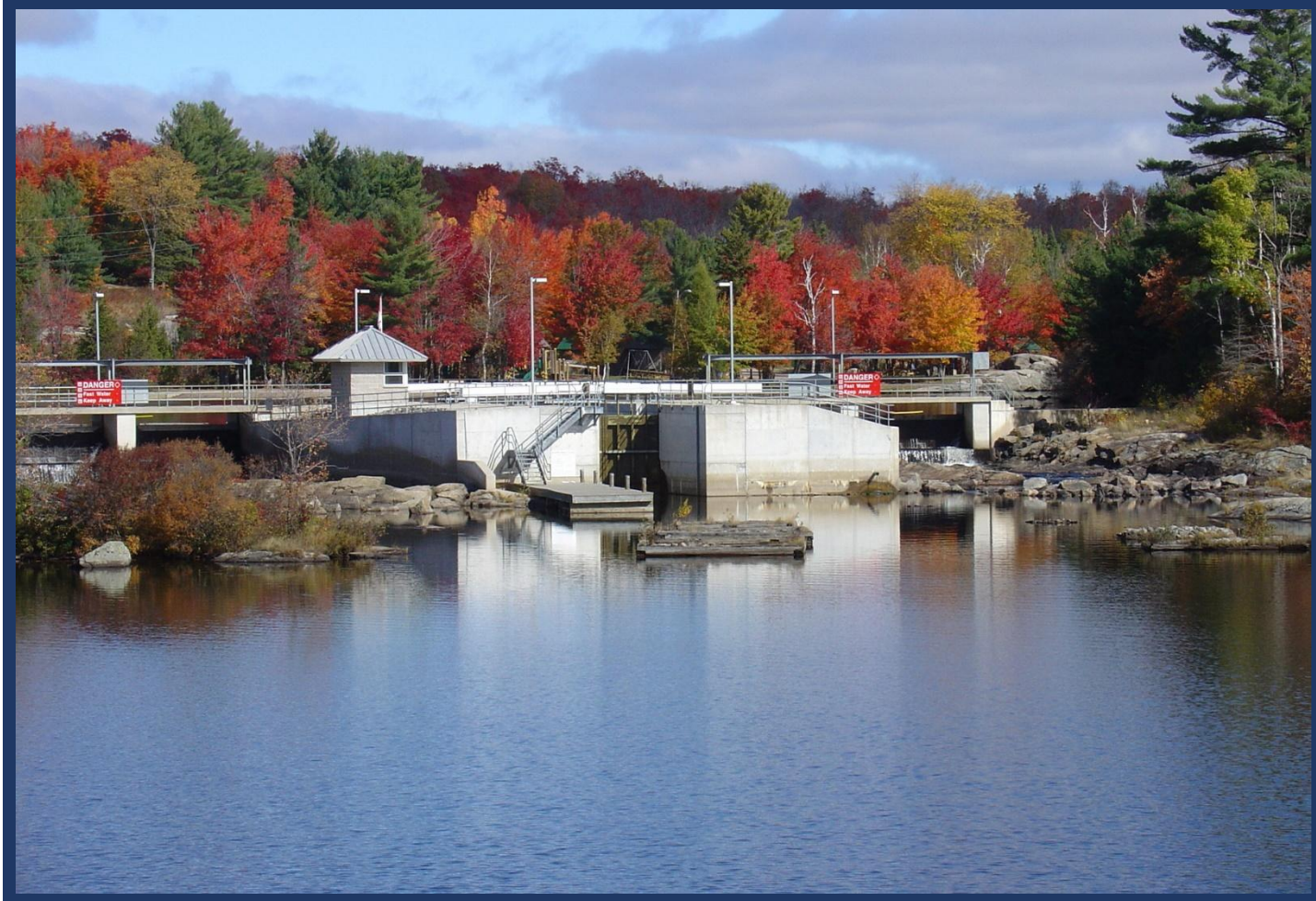


# The Municipality of Magnetawan

## MUNICIPAL RISK PROFILE

2024

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# Contents

# Version Control

## Version

This is version 1.0 of the Municipal Risk Profile, there have been no previous profiles published for the municipality.

## Publication of New Versions

A complete Hazard Identification and Risk Assessment (HIRA) should be completed every five (5) years, and a revised Municipal Risk Profile should be published based on the HIRA results.

The municipality's Emergency Management Program Committee will review this risk profile annually and make those revisions necessary to ensure the document is current and accurately reflects the community's hazards.

# Record of Revisions

## Revisions

Revisions to this document can occur at any time with the approval of the municipality's Emergency Management Program Committee.

| Vers. | Description of Change(s) | Date | Revised By | Approved By |
|---|---|---|---|---|
| 1.0 | Initial Publication | 2024-01-30 | SDM Preparedness Inc. | |
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# Document Management

## Distribution

This document is to be widely distributed to all municipal stakeholders including Emergency Services, Provincial Ministries, the private sector, not-for-profit organizations, elected officials and the general public residing, or operating within the municipality.

Comments and suggestions related to this Municipal Risk Profile should be directed to:

The Municipality of Magnetawan
Magnetawan Fire Department
Attention: Chief Derek Young
4304 Hwy 520, PO Box 70
Magnetawan, ON
P0A 1P0

# Document Approval

## Approval by Municipal Council

**The Municipality of Magnetawan**
**Office of the Mayor**

**APPROVAL**

**Municipal Risk Profile Version 1.0 Dated the 30th Day of January 2024**

With my signature affixed below and on behalf of Municipal Council I hereby approve this document:

Sam Dunnett, Mayor — January 22, 2024 Date

Kerstin Vroom, CAO/Clerk — January 22, 2024 Date

# Emergency Management in Magnetawan

While Magnetawan is a safe place to live, work, and visit, emergencies can happen anywhere and at any time. Emergency management in the community consists of a system of mutually supportive partnerships coordinated by the Magnetawan Fire Department. These partnerships and relationships encompass municipal, regional, unincorporated and private sector enterprises, as well as Not-For-Profit Organizations from across the region and throughout Ontario.

The legislated role of emergency management coordinator has been assigned to the municipality's Chief Fire Official. The Chiefs role is to monitor, co-ordinate and assist in the development and implementation of prevention, mitigation, preparedness, response and recovery strategies to maximize the safety, security and resiliency of the municipality through effective partnerships.

## Disclaimer

This document was developed by SDM Preparedness Consulting Incorporated to provide information in support of the municipality's commitment to fulfilling the requirements of the *Emergency Management and Civil Protection Act*, Sections 2.1 (3) and 5.1 (2).

SDM Preparedness' work is guided by the current best available evidence. SDM Preparedness assumes no responsibility for the results of the use of this document by anyone.



# Acknowledgments

## Local Subject Matter Experts

The Emergency Management Program Committee would like to express their appreciation to the following people who contributed their time and expertise in developing this risk profile:

Kerstin Vroom, Magnetawan
Joe Readman, Magnetawan
Steve Robinson, Magnetawan
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Derek Young, Magnetawan
Scott Edwards, Magnetawan
Charles Saunders, Magnetawan
Tyler Irwin, Magnetawan
Robert A-Muhong, NBPS District Health Unit
Debra Burke, Ministry of Transportation
Tammy MacKenzie, District Social Services Administration
Meghan Powell, Ministry of Natural Resources & Forestry

# Risk Factors

## Vulnerable Populations

An important consideration for the municipality is to recognize the deeply rooted social risk factors within our society. The goal of the Emergency Management Program Committee should not be to solve the issues, but to acknowledge their existence and connect with those in the community who are already immersed in a given population.

Safe and affordable housing, employment, physical and mental well-being, and social inclusiveness are just some of the fundamental human needs that contribute to the health of individuals, families, and communities.

There are numerous social risk factors, such as poverty, homelessness, unemployment, substance abuse, and mental health issues that are pertinent to understanding human vulnerability to hazards. More importantly, these issues can affect specific groups of people disproportionately and exacerbate their vulnerability levels. These groups include, but are not limited to, those who are homeless, unemployed, the elderly, Indigenous peoples, and ethnic minorities.

## Critical Infrastructure

It is vital to understand and liaise with the critical infrastructure owners, operators, providers, and other stakeholders in and around the municipality. These stakeholders are vital to reducing and/or mitigating the hazards and risks associated with their services.

Aging infrastructure and underinvestment have led to some gaps between actual and needed infrastructure in Ontario and Canada, which puts pressure on this infrastructure to meet the growing needs of the population. Aging and poorly maintained infrastructure can expose owners, operators and those living or working in the vicinity of the infrastructure to risk.

The disruption of critical infrastructure and other community assets is often a key threshold or criteria for emergencies. The provision of key services is crucial to the ability of the community to support its' residents, to withstand the effects of hazards, and to respond effectively. This is especially true in the case of essential services such as electrical power.

For the purposes of completing the most thorough risk assessment possible, the following critical infrastructure sectors were considered:

- ✓ Electrical Grid
- ✓ Financial Services
- ✓ Food and Water
- ✓ Petroleum
- ✓ Health Care
- ✓ Government Continuity
- ✓ Public Safety
- ✓ Telecommunications
- ✓ Transportation

## Climate Change

Climate change is causing more frequent and extreme events like flooding, forest fires, ice and wind storms, and warming winters. The effects of the changing climate have already increased our risks of illness, damage to homes and businesses, losses to the economy and impacts on society.

Regardless of the cause, these changes cannot be ignored. We need to understand current and future vulnerabilities and risks in order to prioritize our actions because some risks will be greater than others. Hazard identification and risk assessment can help us set priorities and direct our efforts toward areas where they will be most needed.

Emergency management programs that integrate climate change adaptation measures will ensure an integration of programs, appropriate response mechanisms, suitable tools and resilient governance structures.

# Identifying the Hazards and Assessing the Risks

Hazard identification and risk assessment is a pivotal process within the realm of emergency preparedness, serving as cornerstones for effective risk management in diverse municipalities. This systematic methodology aims to proactively identify potential threats, hazards, and vulnerabilities that may pose harm to people, property, or the environment. By understanding and categorizing these hazards, municipalities can develop informed strategies to mitigate risks and enhance overall community safety.

Hazard identification involves the systematic recognition and analysis of elements or situations with the potential to cause harm. This encompasses a broad spectrum, ranging from physical hazards like machinery malfunctions to chemical, biological, environmental, and psychosocial factors. Thorough hazard identification is essential for creating a comprehensive risk profile.

Subsequently, risk assessment evaluates the likelihood and severity of identified hazards, enabling organizations to prioritize and allocate resources effectively. This process involves quantitative and qualitative analyses to gauge the potential impact and frequency of adverse events. By systematically assessing risks, municipalities can make informed decisions, implement appropriate control measures, and cultivate a culture of safety.

Together, hazard identification and risk assessment empower municipal leaders to preemptively address threats, fostering a safer environment for residents, visitors, and the surrounding community. In essence, they form the bedrock of a proactive and resilient approach to emergency management in an ever-evolving landscape.

## Hazard Identification

The province of Ontario has prepared a comprehensive list of potential hazards that have the potential to negatively impact all or a part of the province. This list was used to guide the Local Subject Matter Experts in determining the likelihood of a hazard occurring.

Using a formula developed by the province of Ontario, the working group was tasked with answering the following question; how likely is each of the potential hazards to occur in the municipality? The working group was divided into four separate teams and each team was asked to work through the entire list using the collective knowledge and experience of their team to determine the most appropriate rating.

| Rating | Description | Percent Chance |
|---|---|---|
| Rare | Occurs every 100 years or more | 1% chance of occurrence in any year |
| Very Unlikely | Occurs every 50-99 years | 1-2% chance of occurrence in any year |
| Unlikely | Occurs every 20-49 years | chance of occurrence in any year |
| Probable | Occurs every 5-19 years | chance of occurrence in any year |
| Likely | Occurs every 2-4 years | chance of occurrence in any year |
| Certain | Occurs every year | chance of occurrence in any year |

## Risk Assessment

After determining the likelihood of each potential hazard the working group was tasked with determining the possible consequences of the hazard.

By examining the exposure, vulnerability and capacity of the people and assets within the municipality the working group considered that when people or assets are exposed to a hazard, they may experience any or all of the following consequences:

- Fatalities
- Injuries/Illness
- Psychosocial impacts
- Severed social connections
- Evacuations or shelter-in-place
- Property damage
- Critical Infrastructure disruption
- Environmental damage
- Economic loss
- Reputational harm

These consequences will be more pronounced in those who are vulnerable. Vulnerability is also known as the susceptibility of a community, system, or asset to the damaging effects of a hazard.

The ability of people or assets to adapt to, transform and recover from those effects, regardless of how vulnerable or exposed, is determined by their capacity. If this capacity is low, the effects may be more severe, or longer lasting.

## 2024 Risk Rating

| | |
|---|---|
| Rare | • Avalanche, Fog, Hurricane, Land Subsidence, Landslide, Storm Surge, Geomagnetic Storm, Space Object Crash, Nuclear Facility Incident, Radiological Emergency, Water or Wastewater Failure, Rail Incident, Transit Disruption |
| Very Low | • Farm Animal Disease, Plant Disease or Infestation, Drought or Low Water, Earthquake, Erosion, Civil Disorder, Cyber Attack, Electromagnetic Pulse, Geopolitical Pressures, Communications Failure, Petroleum Product Shortage. |
| Low | • Thunderstorm, Tornado, Chemical Spill, Oil or Gas spill, Water Quality, Active Attacker, Chemical Biological Radiological Nuclear and Explosives (CBRNE), Crowd Disaster, Sabotage, Mine Emergency, Food Shortage, Marine Accident |
| Moderate | • Flooding, High Winds, Lightning, Power Outage, Substance Abuse or Overdose, Buiding or Structure Collapse, Dam Failure, Medical Drug Shortage, Blood Product Shoratge, Medical Supplies Shortage, Roadway/Highway issue. |
| High | • Extreme Cold, Extreme Heat, Fire/Explosion, Infectious Disease, Winter Weather. |
| Very High | • Wildland Fire. |
| Extreme | • There were no extreme threats identified. |

## Risk Profiles

To better understand those risks which have been identified as being 'high' or 'very high' the following risk profiles have been created.

- ✓ Extreme Cold
- ✓ Extreme Heat
- ✓ Fire/Explosion
- ✓ Infectious Disease
- ✓ Winter Weather
- ✓ Wildland Fire

# Extreme Cold

## Definition

The term "extreme cold" refers to weather conditions characterized by exceptionally low temperatures that pose a significant risk to health, safety, and well-being. In Southern Ontario, Canada, where winters can be quite harsh, extreme cold typically involves temperatures well below freezing, often accompanied by factors such as wind chill, which can make it feel even colder.

The specific definition of extreme cold can vary depending on local guidelines. Generally, extreme cold warnings may be issued when temperatures fall to a certain threshold, such as -30 degrees Celsius (-22 degrees Fahrenheit) or lower, or when the combination of temperature and wind chill reaches a level where exposure to the cold can lead to increased risks of frostbite, hypothermia, and other cold-related illnesses.

## Description

Extremely cold weather can have various impacts on a municipality, affecting both the community and the local infrastructure. Here are some potential consequences of extreme cold conditions:

**Health and Safety Risks:**

- Increased risk of frostbite, hypothermia, and other cold-related illnesses for residents who are exposed to the extreme cold without adequate protection.
- Challenging conditions for vulnerable populations, such as the elderly, homeless individuals, and those with pre-existing health conditions.

**Disruption of Services:**

- School closures and disruptions to public services due to safety concerns.
- Potential disruptions to public transportation, as extreme cold can affect the functionality of vehicles and infrastructure.

**Increased Energy Demand:**

- Higher demand for heating, potentially leading to strain on energy resources and power grids.

**Infrastructure Challenges:**

- Freezing temperatures can lead to the formation of ice on roads and sidewalks, creating hazardous conditions for transportation and pedestrians.
- Water infrastructure may be at risk, with the potential for frozen pipes including standpipes or dry hydrants.
- The structural integrity of buildings and other infrastructure may be compromised due to freezing and thawing cycles.

**Economic Impact:**

- Increased costs for municipalities to address issues related to extreme cold, such as increased road maintenance, emergency services, and support for vulnerable populations.

**Emergency Response Challenges:**

- Emergency services may face challenges in responding to incidents due to harsh weather conditions, impacting response times and overall effectiveness.

**Community Outreach and Support:**

- Increased demand for emergency shelters, food assistance, and other support services for those most vulnerable to the extreme cold.

Depending on the severity of an event there are some terms which may be used during extreme cold events by meteorologists, media sources and subject matter experts. Such terms include the following:

**Cold Wave**

The term 'cold wave' is sometimes used to describe sustained cold weather, just like the term 'heat wave' is for a sustained heat event. There is no official definition for cold wave.

However, there are also many different types of winter weather than can occur in such conditions.

**Polar Vortex**

A polar vortex is a large area of low pressure and cold air that is typically centered over the Earth's polar regions, specifically near the North and South Poles. It is a natural atmospheric circulation pattern that exists high in the Earth's atmosphere, in the stratosphere. The polar vortex is strongest during the winter months when temperature differences between the polar regions and the mid-latitudes are most significant.

While the polar vortex is a regular and natural occurrence, it can sometimes weaken or become distorted, allowing frigid Arctic air to spill southward. When this happens, it can lead to extremely cold temperatures and severe winter weather. This phenomenon is often associated with outbreaks of bitterly cold air and can result in events like the polar vortex intrusion, where portions of North America or Europe experience unusually cold temperatures.

It's important to note that while the polar vortex can contribute to extreme cold events, it is just one factor among many that influence weather patterns. The term gained more public attention in recent years as extreme cold events associated with disruptions in the polar vortex received media coverage.

**Cryoseisms**

The term "cryoseism" refers to a phenomenon known as "frost quake" or "ice quake." Cryoseisms are seismic events caused by the sudden release of energy in the ground due to the rapid freezing of water-saturated soil or rock. This phenomenon typically occurs during very cold winter conditions.

The process leading to cryoseism involves the following steps:

- **Water Saturation:**
  The ground becomes saturated with water, either through rainfall, snowmelt, or other forms of water infiltration.
- **Rapid Freezing:**
  During extremely cold temperatures, the saturated ground freezes rapidly.

- **Expansion of Ice:**
  When water freezes, it expands. In the case of cryoseisms, the rapid freezing and expansion of ice generate stress within the soil or rock.
- **Sudden Release of Stress:**
  The stress builds up until it is released suddenly, causing the ground to crack or fracture. This release of stress creates seismic waves, leading to the cryoseismic event.

Cryoseisms are not true earthquakes in the sense of tectonic activity but can be locally felt and heard. The sound produced during a cryoseismic event is often described as a loud booming or cracking noise. While they are relatively rare and usually not associated with significant damage, they can startle or concern people in the affected areas.

## Scale, Timing and Warning Period

**Scale:** Extreme temperatures can affect large geographic regions.

**Timing:** Extreme cold events that occur at a level of severity to trigger an emergency are limited to the winter months.

**Warning Period:** Extreme temperature events are often forecasted days to a week in advance.

## Past Incidents

Extreme Cold events occur regularly in Magnetawan although they are expected to decrease in duration and severity by 2050.

## Municipal Risk Statement

Extremely cold weather can have a detrimental effect on the Municipality of Magnetawan.

**Human Impacts**
Effects due to extreme cold can be widespread and serious if the conditions are prolonged, or if there is limited relief from the conditions. Fortunately, the capacity to manage such effects is high.

**Social Impacts**
Extreme cold events have the capacity to interfere with the healthy functioning of communities, in that mobility and ability to go outside can be severely restricted. This can affect the capacity for community members to prepare and respond to emergency conditions effectively.

**Property Damage**
Extreme cold generally does not result in as much property damage as many of the other identified hazards. Fires and carbon monoxide related harm may occur as a secondary hazard as people may resort to unsafe heating methods.

**Critical infrastructure**
Damage to critical infrastructure due to the direct impact of cold conditions or increased demands on utility and power services are possible. During these events, the health care sector often responds to increased cases of frostbite, hypothermia and falls from icy walkways.

**Environmental**
The general negative effects of cold waves on animals include decreased animal activity, nutritional uptake, reproduction, and increased mortality.

**Economic**
Supply chains can be interrupted, and costs related to the extreme weather, including from employees having difficulty doing their jobs and increased heating needs, can lead to severe losses for businesses, particularly if conditions persist.

Parents of school aged children may incur economic loss if schools or buses are canceled due to cold weather and they have to pay for child care or lose wages to stay home.

# Extreme Heat

## Definition

Extreme heat refers to weather conditions characterized by exceptionally high temperatures that pose a significant risk to health, safety, and well-being. In the context of Southern Ontario, Canada, where summers can be warm and humid, extreme heat conditions typically involve prolonged periods of elevated temperatures that are well above the seasonal norms.

The specific definition of extreme heat can vary based on local guidelines and weather agencies. Generally, extreme heat warnings may be issued when temperatures reach a certain threshold, often combined with other factors such as high humidity. Heat alerts and advisories are designed to notify the public and relevant authorities about the potential health risks associated with the extreme heat.

In Southern Ontario, temperatures exceeding 30 degrees Celsius (86 degrees Fahrenheit) or even higher, particularly when accompanied by high humidity, can be considered extreme heat. The humidex, which combines temperature and humidity levels to determine perceived temperature, is also used to assess the impact of heat on the human body.

During periods of extreme heat, individuals are advised to take precautions to avoid heat-related illnesses, such as heatstroke or heat exhaustion. These precautions may include staying hydrated, staying in cool environments, using fans or air conditioning, and avoiding strenuous outdoor activities during the hottest parts of the day. Vulnerable populations, such as the elderly and those with pre-existing health conditions, are often at a higher risk during extreme heat events, and special attention is given to their well-being.

## Description

Extreme heat in Ontario can have various effects on municipalities, impacting both the population and local infrastructure.

**Health Risks**

- Increased risk of heat-related illnesses, such as heat exhaustion and heatstroke, particularly among vulnerable populations like the elderly, children, and individuals with pre-existing health conditions.

**Strain on Healthcare Systems**

- Higher demand on healthcare services, including emergency rooms, due to heat-related health issues.

**Energy Demand**

- Increased demand for electricity as residents use air conditioning and cooling systems to cope with the high temperatures.

**Water Supply Challenges**

- Increased demand for water for cooling and hydration, which can strain local water supplies.

**Infrastructure Challenges**

- Potential for pavement and road damage due to extreme heat, leading to issues like buckling or cracking.

**Public Services Impact**

- Disruption of public services, such as transportation and infrastructure maintenance, due to the extreme heat.

**Economic Impact**

- Productivity losses in sectors sensitive to extreme heat, as well as increased costs for cooling and energy consumption.

**Water Quality Issues**

- Elevated water temperatures in lakes and rivers, potentially leading to water quality issues and affecting aquatic ecosystems.

**Increased Fire Risk**

- Higher risk of wildfires, especially in areas with dry vegetation, as extreme heat contributes to drying out the landscape.

**Social Impact**

- Discomfort, reduced quality of life, illness or death for residents who may not have access to air conditioning or cooling centers.

## Scale, Timing and Warning Period

| | |
|---|---|
| **Scale:** | Extreme temperatures can affect large geographic regions. |
| **Timing:** | Extreme heat events that occur at a level of severity to trigger an emergency are more common during the summer months. |
| **Warning Period:** | Extreme temperature events are often forecast several days in advance. |

## Past Incidents

Comparing heat-related deaths across Canada is challenging, as each province records and investigates heat deaths differently. In Ontario, tracking of heat-related deaths is restricted to those classified as Hyperthermia (elevated body temperature due to failed regulation of body heat).

## Municipal Risk Statement

Extreme heat events are projected to become more frequent and longer lasting in the coming decades. As a result, the effects will increase and increase the severity of the impacts.

**Human Impacts**
Effects due to extreme temperatures are mostly limited to adverse health impacts due to heat, humidity and pollution. These can be widespread and serious if the heat wave is prolonged, or if there is limited relief from the conditions. Studies have recorded an increase in the number of fatalities associated with heat waves, particularly in Southern Ontario.

**Social Impacts**
The health and vitality of the social fabric is generally not limited by extreme heat events.

**Property Damage**
Damage can be caused by the thermal expansion of materials but is a fairly rare occurrence in Ontario. Buildings and other structures such as bridges can experience moisture loss in concrete during a heat wave, particularly when it occurs along with low relative humidity which can result in cracking.

**Critical Infrastructure Disruptions**
Extreme heat can also alter road surface conditions and railway infrastructure. Heat can result in the expansion or buckling of roads or tracks, which can cause accidents or delays.

Utilities are susceptible to damage from extreme heat events. The demand for electricity increases during periods with high temperatures and may exceed the supply. Rolling blackouts may be implemented. The efficiency of transmission lines decreases due to high air temperatures and power lines may expand which can make them more susceptible to damage.

**Environmental Damage**
The majority of native plants and animals in Ontario have adapted to occasional heat waves and the environmental damage caused by a heat wave is often minimal. However, prolonged, higher than usual temperatures, especially when coupled with high humidity may result in heat stress in animals and plants, especially those that have been introduced to Ontario, including many agricultural plants.

For some crops, a heat wave during the growing season may result in a decrease in the crop yield and grain quality. Low oxygen levels and higher water temperatures can also trigger increased nutrient pollution resulting in algal blooms.

**Economic**
Any business/financial interruption is likely to be minimal, or related to secondary hazards rather than directly to the heat wave. Agriculture and tourism are the industries that are most likely to be negatively impacted by a heat wave.

# Fire/Explosion

## Definitions

**Fire:** A rapid oxidation process, which is a chemical reaction resulting in the evolution of light and heat in varying intensities. Any instance of destructive and uncontrolled burning, including explosions.

**Explosion**: The sudden conversion of potential energy (chemical, mechanical, or nuclear) into kinetic energy that produces and violently releases gas.

## Description

Fires can pose an immediate threat to the safety of life or damage to property. Among a range of effects, they can cause not only extensive damage to property but also evacuations of large numbers of people, and restrictions on the re-entry of homes and businesses.

Fires can pose a significant public safety risk, both from the direct effects of the fire such as smoke and burn damage, and from the secondary effects.

The environment created by fires and explosions can include any of the following conditions:

- **Smoke**: Which impairs visibility and the ability to breathe.
- **Oxygen deficient atmosphere**: Oxygen is vital for humans and animals to breathe.
- **Elevated temperatures**: Even without direct contact with the flames, conductive heat and radiant heat can cause serious burns even from great distances.
- **Toxic atmospheres:** Combustion produces atmosphere that is harmful to humans and animals.

Structure fires and explosions can result in fatalities, injuries, and significant property damage. However, large-scale and mass fatality fires have decreased due to advances in fire prevention and suppression since the 1970s, when smoke alarms became widely available.

Fire Protection and Prevention Act, 1997 (FPPA) is the overall governing legislation in the province for fire protection matters at both the municipal and provincial level. Under this Act, "fire protection services" includes:

a) fire suppression, fire prevention and fire safety education,
b) mitigation and prevention of the risk created by the presence of unsafe levels of carbon monoxide and safety education related to the presence of those levels,
c) rescue and emergency services,
d) communication in respect of anything described in clauses (a) to (c),
e) training of persons involved in providing anything described in clauses (a) to (d), and
f) the delivery of any service described in clauses (a) to (e).

Municipal fire departments enforce the Fire Code, though local zoning and land use bylaws also help to limit the potential impact of industrial accidents or fires through distancing requirements and other limitations of use.

The Ontario Building Code works together with the Fire Prevention and Protection Act and other regulations, including the Fire Code, by providing building requirements designed to limit and prevent the spread of fire. Specific requirements vary depending on building use.

In addition to legislation, standards and regulation, fire prevention activities are important to mitigate fire and explosion risk, and core to the mandate of the Ontario Office of the Fire Marshal. An example of such initiatives is the extensive public safety education program provided by the Office of the Fire Marshal, including the addition of new curriculum specifically for vulnerable populations such as seniors.

## Scale, Timing and Warning Period

**Scale:** Fires and explosions can affect one or multiple buildings or structures.

**Timing:** Explosions and fires can occur at any time of the year.

**Warning Period:** Explosions and fires often have little to no warning. The presence of proper sensing equipment such as smoke or heat detectors can provide early warning.

## Past Incidents

The Municipality of Magnetawan has experienced the impacts of structure fires over the years. Most notably are the following incidents:

- In 2011 the general store in Magnetawan was destroyed by fire. This incident had a considerable impact on the community and took years to recover from.
- In November of 2021, the Magnetawan Fire Department responded to a fire in the Township of Strong. Three occupants of the home perished in that fire.

## Municipal Risk Statement

**Human Impacts**
There is a risk of fatalities and injuries caused by explosions/fires. From burns to smoke inhalation, the health risks are varied. Toxins contained in smoke can also cause severe respiratory and other longer-lasting health effects.

**Social Impacts**
Social impact is likely to be limited and localized, though psychological or lasting social effects are possible.

**Property Damage**
Damage is often isolated to the building/structure affected; however nearby buildings may suffer serious damage. Larger scale events may impact multiple buildings. Damage may range from cosmetic to severe. Smoke may result in additional damage.

**Critical Infrastructure Disruptions**
Electricity infrastructure may be damaged. Roads near the affected area may be blocked by debris.

**Environmental Damage**

Environmental damage is likely to be fairly localized. Air quality can be impacted by toxins or particulate being released as a result of an explosion and/or fire.

**Economic**

Since this is often a localized hazard, damages are often restricted to economic impacts in the immediate area or within the affected building.

# Infectious Disease

## Definition

An infectious disease outbreak is defined as a widespread incident of disease or other situation that presents a danger to the general health and well-being of the human population.

These diseases can be acquired from another person, through fluid exchange or exposure to vectors, or from the environment.

Infectious diseases can become an epidemic or pandemic:

**Epidemic:** An outbreak of infection that spreads rapidly and affects many individuals in a given area or population at the same time.

**Pandemic:** An epidemic occurring worldwide, crossing international boundaries and usually affecting a large number of people.

## Description

Infectious disease outbreaks can arise from a variety of different pathogens. Some of these include viruses, bacterium, parasites, fungi and protozoa, which are vital and usually innocuous members of the ecosystem.

While the vast majority of these pathogens are harmless or even beneficial to human health, a small number can pose a risk to human health.

Types of diseases include:

**Airborne/Droplet:** Refers to situations where residue from evaporated droplets or dust particles containing microorganisms can remain suspended in air for long periods of time.

**Vector Borne:** Living organisms can transmit infectious diseases between humans or from animals to humans

**Blood borne:** Blood borne pathogens, infectious microorganisms, are found in human blood that can lead to disease in humans.

**Zoonotic:** Diseases that can be transmitted from animals to humans by either contact with the animals or through vectors that carry zoonotic pathogens to from animals to humans.

**Enteric** Infectious enteric disease refers to gastrointestinal illnesses that result from ingesting micro-organisms that may be traced back to food, water, animals or an infected person. Some examples are Salmonella, E. coli, Listeria and Giardia.

There are many factors that can cause infectious diseases, such as the evolution of micro-organisms (including antibiotic-resistant strains), the alteration of natural habitats, the increasing frequency and the decreasing duration of global travel.

Infectious disease outbreaks and their severity are influenced heavily by human behaviour, even though they are naturally occurring. There are several ways an infectious disease outbreak can be introduced and spread:

- Direct contact
- Indirect contact
- Droplet contact
- Airborne transmission
- Vector-borne transmission

Given that pathogens can easily cross-jurisdictional boundaries, from a known or unknown agent of disease, efforts to mitigate and respond to infectious disease should occur at all levels and across borders, to ensure appropriate collaboration and planning takes place and to ensure that communities are prepared to effectively contain the spread of an illness and limit its impact.

The Ontario Public Health Standards (OPHS) are published by the Ministry of Health and Long-Term Care under the authority of the Health Protection and Promotion Act (HPPA) to specify the mandatory health programs and services provided by boards of health.

## Scale, Timing and Warning Period

**Scale:** Varies, although impacts are usually across an entire community/region.

**Timing:** There are seasons where certain diseases are more likely. For example, peak influenza season is typically from November through to March.

**Warning:** The amount of warning can vary significantly, but there is often a period of weeks to months between the identification of the initial cases and greater transmission, depending on the location of initial cases and mode of spread within the environment. Monitoring and forecasting by experts can assist with predictions.

## Municipal Risk Statement

Scientists continue to advise that there is an increasing threat from infectious diseases, including some novel diseases as was the case with SARS CoV2 (Covid-19).

Population density, especially with a mobile population that has global reach, is increasing the risk for the introduction of diseases into the population. Changes in global temperature, precipitation, and extreme events could increase the geographic range of vector-borne diseases.

As more antimicrobial drugs become ineffective and fail to treat a growing number of infections, those infections will persist and increase the risk of disease, poor health and death.

To address these emerging and other risks, emergency planners can integrate understandings of social determinants of health into their program activities. Examples of key sources of expertise include local and regional health partners and social service organizations, Social Services Administration Boards, local Indigenous communities and specialized social support and health groups.

**Human impacts**
The symptoms of infectious disease can be serious and, in some cases, life-threatening. The specific impact depends on a number of factors including vulnerability, which varies for each type of illness, as well as environmental, social, economic, and other conditions.

There are numerous potential mental health impacts that have been associated with past infectious disease emergencies, including stress or anxiety following isolation or quarantine orders/recommendations.

**Social Impacts**
Potential social effects are varied and include community financial loss or employment loss due to need to quarantine or isolate, stigma, disruption in the activities of daily living.

**Property Damage**
Property damage is not likely from an infectious disease outbreak.

**Critical Infrastructure Disruptions**
While some critical infrastructure services may suffer due to large numbers of workers being sick or caring for others, the probability is low and dependent on the severity of the emergency.

**Environmental Damage**
Environmental damage is not a likely impact of an infectious disease outbreak. However, unsafe disposal of infected materials could be of concern.

**Economic**
The business and finances of Ontario continue to be vulnerable to this hazard. The severity of the business and financial interruption depends on the transmission mode and the virulence of the illness. If large numbers of the workforce became ill or if travel restrictions are used to control spread, significant business and financial interruptions will occur.

# Winter Weather

## Definition

For the purposes of this document winter weather is a severe weather event with varieties of precipitation that can form only at low temperatures, such as snow, freezing rain and ice.

## Description

Severe winter weather is an annual occurrence in Magnetawan. Snowstorms, ice storms, snow squalls, blowing snow, flash freeze and blizzards make up the fabric of the community from late October until April each year. A significant portion of the municipality's economic wellbeing is dependent on winter weather. From heating fuel to outdoor adventure seeking tourists, the dollar value of winter and all it entails significantly contributes to the local economy.

Generally, winter weather can include the following:

**Snowstorm**

- A period of rapid accumulation of snow, often accompanied by high winds, cold temperatures, and low visibilities. Snowfall warnings are issued by Environment and Climate Change Canada. when there is an expected accumulation of 15 cm or more during a period of 12 hours or less.

**Blizzard**

- A severe weather condition characterized by winds of 40 km/h or greater causing widespread reductions in visibility to 400 m or less due to blowing snow, or blowing snow in combination with falling snow for at least four hours. Blizzard warnings are issued by Environment and Climate Change Canada when the above conditions are expected.

**Snow Squall**

- Sudden heavy snow showers with strong, gusty winds causing blowing snow conditions that reduce visibility. Sometimes, snow squalls bring zero visibility, which is referred to as a whiteout and is similar to a blizzard but is localized.

**Freezing Rain**

- Rain or drizzle, which falls in liquid form and then freezes upon contact with the ground or a cold object forming a coating of ice. Freezing rain occurs when upper air temperatures are warm enough for rain to develop, but temperatures near the surface are cold enough that the rain cools and forms ice on contact. A long-lived freezing rain event is often referred to as an '**ice storm**'.

**Flash Freeze**

- A flash freeze warning is issued by Environment and Climate Change Canada when significant ice is expected to form on roads, sidewalks or other surfaces over much of a region because of the freezing of residual water from either melted snow or falling/fallen rain due to a rapid drop in temperatures.

It is possible for some of those conditions to follow one another. For example, heavy snowfall may be followed by freezing rain as temperatures warm. Another hazard, extreme cold, may follow a storm system as cold arctic air pushes out a warmer air mass.

There are also some weather systems with unique characteristics and consequently, names have been developed for them, including:

**Nor'easter**

A nor'easter, short for "northeaster," is a type of powerful extratropical cyclone that commonly affects the East Coast of North America, particularly in the northeastern United States and eastern Canada. Nor'easters are characterized by strong, sustained winds that come from the northeast, and they typically bring heavy precipitation, including rain, snow, sleet, and sometimes freezing rain.

Key features of Nor'easters include:

- **Formation:** Nor'easters often develop along the East Coast when a low-pressure system intensifies along the boundary between cold Arctic air to the north and warmer, moist air from the Atlantic Ocean to the south.
- **Direction of Winds:** The term "nor'easter" reflects the northeasterly winds associated with these storms. These winds can be strong and persistent, causing coastal erosion and significant wave action.
- **Precipitation:** Nor'easters are known for producing a variety of precipitation types. Coastal areas may experience heavy rain, while inland areas, especially to the north and west, may see heavy snowfall. The precipitation can be intense and prolonged, leading to the potential for flooding.
- **Impact:** Nor'easters can have a significant impact on transportation, power infrastructure, and daily life. Heavy snowfall and strong winds can lead to blizzard conditions, making travel hazardous. Coastal areas may experience storm surges, beach erosion, and coastal flooding.
- **Seasonality:** While nor'easters can occur at any time of the year, they are most common and often most intense during the fall and winter months when the contrast between cold air masses from the north and warm, moist air from the ocean is greatest.

**Alberta Clipper**

An Alberta clipper, often referred to simply as a "clipper," is a type of fast-moving, low-pressure weather system that originates in the province of Alberta, Canada. These weather systems are known for their swift movement and ability to bring light to moderate snowfall over a relatively short period. Alberta clippers typically track southeastward, affecting regions in the Midwest and Northeast.

Key characteristics of Alberta clippers include:

- **Origin:** Alberta clippers typically form in Alberta, Canada, and are associated with cold air masses originating from the Arctic region.
- **Swift Movement:** These systems move quickly, often at a forward speed of 20 to 40 miles per hour (32 to 64 kilometers per hour). Due to their rapid movement, Alberta clippers don't usually bring prolonged periods of precipitation to a single location.

- **Snowfall:** Alberta clippers are often associated with light to moderate snowfall. The snow tends to be powdery and can accumulate quickly, especially in the colder air behind the clipper's associated cold front.
- **Limited Moisture:** While Alberta clippers can bring snow, they typically don't have access to large amounts of moisture. As a result, they tend to produce less precipitation compared to some other storm systems.
- **Temperature Drop:** Behind the cold front associated with an Alberta clipper, temperatures often drop noticeably, contributing to the cold and wintry conditions.
- **Wind:** Clipper systems may also bring gusty winds, which can lead to blowing and drifting snow.
- **Quick Passage:** Alberta clippers usually pass through an area relatively quickly, with the entire system moving from west to east in a matter of hours.

While Alberta clippers are not as intense as some other storm systems, they can still impact travel and create winter weather hazards, especially due to the quick accumulation of snow and potential for slippery road conditions. Residents in regions affected by Alberta clippers often need to stay vigilant and be prepared for rapidly changing weather conditions associated with these fast-moving systems.

Winter weather can have a variety of impacts as it involves sub-zero temperatures. Impacts can include frozen pipes, resulting in water supply issues and burst pipes, and power outages from downed or damaged lines. Prolonged power outages may result in residents having to vacate homes and discard spoiled food. Those who are particularly vulnerable to winter weather conditions include those who:

- are socially isolated.
- require power for medical equipment.
- are dependent on a caregiver.
- have mobility challenges or issues.

The effects of winter weather on physical infrastructure and the continued operation of critical services can be severe and varied. For example, low visibility can impede travel routes and create unsafe outdoor conditions. Snow accumulation can create slippery conditions or even cause collapse of structures. Icy conditions further increase the potential for slips and falls, and present challenges for the transportation sector. Ice can also accumulate on objects causing them to topple or break. Power lines and trees are particularly susceptible to this form of damage.

Severe power outages can accompany this type of weather event.

Such conditions can also limit mobility and the ability for people to remain independent. Individuals living with disabilities may experience more severe limitations and require greater assistance. In the case of power outages, those dependent on home medical equipment such as oxygen systems, CPAP devices and dialysis machines are particularly at risk.

Snow or blowing snow can lead to poor visibility, impacting drivers and pedestrians.

Heavy snowfalls may present a flood risk later in the season. Large accumulations of snow and ice can swell waterways, especially if there is a rapid thaw.

Areas windward of the Great Lakes and Georgian Bay are prone to lake-effect snow, heavy, usually localized snow squalls which are generated by the difference in temperature between the cold air and the warmer water of the lakes.

## Scale, Timing and Warning Period

**Scale:** Winter severe weather can affect large parts of the province or region. Snowstorms and blizzards may differ greatly in size. Some are fairly localized (e.g. lake effect snow) while others may span a significant portion of the province.

**Timing:** In Ontario, winter weather events usually occur from November to April. In general, these events can last from a few hours to several days. Snow squalls are more frequent earlier in the fall/winter season before ice covers the large bodies of water that feed the squalls.

**Warning Period:** Winter weather usually has a significant lead time and can be forecasted days ahead.

## Past Incidents

By far the costliest winter event was the North American Ice Storm of 1998 at a cost of $4,635,720,433 and 25 deaths (primarily from hypothermia). between Ontario, Quebec and New Brunswick. A weather system stalled over the St. Lawrence region dumping a steady stream of freezing rain for 80 hours. Hundreds of hydro towers toppled under the weight and millions of people in Eastern Canada and the North-Eastern United States were plunged into darkness. The event prompted the largest military mobilization in Canadian history since the Korean War.

The following additional significant incidents are recorded in the Canadian Disaster Database:

- December 24, 2022: Southern Ontario
- Mar 23, 2016: Southern Ontario
- Feb 24, 2016: Ontario
- Dec 21, 2013: Southern Ontario. 2 fatalities. 25 injured. $262,781,642 estimated total cost.
- Dec 12, 2010: Lambton County ON. 1 fatality. 1 injury. 625 evacuated
- Dec 01, 2006: Russell ON
- Feb 13, 1999: Barrie ON. 30 injured.
- Jan 13, 1999: Toronto ON. 2 fatalities. $122,000,000 estimated cost
- Jan 03, 1999: Southern Ontario. 11 fatalities. 7 injured.
- Dec 10, 1995: Southern Ontario. 1 fatality. 50 evacuated
- Nov 01, 1993: Quebec and Ontario
- Dec 23, 1986: Eastern Ontario and Southwestern Quebec
- Jan 26, 1978: Southwestern Ontario. 8 fatalities. 400 injured
- Jan 28, 1977: Niagara Peninsula ON.

## Municipal Risk Statement

Severe winter weather will continue to bring hazards to Magnetawan although the hazard may change in frequency and severity from year to year.

The potential consequence and likelihood of power outages related to winter weather has been historically high, but so have prevention and mitigation efforts. While this hazard can directly affect overhead wires and power infrastructure, secondary impacts from falling tree limbs or cascading failures felt as a result from effects in other regions (such as in the 2003 Eastern blackout) should also be considered in risk assessments and planning efforts.

The long-term costs of winter storms can be particularly significant, given the high level of complexity and likelihood for secondary and cascading failures.

**Human impacts**
The number of traffic accidents skyrockets during winter storms, causing injuries and (some) fatalities. In addition, people trapped outside, in their vehicles or in isolated residences without adequate heating may suffer from hypothermia. While hypothermia can directly result in fatalities and injuries, indirect causes of fatalities and injuries are more common during snowstorms and blizzards.

**Social Impacts**
People in Ontario can be vulnerable to winter storms. Familiarity with this hazard, as well as advanced forecasting has helped to decrease the population's vulnerability. Of particular concern are socially isolated individuals, those with mobility challenges, and those with a dependence on support services.

**Property Damage**
The Ontario Building Code has reduced the vulnerability of property. Buildings that have not followed this code risk the collapse of roofs under the weight of the snow. Flat roofs are more vulnerable than sloped ones.

Buildings may be damaged by ice accumulation, falling branches, or water seepage.

**Critical Infrastructure Disruptions**
Without power, many buildings will not have a source of heat. Heavy snowfall may also make unplowed roads and rail lines impassable. Poor visibility may further hamper transportation conditions. Transportation and electrical infrastructure are particularly sensitive to freezing rain.

Health care facilities may experience higher than normal volumes, and experience capacity issues as a result of power disruption.

**Environmental Damage**
Snowstorms and blizzards are a naturally reoccurring hazard in Ontario. As a result, the majority of the native flora and fauna are well adapted to survive the impacts of such a storm. Plants, in particular deciduous trees, are especially sensitive to the effects of freezing rain.

**Economic**
A large and prolonged snowstorm or blizzard or freezing rain, in particular ice storms with a long duration and that result in a large ice accumulation, can significantly disrupt business and financial transactions. Disruptions to air, road, and rail travel could lead to financial loss, especially if it occurs for several days.

# Wildland Fire

## Definition

Any fire in forests, shrub lands and grasslands.

## Description

Wildland fires, also known as wildfires or forest fires, can pose various risks in Southern Ontario, although the region is not as prone to large-scale wildfires as some other parts of North America. Nevertheless, the risks associated with wildland fires in Southern Ontario include:

**Forest and Vegetation Damage:** Wildfires can destroy large areas of forests, grasslands, and other natural vegetation, leading to ecological disruption and loss of habitat for wildlife.

**Air Quality:** The smoke generated by wildfires can degrade air quality over wide areas, impacting respiratory health. This can be a concern for both rural and urban communities.

**Property Damage:** Wildfires can threaten homes, infrastructure, and other property near wooded or forested areas. Embers carried by the wind can ignite structures even if the main fire is some distance away.

**Economic Impact:** The costs associated with firefighting efforts, property damage, and loss of productivity in affected areas can have economic repercussions for local communities.

**Human Health Risks:** Wildfire smoke contains various pollutants that can pose health risks, especially for individuals with respiratory conditions. Evacuations and displacement of communities during wildfires can also impact mental and physical well-being.

**Water Quality Issues:** Wildfires can lead to soil erosion, which may affect water quality in rivers and lakes. Ash and debris runoff can contribute to sedimentation and pose challenges for water treatment facilities.

**Emergency Response Challenges:** Large wildfires can strain emergency response resources, including firefighting personnel, equipment, and infrastructure. Coordination and management of evacuation efforts become critical during major wildfire events.

**Impact on Biodiversity:** The destruction of natural habitats and ecosystems due to wildfires can have long-term impacts on the diversity of plant and animal species in the affected areas.

**Climate Change Feedback:** Wildfires release significant amounts of carbon dioxide into the atmosphere, contributing to greenhouse gas emissions. In the context of climate change, the frequency and intensity of wildfires may increase, creating a feedback loop that exacerbates global warming.

It's important for communities in Southern Ontario to be aware of the potential risks associated with wildfires, even if large-scale wildfires are less common in the region compared to the north. Fire prevention measures, public education, and preparedness efforts, including creating defensible spaces

around homes and implementing effective firefighting strategies, are crucial in mitigating the impact of wildfires in areas susceptible to these events.

## Scale, Timing and Warning Period

**Spatial Scale:** The size of forest fires can vary significantly. The size, location, spread direction, and fire intensity all have an effect on the potential for threats to public safety or social disruption. Smoke further increases the size of the impacted area.

**Timing:** The wildland fire season is April 1 to October 31. Fires are more common during the spring (before canopy cover is renewed and while there this still a large amount of dry vegetation on the forest floor) and summer (when lightning is more frequent). Both of these seasons tend to have periods of hot, dry and windy weather, which can further spread fire.

**Warning Period:** The amount of warning varies for each situation, although several days is average.

## Municipal Risk Statement

Fires that occur in storm-damaged forests are generally more intense and make firefighting efforts more difficult.

Of particular concern are fires that occur within or close to areas where homes, cottages and subdivisions are built into the forest landscape (the urban interface).

Organized forest fire protection has been active in Ontario since 1885. To support the protection of public safety and other values, the Ministry of Natural Resources and Forestry maintains a system of firefighting resources to allow appropriate response to wildland fire. The goals of the wildland fire management program are to:

- prevent loss of human life and injury
- prevent and mitigate losses alongside economic and social disruption
- promote understanding of the ecological role of fire
- use fire to benefit resource management

**Human Impacts**
Wildland fires can endanger lives when they approach populated areas. However, due to improvements in fire prediction and forest fire management, deaths due to forest fires remain uncommon in Ontario. Injuries due to wildland fires are also uncommon. There are health concerns related poor air quality and wildfire smoke.

**Social Impacts**
Evacuations may occur due to smoke even if the community is not directly threatened by the fire itself. This can cause serious disruptions in social networks and support systems.

**Property Damage**
Property is vulnerable to wildland fires and can result in substantial property damage. Buildings and structures within the path of the fire may be completely burned. Buildings that remain structurally intact after a fire has ended may have had their contents damaged due to smoke.

**Critical Infrastructure Disruptions**
Wildland fires can result in substantial infrastructure damage. Structures within the path of the fire may be completely burned. Roads, electrical lines, and other above- ground assets can be burned, as well as below-ground cable and communications infrastructure. Large networks of assets such as these are challenging to defend from fire; the strategy often employed to defend them is for wildfire services to prioritize 'values protection' on key hubs or nodes in the areas at risk.

**Environmental Damage**
Wildland fires are a natural feature of the forest ecosystem. While a forest fire may have what appears to be negative effects, these often turn out to be beneficial for the ecosystem in the long-term. Many species are adapted to fire, and some (such as jack pine) use fire to release seeds. Fire also benefits vegetation by enriching the soil with ash and allowing more sunlight and precipitation to reach the forest floor. Fire can help control invasive species (including insects, plants, and diseases) that have not evolved in areas in which fire is a natural part of the maintenance of the landscape and reducing the competition for some species.

Excessive fire over large areas may adversely impact ecosystems, wildlife, and species at risk.

Erosion and changes in water temperature caused by the loss of vegetation due to a fire can negatively impact water quality affecting cold water fish habitats.

**Economic**
Wildland fires can have a negative economic impact if they occur near communities and necessitate the evacuation of large numbers of people. Resources needed for suppression may be costly. The forestry sector is the industry most likely to be negatively impacted by wildland fires, although tourism can also be severely affected.

Perceived impacts of fire can lead to similar negative effects, even if there are no direct or immediate hazards. In July 2018 the community of Parry Sound reported a decline in tourism and cottage-related industry as a result of a significant fire. While the fire was more than 100km away from the community, the fire was widely covered in the media, and its official designation 'Parry Sound 033' led to concern about the settlement.

# Conclusion

The Municipal Risk Profile and the Hazard Identification and Risk Assessment (HIRA) process, integral components of a comprehensive emergency management program, play a pivotal role in enhancing community resilience. As a crucial step in the risk management continuum, the HIRA process identifies potential hazards and evaluates their associated risks, providing a foundation for informed decision-making.

Once the risks for each hazard are discerned, proactive measures must be implemented to reduce these risks, with particular emphasis on hazards identified as posing high and very high levels of risk. This strategic approach ensures that resources are allocated efficiently, targeting areas where vulnerabilities are most pronounced.

The wealth of data obtained through the HIRA process serves as the cornerstone for developing robust emergency procedures. These procedures are tailor-made to address the specific risks identified, equipping the municipality with a well-defined roadmap to respond effectively to potential threats. The emergency response plan, grounded in the HIRA data, becomes a dynamic tool that not only outlines immediate response actions but also guides ongoing preparedness efforts.

By translating risk assessments into actionable emergency procedures, municipalities fortify their ability to mitigate the impacts of diverse threats, fostering a safer and more resilient community. This integrated approach underscores the importance of proactive risk reduction and lays the groundwork for a comprehensive emergency management framework.