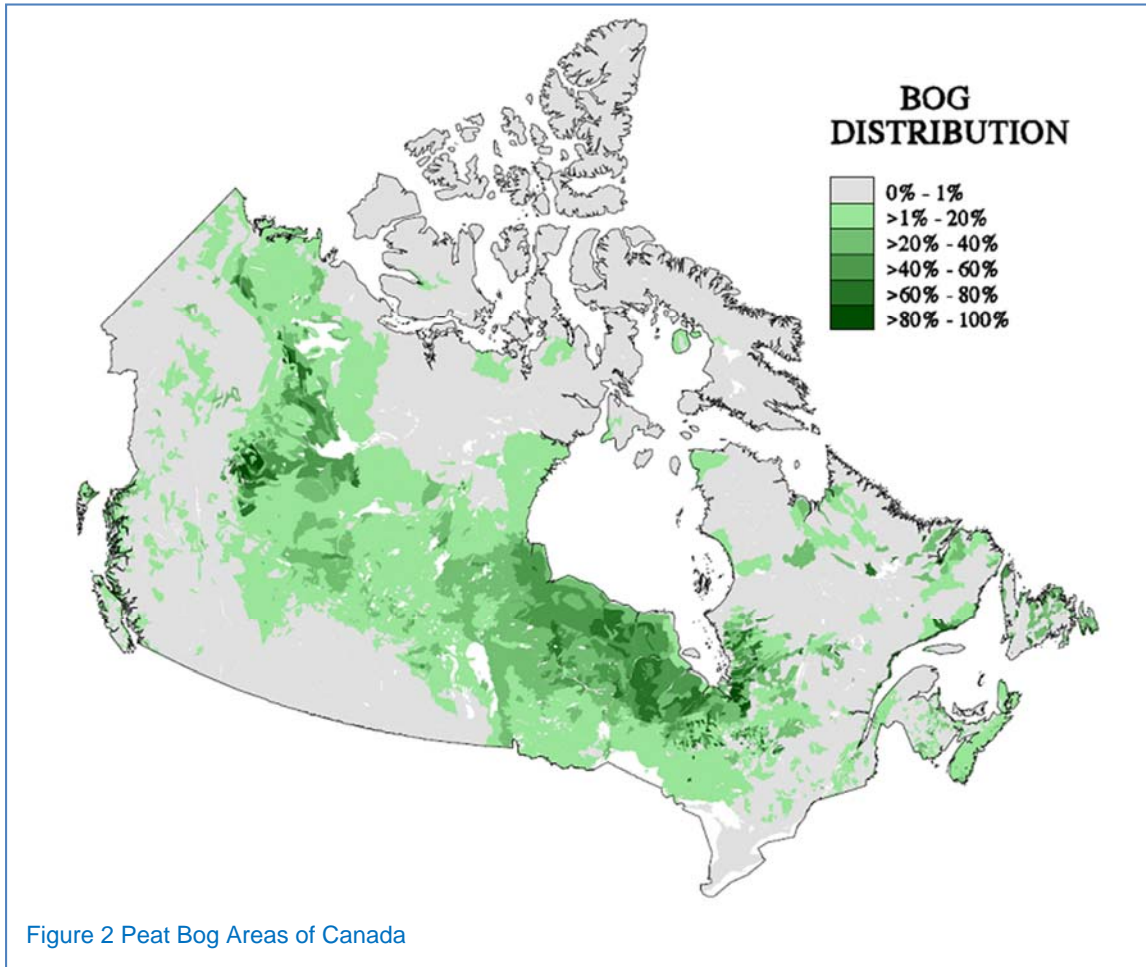
Hazard Rating					High Risk	<input type="checkbox"/>	Low Risk	<input type="checkbox"/>	Need More Info	<input type="checkbox"/>	Not Applicable	<input type="checkbox"/>
					FACTORS							
Yes	No	Need More Info	Not Applicable									
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		**Peat bog fires will occur again where they have happened in the past. Canadian research shows that peat bogs happen again sometime between 4 and 102 years. Has there been a peat bog fire in the past?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Is your community located in an area known to have peat bogs (Check Risk Analysis Resources – Peat Bogs)?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Does your community experience hot dry summers?							

Peat Bog Fires Human-caused

Hazard Rating					High Risk	<input type="checkbox"/>	Low Risk	<input type="checkbox"/>	Need More Info	<input type="checkbox"/>	Not Applicable	<input type="checkbox"/>
					FACTORS							
Yes	No	Need More Info	Not Applicable									
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Are peat bogs frequented by tourists, hikers, or locals?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Is your community located in an area known to have peat bogs (Check Risk Analysis Resources – Peat Bogs)?							
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		Does your community experience hot dry summers?							

Risk Analysis Resources

Peat Bogs



Fire Related Resources

FireSmart Canada provides resources for fire fighters, community members, industry and educators on topics related to wild fire, forest fire, wildland/ community (or urban) interface fire.

<https://www.firesmartcanada.ca/>

Keywords: Fire Smart Canada, wild fire, forest fire, natural hazard

Natural Resources Canada provides reports, guides, links, maps, and a web-based fire information system that monitors daily forest fire conditions and fire occurrences across Canada, including the Canadian Wildland Fire Information System

<http://cwfis.cfs.nrcan.gc.ca/background/summary/fbp>

<http://www.nrcan.gc.ca/forests/fire/13143>

Keywords: Natural Resources Canada, forests, forest fires, wild fire, natural hazards

Fire Prevention Canada provides links and useful tips regarding fires safety in general.

<http://www.fipreca.ca/index.php?section=0>

Keywords: Fire Prevention Canada, forest fires Canadian Forest Fire Behavior Prediction (FBP) System

The Institute for Catastrophic Loss Reduction (ICLR) has a lot of information about a number of natural hazards including wildfires.

<http://www.iclr.org/resourcecentre/hazardresearchpapers.html>

Keywords: Institute for Catastrophic Loss Reduction, wild fires, forest fires

Historical Events – General Information

Please Note: See your Provincial/Territorial Risk and Resilience Information Guides for additional resources, including information regarding your community emergency manager, contact with Aboriginal Affairs and Northern Development Canada, and provincial or territorial Emergency Management Organization (EMO). EMO websites generally provide information specific to the hazards in your territory or province. Band websites or regional Aboriginal community websites can provide more information.

Resources
<p>The “Canadian Disasters - An Historical Survey” website by Robert L. Jones provides a great list of past disasters which have occurred since the 1500s in Canada and have resulted in at least 20 deaths.</p> <p>http://web.ncf.ca/jonesb/DisasterPaper/disasterpaper.html</p> <p>Keywords: Canadian disasters historical survey</p>
<p>The Public Safety Canada “Canadian Disaster Database” contains a list of past disasters in Canada.</p> <p>http://www.publicsafety.gc.ca/prg/em/cdd/srch-eng.aspx</p> <p>Keywords: Canada disaster database</p>
<p>Wikipedia has a list of disasters in Canada and links to various events; however, it does not have a lot of information about British Columbia.</p> <p>http://en.wikipedia.org/wiki/List_of_disasters_in_Canada</p> <p>Keywords: Canada disasters wiki</p>
<p>SOS! Canadian Disasters is supported by Library and Archives Canada, and provides some interesting stories on historical events and also has a great website on an education program (Grades 7 to 12) on understanding hazards and disasters in Canada.</p> <p>http://www.collectionscanada.gc.ca/sos/index-e.html</p> <p>Keywords: sos! Canada library archives</p>
<p>CBC Archives have a wide variety of news clips on historical and current disasters in Canada as well as educational information on hazards for teachers. On the CBC Digital Archives webpage, search for “disaster” in their own keyword search bar.</p> <p>http://www.cbc.ca/cgi-bin/MT4/mt-search.cgi?search=disaster&IncludeBlogs=777&limit=20</p> <p>Keywords: CBC archives, Disaster</p>

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