Purpose

This product is intended to assess potential critical infrastructure (CI) impacts resulting from seasonal wildfires within Canada. It will identify the significant impacts of the 2021 wildfire season, review the 2022 seasonal forecast, and examine the impacts of wildfires on Indigenous and northern communities given the heightened level of risk.

The product will provide analysis on CI and supply chains, which, if disrupted or destroyed, could have implications on public safety and economic stability. Interdependencies between CI sectors affected by wildfires will also be highlighted in Annex B and C.

CI stakeholders, federal, provincial, territorial partners, and CI owners/operators that are members of the CI Gateway (https://cigateway.ps.gc.ca) can refer to the Portal to access additional hazard papers, past assessments and more detailed Infrastructure of Concern information as it becomes available.

Help us improve our assessments by providing your feedback!

Overview

Wildfires are common to the Canadian landscape during hot and dry conditions associated with spring, summer, and fall. For remote communities and urban areas encroaching wildlands, wildfires can place communities, people, and CI at risk. Although the amount of burned land varies annually (as shown in Figure 1), a number of factors such as housing growth in the wildland-urban interface (WUI), and more people working, living, and visiting forested areas for recreation can cause fires to be more damaging and difficult to control. [1] According to Natural Resources Canada, the requirement for expansive emergency management and fire suppression activities has led to increasing costs in the billions of dollars for a number of organizations including governments, industry stakeholders, insurers, and citizens, during both the response and recovery phase. [2, 3] Climate change is also expected to exacerbate future fire seasons.

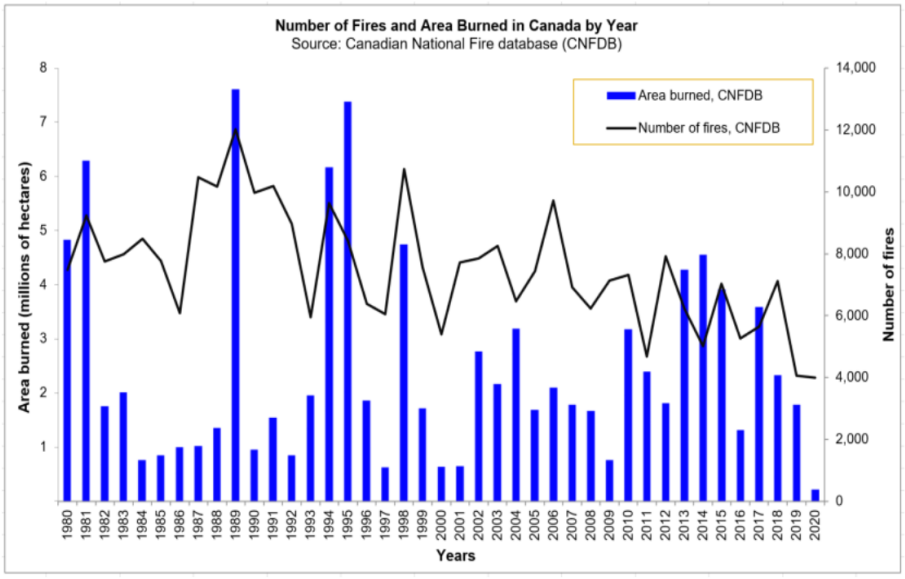

Figure 1: Past years number of fires and areas burned in Canada. [1]

[1] Canadian Wildland Fire Information System | Canadian National Fire Database (CNFDB) (nrcan.gc.ca)
[2] Cost of wildland fire protection (nrcan.gc.ca)
[3] 2018 Canadian Wildland Urban Interface Fire Season Overview and Potential Impacts to Critical Infrastructure

Wildland fires are a natural hazard that occur in forested, shrub land, and grassland regions in Canada. Typically the regions with the highest wildland fire occurrence are British Columbia (BC), the Boreal forest zones of Ontario, Québec, the Prairie provinces, Yukon, and Northwest Territories. Fires are common from April through to September, but can occur as early as March depending on conditions.[4] Wildland fires present a challenge for forest management because they have the potential to be both harmful to communities and beneficial to the forest ecosystem.[5]

In Canada, approximately 8,000 wildfires occur each year. Over the past 10 years, a yearly average of 5,533 wildfires have burned 2.9 million hectares of wildland throughout Canada.[6] Fires caused by lightning represent 45% of all fires, but because they occur in remote locations and often in clusters, they represent 81% of total area burned. Human-caused fires represent 55% of all fires, which occur in more populated areas and are usually reported and extinguished quickly.[7]

2021 Wildfire Season

The 2021 fire season was a significant active wildfire season for parts of Canada. BC, Saskatchewan, Manitoba, and northern Ontario accounted for 90% of the total area burned and 60% of the total number of fires.[8] Early spring drought, lack of precipitation, and extreme heat were factors that resulted in an extreme wildfire season across most of western Canada and into Ontario. Due to the severity of the wildfires, increased efforts led to multiple provincial agencies competing for firefighting resources and equipment. Approximately 367 international personnel were deployed to Canada to assist in response efforts. Though many provinces experienced an intense wildfire season, BC and Manitoba experienced the most significant impacts to CI.

British Columbia

BC experienced another challenging wildfire season, recorded to be the third worst fire season in terms of area burned, behind 2018 (nearly 1.355 hectares burned) and 2017 (more than 1.216 hectares burned).[9] At the peak of BC's 2021 wildfire season, there were over 300 active wildfires, with 67 wildfires being particularly visible or posing a threat to public safety. There were a total of 1,642 wildfires, with a total of 869,279 hectares burned.[10] The province saw 181 evacuation orders, 304 evacuation alerts and declared a provincial state of emergency that stayed in effect for 56 days ending on September 14, 2021.[11] Notably, the Lytton Creek wildfire destroyed the village of Lytton, and the White Rock Lake wildfire destroyed the Central Okanagan region between Kamloops and Vernon. The White Rock Lake wildfire accounted for about half of all the evacuations orders issued within the province.[12, 13]

Several CI impacts occurred as a result of the wildfires. The Manufacturing Sector (specifically the forestry industry) was impacted as companies had to scale back operations and timber supply was destroyed. As a result, lumber

[4] Government of Canada Contingency Plan 2018 – Wildland Urban Interface Fire Season
[5] Forest fires (nrcan.gc.ca)
[6] National guide for wildland-urban-interface fires: guidance on hazard and exposure assessment, property protection, community resilience and emergency planning to minimize the impact of wildland-urban interface fires (canada.ca)
[7] Wildfires (getprepared.gc.ca)
[8] Canadian Wildland Fire Information System | National Wildland Fire Situation Report (nrcan.gc.ca)
[9] Canadian Wildland Fire Information System | National Wildland Fire Situation Report (nrcan.gc.ca)
[10] Wildfire Season Summary - Province of British Columbia (gov.bc.ca)
[11] Wildfire Season Summary - Province of British Columbia (gov.bc.ca)
[12] White Rock Lake wildfire responsible for half of B.C.'s evacuation orders | CTV News
[13] White Rock Lake wildfire caused an estimated $77M in insurance damage | Globalnews.ca

prices significantly increased.[14] Ranchers experienced loss of livestock, damage to feed and shelter, and incurred costs to evacuate livestock during the wildfires.[15] The Transportation Sector experienced impacts as many road closures occurred as a result of the rapidly spreading wildfires.

As CI was destroyed, Lytton's shared infrastructure in the Energy and Utilities and Water sectors had cascading impacts to surrounding communities.[16] In Lytton, damage to the Canadian National (CN) and Canadian Pacific (CP) rail lines caused train shipments to be delayed in and out of the Port of Vancouver. Due to the close proximity of the two rail lines being damaged, alternate supply routes had to be found. At the peak of the backlog more than 4,000 rail cars were stranded due to the line disruption. This impacted the movement of everything from lumber to grains to plastic and crude oil.[17] Due to the damaged rail lines, coal-export supplies were rerouted to the Port of Prince Rupert in northern BC.[18] The damaged tracks caused crude oil shipment delays from Vancouver to refineries. This impacted the Energy and Utilities Sector as crude oil shipment delays disrupted the production of petroleum products (gasoline, diesel fuel, etc.) produced in refineries which are used to for both the supply of heat and electricity. The Information and Communications Technologies (ICT) Sector experienced impacts as Lytton's communication network was destroyed.[19] Additional temporary resources were provided for emergency responders to communicate.[20] Lytton's RCMP detachment, ambulance station, and emergency operations centre were also damaged, resulting in limited support to the community and surrounding area.[21, 22]

The wildfire season in BC may have contributed to the devastating flooding impacts later in the year. The loss of vegetation cover from wildfire led to soils being more prone to erosion, which fostered landslide and mudslide occurrences that destroyed roads and bridges. The settled ash and debris also reduced the ability of the rainfall to infiltrate the soil, increasing runoff. During heavy rainfalls the runoff moved into streams, lakes and reservoirs that impacted the quality and quantity of available drinking water.[23]

Manitoba

Manitoba experienced the most severe wildfire season since 1989 with nearly 450 wildfires and more than 1.2 million hectares burned across the province.[24] Throughout the season more than 4,000 individuals were evacuated from seven First Nations and three northern communities.[25] The Transportation Sector experienced impacts as reduced visibility caused road closures from scattering smoke. The province received national firefighting personnel, aircraft, and equipment, as well as international assistance to aid in the response.[26]

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[14] Wildfires are causing the price of lumber to spike again | CBC News
[15] Many B.C. ranchers affected by wildfires and floods still haven't received financial aid | CBC News
[16] 'Melted, incinerated' infrastructure found after Lytton, B.C., fire | CTV News
[17] Supply chain crunch as B.C. wildfires halt hundreds of rail cars, slowing exports | Financial Post
[18] Port of Vancouver hit with trade delays after B.C. wildfires damage railway tracks - The Globe and Mail
[19] Lytton wildfire destroys community-built fibre network - Cartt.ca
[20] Lytton wildfire destroys community-built fibre network - Cartt.ca
[21] BC RCMP's response to Lytton fire and impacts as other wildfires emerge | Indo-Canadian Voice (voiceonline.com)
[22] 'Melted, incinerated' infrastructure found after Lytton, B.C., fire | CTV News
[23] Wildfires and Flood Damage | Sparkgeo
[24] Province of Manitoba | News Releases | Manitoba Wildfire Service Thanks Firefighters from South Africa for Efforts on Front Lines of Manitoba Fires (gov.mb.ca)
[25] Province of Manitoba | News Releases | Manitoba Wildfire Service Thanks Firefighters from South Africa for Efforts on Front Lines of Manitoba Fires (gov.mb.ca)
[26] Province of Manitoba | News Releases | Manitoba Wildfire Service Thanks Firefighters from South Africa for Efforts on Front Lines of Manitoba Fires (gov.mb.ca)

Pauingassi and Little Grand Rapids First Nation communities, which are only accessible by plane, experienced an extended evacuation due to loss of power from damage to 91 hydro poles.[27] It took approximately eight weeks to restore power to the two communities due to the lack of road access and poor weather conditions.[28, 29]

The Safety and Transportation sectors were impacted as a drone was operating on the same flight path as a water bomber, which forced the flight to abort its mission leaving firefighters on the ground in jeopardy.[30]

For other notable impacts from past years flooding events, refer to Annex A.

2022 Wildfire Seasonal Outlook

The late arrival of spring across Canada provided periodic cool temperatures in April. In much of Canada, the slowly melting snowpack will limit fire activity in BC, the southern Prairie provinces, and possibly the southern parts of the eastern provinces. However, the delays of green-up of broadleaf trees could contribute to an above normal fire activity in May for the southern interior of BC, southern Saskatchewan, and Manitoba.[31] As for the Eastern regions, precipitation levels may prevent most fire starts.

The fading La Niña favours Arctic high-pressure areas drifting through the Prairies, typically bringing large dry pools of air and high winds southward.[32] By May, warm air temperatures are expected on the west side of these high-pressure areas that may contribute to fast-spreading fires. Natural Resources Canada predicts fire activity may be above normal in Alberta during the month of May.[33] June is predicted to be dry in western Canada and along the Great Lakes area into the east, with patchy heavy rainfall throughout the country. As above normal temperatures in June are expected across much of the country, excess precipitation may not be enough to prevent above normal fire activity. This will likely impact regions from southwestern BC through western Quebec. Northern Saskatchewan into the Territories is less likely to be impacted by wildfires due to heavier rainfalls predicted.

Considerations for Indigenous and Northern Communities

Indigenous and northern communities are at high risk for wildfire related emergencies and evacuations. The Canadian Forest Service indicated that 60% of all reserves in Canada are located within or intersect with wildland and urban development which are high risk areas for wildfires.[34] Emergency response and recovery efforts in Indigenous and northern communities can be challenging due to remote locations and decreased access to resources. For example, remote locations may have limited transportation infrastructure, such as being a fly-in community or only having one-road access, which should be taken into consideration during the planning process.

Some Indigenous communities are particularly more vulnerable and require additional attention when wildfires are a concern. Historical trends of previous wildfire occurrences should be taken into consideration when planning and preparing for wildfire related emergencies. Indigenous communities most at risk may require additional attention during the wildfire season. CI sector organizations may want to consider prioritizing preparation, response, and recovery efforts to these vulnerable communities. During wildfires, Indigenous communities are valuable assets that

[27] Power restored to Little Grand Rapids, Pauingassi First Nation, allowing hundreds to return home | CBC News
[28] Band councillor urges more action to restore Manitoba Hydro to fire-evacuated communities | CBC News
[29] Power restored to Little Grand Rapids, Pauingassi First Nation, allowing hundreds to return home | CBC News
[30] Drone blocks water bomber from fighting wildfire in Manitoba's Whiteshell Provincial Park | CBC News
[31] NA_Outlook.pdf (nifc.gov)
[32] NA_Outlook.pdf (nifc.gov)
[33] Canadian Wildland Fire Information System | Monthly and Seasonal Forecasts (nrcan.gc.ca)
[34] MergedFile (cif-ifc.org)

hold expert knowledge on fire behaviour from being very familiar with the environment and landscape.[35] Engaging Indigenous communities as early as possible in the onset of a wildfire could alleviate much undue stress caused from evacuation, also allowing the community to be better prepared and organized for an evacuation.

Isolated and remote communities have additional complexities which need to be considered when supporting emergency responses. They can include frail CI infrastructure, lack of basic essentials and retailers / providers of these essentials, limited transportation access, and emergency response resources. The effects of these issues may be exacerbated in the event of a wildfire. In addition, maintaining a social support network, financial capacity, cultural understanding from host communities, access to traditional food, and continuation of cultural and social activities are factors that impact well-being and resilience.

Some Indigenous people may be hesitant to evacuate for reasons such as land attachment, feeling unwelcomed by the hosting community, and losing their homestead and possessions. Allowing people to stay within their traditional territory , or relocating to a nearby Indigenous community providing cultural support and accommodations would be beneficial.

[35] Committee Report No. 15 - INAN (42-1) - House of Commons of Canada (ourcommons.ca)

Annex A – Historical Impacts

Wildfires have had a significant impact in Canada over the past several years. Notably, the 2016 Fort McMurray wildfires and the 2018 BC wildfires were among the largest and costliest fires in Canada, with several impacts to CI.

Fort McMurray, Alberta – 2016

The 2016 Fort McMurray wildfire was the largest natural disaster in Canadian history and had a major economic impact. An assessment by McEwan University estimated that the total cost of the wildfire was approximately $10 billion, however it could take up to 10 years to get a more accurate estimate of the overall costs.[36, 37] On May 4, 2016, a provincial state of emergency was declared in Alberta, and assistance from the Canadian Armed Forces (CAF) was called upon. Approximately 350 CAF personnel provided support during this time.[38]

From an **Energy and Utilities Sector** perspective, many oil producers in the area ceased operations including Suncor, Syncrude, Shell, Canadian Natural Resources, and Husky. The oil sands operations were closed for more than two weeks, which prevented the production of approximately 1 million barrels of oil per day. Overall, the wildfires reduced Canada's oil output by an estimated 16% daily. Due to drop in production, 30 million barrels of oil were taken out of storage hubs to meet demand.[39]

Natural gas was also shut off to Fort McMurray. Electrical power was disrupted and damaged in some cases. The loss of electricity forced the use of electrical power generators. With fuel supplies secured, owners and operators were able to keep backup power in place for an extended period of time.

The **Information and Communication Technology (ICT) Sector** was able to maintain cellular reception throughout Fort McMurray; however, coverage was spotty. Communications towers were running on back-up power. Backup mobile units were deployed to impacted areas in order to restore cellular connectivity, and providers offered free Wi-Fi and texting capability to facilitate emergency services and family reunification.

The **Safety Sector** operated around the clock, with emergency personnel battling the wildfire, protecting public safety and property, and escorting evacuees south of Fort McMurray. Approximately 500 firefighters were engaged around the Fort McMurray area, as well as 15 helicopters, 14 air tankers, and 88 pieces of equipment. Additional equipment and assistance were sent to the city from other provincial governments. The Royal Canadian Air Force deployed heavy-lift battlefield helicopters to support the disaster relief operation. The CH-147F Chinook took loads of food, medicine, and emergency supplies to a First Nations community 50 kilometres outside of Fort McMurray. This aided the efforts of the existing four CH-146 Griffons and the one C-130J Hercules.

The **Transportation Sector** also experienced disruptions with its response and recovery efforts. Firefighting efforts required aircraft. All major highways in Fort McMurray were affected by the wildfire situation. In May 2016, the Fort McMurray Airport experienced delays and temporarily ceased operations due to the fire.

[36] Quantifying disaster - MacEwan University
[37] Fort McMurray wildfire cost nearly $10 billion - Wood Business
[38] Fast, Effective, and Exactly What Canadians Should Expect: The Canadian Armed Forces Response in Fort McMurray – NAOC (natoassociation.ca)
[39] Canadian wildfires are having a global effect on oil prices - Trade Ready

The **Water Sector** was also impacted. Almost the entire Fort McMurray area was placed under a boil-water advisory during the fire, since untreated water was placed into the municipal water system to supply firefighters. The boil water advisory was lifted in all areas of Fort McMurray on August 17, 2016.

British Columbia – 2018

BC experienced the worst wildfire season on record in 2018, burning 1.35 million hectares, and requiring 66 evacuation orders. The province spent $615 million to fight the fires.[40]

The **Transportation Sector** was impacted as several flights in BC's interior and Western Kootenay regions were cancelled or delayed.[41] Sporadic road closures occurred, including Highway 93 in the Kootenay region.[42] The **Health Sector** was impacted as the Metro Vancouver and Fraser Valley regions experienced an increase in visits to the doctor for prescriptions to treat lung conditions caused by poor air quality.[43] The **Manufacturing Sector** saw an increase in lumber prices.[44] The **Food Sector** was impacted as approximately 9,392 livestock animals were displaced as of September 5, 2018.[45] As a result provincial authorities were required to explore potential sources for emergency feed supplies for farmers and ranchers impacted by fires.

[40] A look at Canada's biggest wildfires in the last two decades | Canada's National Observer: News & Analysis
[41] B.C. Wildfires 2018: Flights cancelled as smoke chokes airports | CBC News
[42] B.C. Wildfires 2018: Fire destroys 27 structures in Telegraph Creek | Vancouver Sun
[43] Medical issues surge as air quality advisory becomes longest on record | Vancouver Sun
[44] B.C. wildfires linked to rising lumber prices and rallying forest company shares | Globalnews.ca
[45] 2018 British Columbia (BC) Wildland-Urban Interface Fires Summary and Observed Impacts to Critical Infrastructure

Annex B – Cross-Sector Impact Overview

		Secondary Sector Impacts									
	SECTORS	**Energy and Utilities**	**Finance**	**Food**	**Government**	**Health**	**ICT**	**Manufacturing**	**Safety**	**Transportation**	**Water**
Impacted Primary Sector	**Energy and Utilities**		• economic activity • ATMs, point of sale, security systems and internet banking • fuel re-supply issues	• electricity for food processing, storage, and distribution centres	• business operations	• hospital operations (operating rooms, medical devices, heating and cooling)	• ICT systems	• fuel • electricity for operations	• fuel	• fuel delivery and usage	• pumps and water treatment systems • fuel for backup generators
	Finance	• automated systems (i.e. ATMs, internet banking)									
	Food		• economic activity			• health of patients • wildfire harvesting		• food production		• food delivery	
	Government										
	Health										
	ICT	• automated systems (i.e. safety mechanisms)	• ATMs, point of sale, security systems and internet banking	• food processing • communications	• business operations	• medical devices • communications		• production • business operations • communications	• communications	• communications	• automated operations
	Manufacturing	• fuel delivery • components delivery	• economic activity	• food processing and packaging	• production of military, technological and office equipment	• production of medical equipment, pharmaceuticals and food	• production of technological equipment		• production of safety equipment	• business operations	• water treatment equipment and chemicals
	Safety		• protection and security at financial institutions		• protection and security of assets	• health sector support					
	Transportation	• fuel delivery • components delivery • movement of workers	• economic activity • movement of workers	• just-in-time delivery of food • movement of workers	• delivery of goods and equipment • movement of workers	• receiving medical supplies and equipment • movement of workers	• receiving equipment • movement of workers	• shipping products • movement of workers	• receiving equipment • EM response times		• water treatment supplies • movement of workers
	Water	• energy production		• food sanitization • additives to food • drinking water for livestock & irrigation	• business operations	• business operations • sanitization	• component cooling	• business operations	• business operations	• potable water delivery	

Annex C – Sector Impact Overview

ENERGY AND UTILITIES	• Above ground distribution and transmission networks of the electrical grid can be vulnerable to urban interface wildfires. • Transmission and distribution corridors often traverse remote forested areas, and therefore may come under threat. • A clear-cut buffer adjacent to wildlands typically surrounds substations and transmission lines in order to mitigate risk; however, proximity to intense heat may still result in damage. • Local distribution assets, such as insulators, bushings, and street level transformers, are susceptible to direct fire and heat damage and fallen trees. • Automated safety mechanisms, such as industrial control systems, are common within utility grids which could and should mitigate the potential for extensive damage. • Disruption of one or more Energy Sector assets could cause performance degradation, eventually leading to cascading failures within the system, resulting in loss of service to large areas, consumers, emergency responders, and dependent infrastructure across the ten CI sectors. • Refineries may also be shut down due to a wildfire to mitigate against the disruption of electricity supply or the disruption of pipelines feeding the refineries. • Prolonged disruption of Energy Sector assets could have impacts on the personal health of Canadians, disrupt regional or national economic activity, and disrupt recovery efforts. • If widespread outages of electrical systems occur, there can be delays in restarting and rebalancing the electrical system as components are repaired. The capacity of local utility labour forces will be stressed, and recovery may require assistance and coordination to access additional resources. • Wildfires have a minimal and temporary impact on below ground petroleum products infrastructures and their distribution; however, above ground compressor pumps can be impacted. • Locally, shortages of refined fuels at the pumps may impact evacuation and response efforts. • In the event fuel supplies become limited, the commodity would be provincially controlled so that communities and CI sectors can maintain essential services. • The Energy Sector has cross sector dependence on Transportation and Manufacturing for the movement of workers, delivery of components, and delivery of fuel sources. • If road and rail transportation networks are disrupted, the movement of petroleum products may be impacted. • Potential disruptions of supply chains supporting the sector (e.g., access to critical equipment and supplies).
FINANCE	• Banking and financial services may be disrupted through cascading effects on dependent sectors, such as energy and ICT infrastructure. • Automated Teller Machines (ATM), point-of-sale, security systems, and internet banking depend on electricity and communications for provision of service; therefore, prolonged outages can have a major effect on commerce and consumer banking within an impacted community. • Loss of service and access to funds may be observed at banks, financial institutions, and retail points of sale. • Digital payment systems used by businesses, retailers and consumers may be disrupted by electrical or communications outages, causing an increasing reliance on cash, and restricting access of goods and services. • Though banks and financial institutions have backup generators, they may experience fuel re-supply issues that can arise during an extended power outage, particularly with disruption to the Transportation Sector.
FOOD	• The Food Sector is vulnerable to direct physical damage at the agricultural production level, as well as disruption throughout its supply chains. • Prolonged disruptions to the Food Sector or its dependencies in the Energy and Utilities, Transportation, or ICT sectors can lead to regional shortages of food. • Wildfires have significant potential to impact arable lands and resident livestock within the sector. • Wildfires have potential to cause lasting impact to agriculture due to loss of crops where land or water sources experience contamination. • Livestock may be evacuated or set free in dire circumstances.

	• Long-term impacts, including an inflation of prices for food products, may occur due to damage to crops, facilities, and loss of livestock. • The sector relies on frequent orders and deliveries, typically supported by the road network and communications systems. • Digital payment systems used by food businesses, retailers, and consumers may be disrupted by electrical or communications outages, causing an increasing reliance on cash and restricting access of goods and services. • Physical damage or loss of electricity to food processing, storage, and distribution centres could disrupt the production and delivery of products. • Spoiling of large quantities of food could occur due to loss of refrigeration. • Dependencies on the Water Sector for irrigation, cleaning facilities, food sanitization, additives to food, and drinking water for livestock. • Recovery efforts may need to focus on isolated communities and rural food deserts (limited transportation routes, lack of retail points of sale, and low socioeconomic conditions) to assist in prolonged outages within supply chains to ensure food distribution after a wildfire. • Government Sector intervention—resources, services, and financial assistance—may be required to aid farm and agricultural businesses impacted by crop, equipment, infrastructure, and livestock loss.
GOVERNMENT 	• Disruptions to governmental service provisions could occur as they rely on communications, transportation, water, and finance to operate. • Physical damage to government facilities and equipment could impact the ability to conduct regular activities. • Government services may take time to resume and their restoration may be required to support response and recovery efforts. • Disruption of government facilities or equipment could impact various functions at the federal, provincial, and municipal levels of government. • Local and regional governments, which endure the brunt of emergency response, may require assistance from provincial and/or federal governments. • Disruptions to dependent services may require the relocation of offenders from impacted correctional facilities. • Military assets may be relocated during preparatory phases to mitigate damage sustained to specialized equipment and vehicles. • During recovery efforts, government infrastructure assets may act as hubs to assist returning residents. • Reduced services may be more prevalent in remote or rural communities.
HEALTH 	• Health care facilities in affected areas could be impacted by evacuation orders and damage to facilities. • Degradation of the electrical grid may affect hospital operations including emergency care, patient care, operating rooms, and other specialty services over a long-term disruption. • Health Sector is dependent on the ICT Sector for communication, record keeping, and operating some medical devices. • Disruptions or damage to transportation infrastructure could affect both land and air ambulance services, the delivery of pharmaceuticals, other essential medical supplies, and food. • Structural damage of health care facilities and hospitals will directly impact the ability of emergency responders and medical personnel to provide services to patients. • Delay in delivery of health products, biomedical materials, and supplies may impact level of care that can be provided. • Disruption and reduced access to health services has the greatest impact on vulnerable patients with acute and serious illness. • Preparatory evacuation may occur before a wildfire approaches an urban area, leveraging transfer agreements with regional or possibly cross-jurisdiction health care facilities. • Mandatory or recommended evacuations may reduce labour force capacity or strain emergency / ambulatory staff. • Clean potable water and the ability of water and waste water treatment facilities to sanitize discharged water and effluence are critical to the health of patients in hospitals and long-term care facilities. Waterborne illness or the spread of bacterial infections due to contaminated water may exacerbate the potential influx of the injured.

INFORMATION COMMUNICATION TECHNOLOGY (ICT) 	• Landline communications may be disrupted as a result of physical damage to telephone exchanges, data servers, and landlines. • Cascading impacts on emergency response communications and Safety Sector functions may be observed, especially in mountainous regions with sporadic cellular coverage. • Disruption to the electrical grid may affect the supply of electricity to the battery packs that support cell phone towers and telephone and data switching offices. These batteries can be charged by onsite backup generators; however, they typically stock two to three days of fuel onsite at large centres, while cell towers may only possess four to eight hours of fuel. • Refueling prioritization by road network is critical to the sustainability of a communication network, and if not possible, cell coverage will begin to degrade roughly four to eight hours after disruption to the electrical grid. • Above ground transmission networks of ICT infrastructure, as well as switching stations, telecommunication facilities, and cell towers are highly vulnerable during a wildfire. • Wildfires pose a significant risk to the destruction of telecommunication assets and electronic equipment. Fire damage will require their replacement, which may take days to several weeks depending on the complexity of components, cleanup of debris, and structural integrity of the pole or facility housing it. • Some ICT assets require the Water Sector for component cooling; therefore, cascading effects may be observed in central switching offices, data centres, and satellite ground stations. • The general public's ability to request assistance also requires functioning ICT infrastructure. • The operation of radio and television broadcasting stations may be disrupted either through direct damage to stations or towers, or by power failures. Although many broadcasting stations have backup generators, issues of fuel re-supply will also arise. • Wildfires may cause damage to telecommunication cables and communications towers which may impact service. • ICT assets including the broadcast system and cellular networks are at the core of the government's emergency communications to the public. • Disruptions to communication networks can have significant cross-sector impacts if the Supervisory Control and Data Acquisition (SCADA) systems that support the infrastructure's operations are disrupted. • Remote communities with limited ICT infrastructure are more susceptible to degraded services.
MANUFACTURING 	• Work stoppages and closing of facilities may commence in the event of an encroaching wildfire as part of preparedness measures to mitigate damage and loss of equipment and infrastructure. • Disruption to electrical power and fuel supply may cause the reduction or closure of manufacturing facilities that attempt to maintain operations throughout a wildfire, or those who look to initiate startup rapidly post-event. • Manufacturing infrastructure is highly dependent on its skilled and available labour force. Mandatory or recommended evacuations, as well as disruption to the transportation networks (road, rail, and marine) required for the movement of workers, may limit operation capacities and access to upstream and downstream supply chains. • Prolonged disruption to the Manufacturing Sector could have significant impacts to the regional or national economy, disrupt Canada's imports and exports, and reduce the availability of goods and services within affected markets. Although national impacts are less probable, regional shortages of raw materials are possible. • Potential disruption may occur to resource extraction activities in the lumber and mining industry within the impacted area, by restricting access to the resource and temporarily closing processing facilities, saw mills, and mines due to safety concerns. • The destruction of wildlands may reduce regional harvestable timber. • Urban interface wildfires could result in an inflation of prices for products such as lumber for commercial buyers and customers.
SAFETY 	• Emergency services infrastructure, buildings, and equipment, may be just as susceptible wildfire damage as the surrounding community. • Degradation of communications or transportation routes due to a wildfire may affect the coordination and response time of first responders. • Dependency on the Water Sector to maintain continuity of service. • Wildfires may increase demand for police resources including enforcing restricted areas and evacuations, crowd management, wellness checks, and maintaining public order. • Strain on available ambulatory care services may occur if responding to mass casualties.

	• There is the potential for increased need for specialized emergency response and medical assistance. • If wildfires persist long term, proper supply chain management of aviation fuel, diesel, and chemical retardants would be required to sustain suppression efforts. • Preparatory activities, response, and recovery in the aftermath of a wildfire may overwhelm regional capacity, resulting in the burnout of local first responders. • External assistance from other jurisdictions and federal departments would help offset this local strain.
TRANSPORTATION 	• Prolonged disruption of major transportation systems has the potential to create widespread secondary disruptions, as dependent facilities are in turn forced to reduce or cease operations. • Mitigation to disrupted transportation routes may be possible through redirecting traffic but there may be economic, volume, or timing issues that could have significant impacts on the movement of first responders, repair crews, and supply chains. • Highways, airports, and rail provide egress corridors for evacuating residents while providing access to emergency responders and fire crews. • Smoke and ash may impact transportation services due to poor visibility. • Delays and cancellations of chartered or scheduled rail, air, and marine services may occur due to a wildfire which would impact dependent CI sectors and related supply chains. • Highways may be completely shut down once a community has been evacuated. • Disruption to the electrical grid could have significant impacts across the major transportation modes, impacting the operations of control centres, passenger terminals, traffic control systems, refueling stations, and propulsion of electrically powered vehicles. • Disruption of timely fuel delivery in support of vehicles and facility backup generators could have significant impacts across the major transportation modes and halt the movement of people, goods, and services. • Degradation of ICT services may reduce the functionality of navigation aids, scheduling and check-in services of public and cargo carriers, and communications amongst ground staff, emergency services, and vessels/aircraft. • The Food Sector is heavily dependent on the Transportation Sector as food is frequently delivered by truck. • Damage to transportation infrastructure, lack of fuel, and communication failures could lead to local food shortages in the most affected areas. • Response time of first responders including police, fire, and paramedic services may be substantially impacted as road closures compound. • Rail operations may be affected by damage to stations, tracks, bridges, locomotives and rolling stock, and the lack of electricity for operations and communication systems, including the operation of electrically-driven locomotives and automated control and signaling systems. • Disruptions to port facilities could have significant impacts on national supply chains where they support the import and export of goods.
WATER 	• Water treatment and control facilities, along with their network of pumping stations, are crucial to emergency responders for fire suppression activities and the defence against an encroaching wildfire to urban areas. • Disruption to the supply of safe potable water due to fallen ash caused by a wildfire, or the degradation of treatment facilities may result in the discharge of untreated wastewater, putting human welfare at risk. • Continued and prolonged use of fire retardants may lead to environmental contamination of local drainage basins and supply headwaters. • The sector is reliant on the Energy and Utilities Sector for electrical power for the operations of its facilities and fuel supply for backup generators. Power outages may result in the loss of power to pumps required to pressurize water delivery systems and draw water from wells, monitoring systems needed for water quality, chemical dispensers needed for water treatment, and communications systems for SCADA systems (digital infrastructure). • The sector is supported by the Transportation Sector to get staff onsite, receive fuel for backup generators, and for the regular delivery of the water treatment chemicals. • Several of Canada's CI sectors rely on the Water Sector to support their operations, including electrical generation, agriculture, and a wide variety of manufacturing processes.

	• Dams and other water control structures are often dual purpose and may provide water control, maintain drinking water reserves, support irrigation or support electrical generation. • Disruption to the Water Sector could have significant impacts on the health of Canadians, disrupt supply chains that rely on water intensive processes, impact the environment with untreated discharge of wastewater, or create secondary destruction with the failure of water control structures. • Communication of cautionary guidelines to remote and rural residents reliant on well water and septic systems may need to be considered by regional health authorities.