MUNICIPALITY OF
PORT HOPE

Municipality of Port Hope
Wildland Fire Management Plan

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Disclaimer

This Wildland Fire Management Plan contains both public and confidential information.

In order to prevent unauthorized access to confidential information, the following sections of this Wildland Fire Management Plan shall be withheld from disclosure except to those individuals or groups with prior permission to retrieve said information:

Appendix F: Ganaraska Forest Committee Contacts

Appendix O: Confidential Contact List

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1.0 Introduction

1.1 Context of the Wildland Fire Management Plan

It is widely recognized that the number of wildland fires occurring in Canada is on the rise. The impacts of wildland fire incidents are also increasing in severity. On October 30, 2025, Public Safety Canada issued a news release that included the following statement:

> [The year] 2025 has been the second[-]worst wildfire season in Canadian history, with more than 6,000 wildfires in nearly every province and territory, impacting communities across the country and burning over 8.3 million hectares.

In addition to an increased number of wildland fires, there is a heightened level of human activity and development in forested and agricultural areas.

On November 20, 2025, a private members' bill was introduced into the Ontario legislature. This bill is called the "Protecting Ontario from Urban Wildfires Act," and it calls for a committee to be created to assess and develop recommendations for fires that occur in wildland urban interface ("**WUI**") areas. The preamble of the Protecting Ontario from Urban Wildfires Act includes the following statement:

> Major fires in Los Angeles, Jasper and Fort McMurray, a near miss in London, England[,] and wildfires in New York City parks have all made it clear that, in a world that is getting hotter at an increasing rate, we risk confronting urban wildfires in Ontario in a way not seen in the past century.

Due to the factors noted above, the Municipality of Port Hope has recognized the need to assess its preparedness and response capabilities in regard to wildland fires. This Wildland Fire Management Plan ("**WFMP**") is a key component of that initiative.

1.2 Scope of the Wildland Fire Management Plan

This WFMP outlines strategies and tactics that are intended to help mitigate the risk to the values at risk from wildland fires in Port Hope.

The scope of the WFMP is to include information for the following objectives:

- Address the risk of wildland fire.
- Review preparedness measures.
- Identify response capacity and procedures.
- Provide wildland firefighting safety guidance.
- Strengthen public prevention and mitigation education.

1.3 Stakeholder Contributions to the Wildland Fire Management Plan

The following organizations and stakeholders provided vital information and guidance throughout the development of this WFMP:

- Port Hope Fire and Emergency Services ("**PHFES**")
- County of Northumberland
- Ganaraska Forest Conservation Authority
- Peterborough Fire Services – Dispatch Services
- Ministry of Natural Resources ("**MNR**"), specifically the Aviation and Forest Fire Emergency Services ("**AFFES**") branch
- Emergency Management Ontario

In addition to the contributions made by the stakeholders listed above, this WFMP is made possible in part by the financial support of Hydro One and its "Energizing Life" grant program.

2.0 Summary of Recommendations

2.1 Purpose of Recommendations

This WFMP recommends practical improvements that Port Hope can reasonably complete within the next five years in order to:

1) Adhere to best practices.
2) Enhance operational effectiveness.
3) Boost the safety of community residents, visitors, and businesses.
4) Augment the safety of firefighters and other emergency response personnel.

2.2 Additional Considerations

In order to provide Port Hope with a feasible implementation schedule, each recommendation in this WFMP includes the following considerations:

1) Does the recommendation have associated legislation?
2) Does Council need to approve the recommendation before it is implemented?
3) Does the recommendation need to be included in the municipal budget through the regular budgeting process?
4) When should the recommendation be implemented?
    a) Immediate: Implement the recommendation within one year.
    b) Short-term: Implement the recommendation within two years.
    c) Long-term: Implement the recommendation within five years.

2.3 List of Recommendations

Table 1 collects the 12 recommendations that are found throughout this WFMP.

Table 1. Summary of recommendations.

#	Section	Recommendation	Considerations
1	Jurisdictions, Policies, and Legislation	Port Hope should seek support from upper-tier and provincial elected officials, government ministries, and private interest groups. This support should be used to lobby for assistance in regard to wildfire management preparedness and response for the local fire departments that bear this responsibility.	Legislation: No Council approval: No Budget impact: Yes Term: Long-term
2	Fireline Safety – PPE	Port Hope Fire and Emergency Services should invest in appropriate wildland fire PPE—such as wildland fire helmets and eye protection—for its staff members (as per Firefighter Guidance Note 4-7, "Wildland fire fighting and personal protective equipment").	Legislation: Yes Council approval: Yes Budget impact: Yes Term: Immediate
3	Fireline Safety – Policy	The Port Hope Wildland Fire Management Plan should be used to help create standard operating guidelines that are specific to wildfire preparedness, response, and restoring equipment to service.	Legislation: Yes Council approval: Yes Budget impact: Yes Term: Immediate
4	Port Hope Wildland Fire Operations Guidelines – Preplanning	Ensure that supervisory staff members from Port Hope Fire and Emergency Services review Natural Resources Canada's Canadian Wildland Fire Information System link (https://cwfis.cfs.nrcan.gc.ca/en) every day during the fire season in order to determine the wildfire hazard for the Port Hope area.	Legislation: No Council approval: No Budget impact: No Term: Short-term

#	Section	Recommendation	Considerations
5	Port Hope Wildland Fire Operations Guidelines – Preplanning	Port Hope Fire and Emergency Services should explore additional options for foam delivery systems (such as nozzles and inline injectors) to add to its wildland fire trailer inventory. The delivery systems should be acquired in order to enhance wildland fire and wildland urban interface structure protection.	Legislation: No Council approval: No Budget impact: Yes Term: Short-term
6	Port Hope Wildland Fire Operations Guidelines – Assessing Fire Location	Port Hope Fire and Emergency Services should acquire the necessary tablets and data to support wildland fire responses and enable the viewing of "leafless imagery" for Port Hope without internet connectivity.	Legislation: No Council approval: No Budget impact: Yes Term: Short-term
7	Port Hope Wildland Fire Operations Guidelines – Communications	The senior staff at Port Hope Fire and Emergency Services should have cellular plans with satellite connectivity for use during cellular outages and incidents in remote areas with no cellphone coverage.	Legislation: No Council approval: No Budget impact: Yes Term: Immediate
8	Port Hope Wildland Fire Operations Guidelines – Investigations	Port Hope Fire and Emergency Services should ensure that it has a sufficient number of staff members trained to the standard of NFPA 921, *Guide for Fire and Explosion Investigations*.	Legislation: Yes Council approval: No Budget impact: Yes Term: Short-term
9	Wildland Fire and Urban Interface Structure Protection Training	Port Hope Fire and Emergency Services should allocate funding to obtain the recommended ongoing wildland fire training and equipment to support wildland fire responses.	Legislation: Yes Council approval: Yes Budget impact: Yes Term: Immediate

#	Section	Recommendation	Considerations
10	Fire Detection and Reporting	Due to the size of the Ganaraska Forest and the number of municipalities within its boundaries, standardized messaging for users of the forest should be promoted in order to improve the accuracy of wildfire reporting, as well as any other emergency that occurs in remote areas. This initiative could be accomplished through the Ganaraska Forest Committee.	Legislation: No Council approval: No Budget impact: No Term: Long-term
11	Prevention and Mitigation	Port Hope should establish a FireSmart committee to create and implement a FireSmart program that adheres to the practices outlined in the Port Hope Wildland Fire Management Plan.	Legislation: No Council approval: No Budget impact: No Term: Short-term
12	Prevention and Mitigation	Port Hope should seek to fund and hire a summer student position to facilitate the development and delivery of a FireSmart program (from 2027 to 2028).	Legislation: No Council approval: Yes Budget impact: Yes Term: Short-term

3.0 Jurisdictions, Policies, and Legislation

3.1 Establishing and Regulating By-law

As of the date of this WFMP, the establishing and regulating by-law for Port Hope is By-Law 43/2023: A By-Law to Establish and Regulate a Fire Department for the Municipality of Port Hope under the Fire Prevention and Protection Act ("**FPPA**").

By-law 43/2023 is the governing document for PHFES, and it outlines the level of service and the core services that PHFES is approved/expected to provide.

The following three concepts are essential to developing a WFMP under the FPPA:

1. **Role of the Fire Chief:** The Fire Chief is responsible for overseeing the delivery of fire protection services and is accountable to the Municipal Council. The Fire Chief provides expert advice to Council on:
    a. The services required to meet legislative requirements
    b. The services needed to address the specific risks and needs of the community
2. **Role of Municipal Council:** Council acts as the governing body and is responsible for:
    a. Deciding which fire protection services will be provided
    b. Establishing the level of service expected from the fire department. These decisions are based on local priorities, risks, and available resources.
3. **Fire Protection Services:** Fire protection services refer to the programs and activities a municipality is required to establish, including:
    a. Public education on fire safety
    b. Key components of fire prevention
    c. Any additional services (response) deemed necessary according to the municipality's needs and circumstances

In summary, the Fire Chief provides Council with recommendations about the types and levels of fire protection services that are needed in the community. Based on the Fire Chief's advice, Council sets a level of service for the fire department.

Once a level of service is determined, the Fire Chief is responsible for ensuring the approved services are delivered. This duty involves defining a range of programs and responsibilities that support community safety.

3.1.1 Services Provided by Port Hope Fire and Emergency Services

In By-law 43/2023, Schedule A lists the approved services and programs that PHFES shall provide. Excerpts about these services read as follows:

- A.1 Emergency Response, the Fire Department identifies under A.1.5 Grass, Brush, and Forestry Firefighting Services: Service shall be provided and best efforts shall be exercised to conform to NFPA 1143, *Standard for Wildland Fire Management*.
- B1 Fire Prevention and Public Education subsection B.2.2 Public Education Services, B.2.3 Fire Investigation Services and B.2.4 Risk Assessment Services list the required actions based on the needs of Wildland Fire risk.
- B.5 Training and Education identifies the responsibility for the Fire Department to provide training for Wildland Firefighting.

3.1.2 Ontario Association of Fire Chiefs Guidance Note Wildland Fire Fighting

As of this WFMP, the Section 21 Committee of the Ontario Association of Fire Chiefs has released a draft guidance note for comment relating to wildland firefighting.[1] The guidance note references measures for employers to take in order to ensure firefighter safety during wildland fire suppression activities, as well as operational considerations that a fire department should have in place.

This WFMP meets and exceeds many of the points identified in the draft guidance note. In the areas of training and the implementation of a FireSmart program, PHFES has plans in place to achieve these recommendations in the near future.

3.2 Mutual Aid Agreements

Under section 7 of the FPPA, a mutual aid agreement allows a participating fire department to request assistance from a neighbouring fire department (provided the fire department is authorized to participate in an agreement as approved by the Ontario Fire Marshal).

As of this WFMP, PHFES participates in the Northumberland County Mutual Aid Program. PHFES also has a mutual aid agreement with Clarington Fire and Emergency Services and Cavan Monaghan Fire and Emergency Services.

Collectively, the current mutual aid agreements were established in order to address incident response in the northern portion of Port Hope, which includes the Ganaraska Forest.

[1] https://www.oafc.on.ca/sites/default/files/Section%2021/Guidance%20Notes/GN%20%23-%23%23%20Wildland%20Firefighting.pdf

Figure 1 shows the process PHFES uses to request mutual aid. (For reference purposes, “PFS” denotes Peterborough Fire Services, “NH” denotes Northumberland, and “MA” denotes Mutual Aid.)

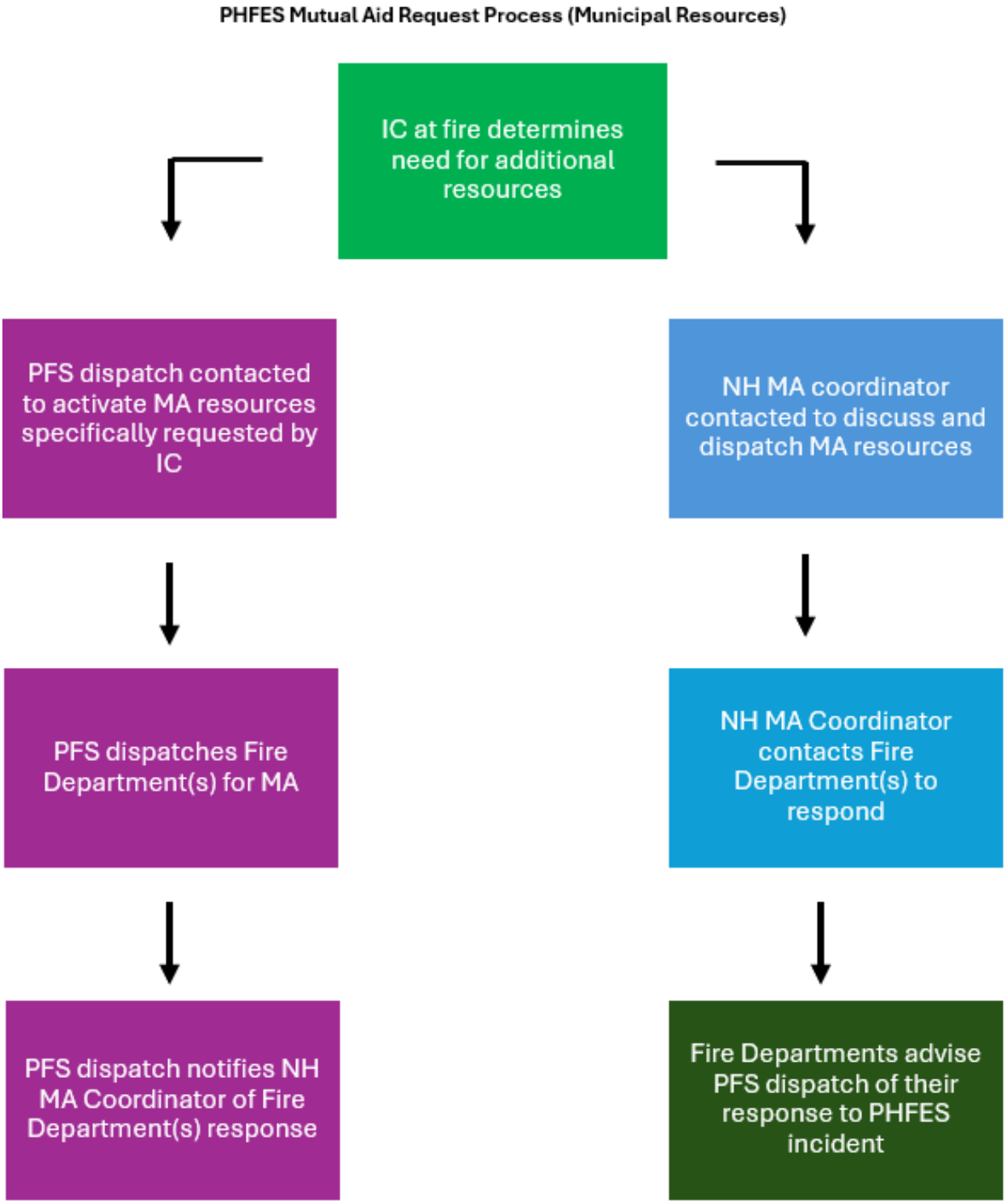


Figure 1. Mutual aid request process for Port Hope Fire and Emergency Services.

3.3 Automatic Aid Agreements

An automatic aid agreement is more formal than a mutual aid agreement because it permits a fire department to be dispatched automatically to another municipality.

As of this WFMP, Port Hope has two automatic aid agreements. These agreements are with the Hamilton Township Fire Department and Clarington Fire and Emergency Services.

The current automatic aid agreements allow the participating fire departments to provide initial and supplemental responses to fires, rescues, and other emergencies within each other's municipalities.

3.4 Conservation Areas

Conservation authorities are governed by the Conservation Authorities Act, which is administered by the MNR.

A conservation authority can prohibit open-air burning if there is a hazard (as per O. Reg. 688/21: Rules of Conduct in Conservation Areas).[2] All fire responses for conservation areas are deemed the responsibility of local municipalities.

Recommendations

1. Port Hope should seek support from upper-tier and provincial elected officials, government ministries, and private interest groups. This support should be used to lobby for assistance in regard to wildfire management preparedness and response for the local fire departments that bear this responsibility.

3.5 Aviation, Forest Fire and Emergency Services Branch

The AFFES branch of the MNR provides forest fire management services for Ontario. As of this WFMP, the AFFES uses the 2014 Wildland Fire Management Strategy as the policy that guides its approach to wildland fire management.[3]

The AFFES is responsible for creating provincial fire management policies and strategies. For example, the AFFES created the following policies:

- Fire Management South of the Fire Regions AFFES FM:2:04 (to guide fire management outside the fire region)

[2] https://www.ontario.ca/laws/regulation/210688

[3] https://www.ontario.ca/page/forest-fire-management

- Ontario Parks PAM 7.02; AFFES: FM:2:12 (to govern provincial parks and conservation reserves)

AFFES documentation relating to the polices listed above provides the following statements:

- Municipalities are responsible for appropriate fire response on all forest fires to protect life, property and infrastructure in accordance with the Fire Protection and Prevention Act.
- OMNR will provide support to municipalities in the event of extraordinary wildland fire situations on a cost-recovery basis when requested. If OMNR is requested to assist a municipality, the cost of OMNR suppression activities will be charged to the municipality.
- Provincial Parks will negotiate fire protection support with their local municipality.
- Fire suppression resources will be positioned adjacent to this Zone according to the anticipated fire load.

The cost associated with MNR wildland fire assistance outside the fire region is outlined in Appendix K.

The AFFES assists municipalities outside the fire region by providing basic wildland firefighter training materials. For example, the AFFES provides the following training:

- SP103 Fire Department Wildland Fire Fighting
- SP230 Wildland Fire Strategies and Tactics for Fire Departments (through the Ontario Association of Fire Chiefs)

Section 11.1 of this WFMP outlines a plan that PHFES can use to obtain the training listed above.

Figure 2 shows the process that PHFES uses to request assistance from the MNR when responding to a fire located outside the fire region.

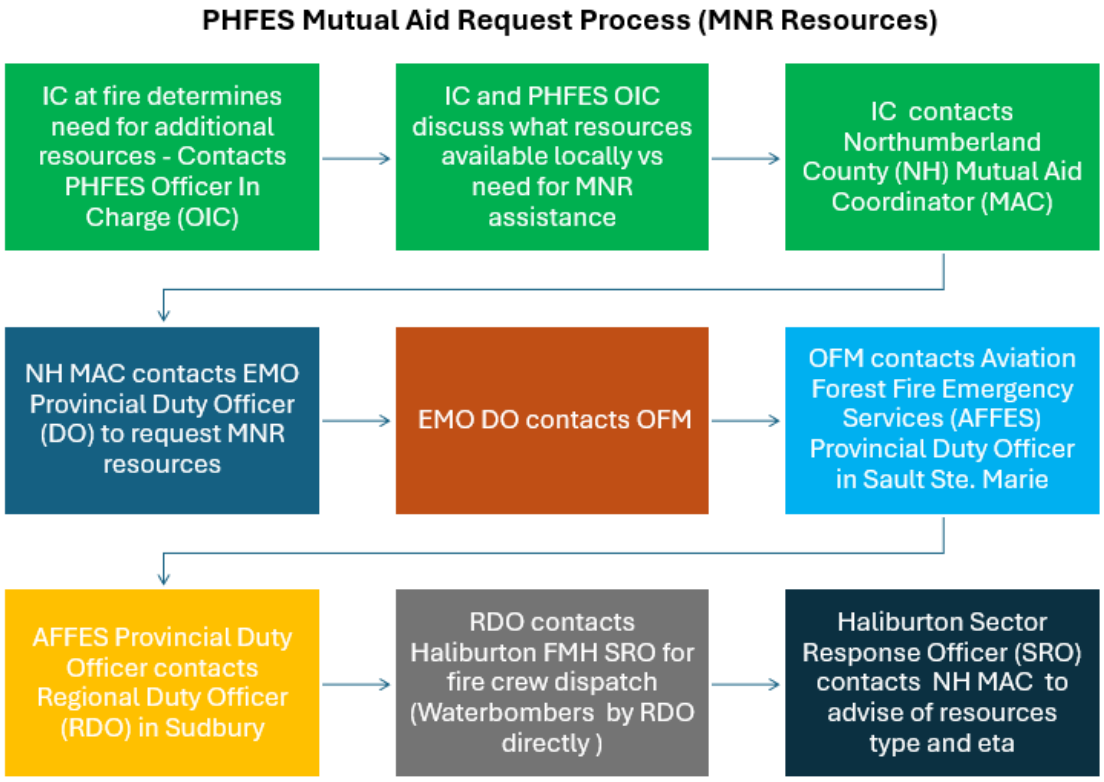


Figure 2. Process for requesting assistance from the Ministry of Natural Resources.

4.0 Conditions Impacting Wildland Fire Behaviour

4.1 Fire Weather

The weather has a major impact on all emergency responses. In the case of a wildland fire, weather conditions dictate how the fire will behave and which types of environmental conditions firefighters will need to endure.

Understanding the effects of weather on incident responses is critical to firefighter safety. Weather conditions should also be considered when developing a plan to attack a wildland fire.

The following subsections provide information about various components that influence "fire weather."

4.1.1 Temperature

Temperature is the first weather condition that should be considered when responding to a wildland fire. Vegetation and soil in areas that receive direct sunlight heat up and dry out more quickly than those in shaded areas. Working in areas with direct sunlight and higher temperatures causes fatigue to set in more rapidly.

4.1.2 Relative Humidity

Relative humidity ("**Rh**") is the amount of water vapour held by the air compared to the amount it could hold. The level of Rh is expressed as a percentage.

When discussing Rh, the term "dew point" is used. The dew point is the temperature at which air must be cooled to become fully saturated with water vapour (100 per cent Rh), causing it to condense into liquid water (such as rain in the summer or fog in the spring and fall).

During the Ontario wildland fire season, Rh values below 30 per cent represent a concern if the temperature rises to a similar value. For instance, if the Rh is 30 per cent and the temperature is 30°C, a condition called "crossover" occurs, and extreme fire behaviour is likely.

4.1.3 Wind

Wind, defined as "air in motion," is primarily caused by a difference in pressure between air masses. Other factors (such as daytime heating) can also promote wind behaviour.

Local geographic features (such as large bodies of water, topography, and open versus heavily forested areas) contribute to wind patterns. Human-caused features (such as pipelines or high-tension utility corridors) can also influence wind patterns.

Wind is the most rapidly changing weather phenomenon. Variations in wind speed and direction significantly affect a fire, and they can create dangerous situations for firefighters. An example is when a thunderstorm passes near—but not—over a fire. A nearby thunderstorm influences fire spread and intensity through its downdrafts, which are felt at the Earth's surface.

The time of day is another factor affecting wind conditions. Increased heat on the Earth's surface causes air to rise, which is replaced by cooler surrounding air.

4.1.4 Air Masses

There are differences in air pressure on the Earth's surface. Air masses are generally identified as high or low pressures. Each of these air masses is thousands of square kilometres in size and occurs in specific regions.

In Ontario, air masses in the summer typically travel north from the southern United States (such as the Gulf of Mexico) or west from the Pacific Ocean across the North American prairies.

High- and low-pressure systems have unique characteristics. In high-pressure systems, the air is dry and moves clockwise. Low-pressure systems have moist air that moves counterclockwise within the system. The area between air masses is called a front, which can produce higher winds and violent weather.

Summer air masses approaching Southern Ontario typically create predictable situations. For instance, a low-pressure system causes the wind to shift to the east-southeast, accompanied by rising Rh levels and increasing cloud cover. A high-pressure system will produce a wind shift to the south-southwest, lower Rh levels, and less cloud.

4.1.5 Daily Diurnal Weather Effect

Weather conditions change throughout the day and night due to heating and cooling. Changes in temperature also influence Rh and wind patterns.

In most cases, the Rh increases as evening approaches and winds diminish. However, there are instances where the Rh level and amount of wind do not significantly change throughout the evening. This situation creates a phenomenon where fire behaviour can remain challenging throughout the night.

4.2 Fuel Types

4.2.1 Fuel Type Classification

The Canadian Forest Fire Danger Rating System ("**CFFDRS**") classifies 16 different fuel types, rating them based on their ability to ignite, sustain, and spread wildland fires.[4]

Provincial wildland fire response agencies use these fuel types as the baseline for predicting fire intensity and growth in boreal forests. Using the CFFDRS, fire behaviour specialists can assess risk and develop growth/intensity models of wildland fires.

The AFFES has used GIS technology to map forest-type data for Ontario municipalities, identifying potential forest-hazard classifications for wildland fires.

An urban interface wildland fire risk assessment for Port Hope can be found in section 10 of this WFMP.

4.2.2 Agricultural Lands

Maps detailing wildland fire risks typically do not include agricultural lands. The CFFDRS does not include an agricultural fire hazard fuel type other than grass (which is classified as O1).

The impact of grass on wildland fires is often underestimated. Grass fuels have claimed more wildland firefighter lives than any other fuel type. When weather conditions change, as they do throughout the day, a grass fire will go from smouldering to extreme intensity in minutes.

Recently, additional work has been done to better model O1 grass fire intensity and growth.[5] These models can be applied to other crops that are similar to grasses (such as wheat, rye, and oats).

As of this WFMP, there is no fuel type classification for crop types that ripen in the fall and pose a risk after harvest (such as corn). The classification for immature jack pine (C4) is an extreme fuel type and may provide some comparison. Consideration for the factors related to agricultural land has been incorporated into the urban interface wildland fire risk assessment conducted for Port Hope (see section 11 of this WFMP).

[4] https://cwfis.cfs.nrcan.gc.ca/en/background/fuel-types?fuel=c1

[5] https://ostrnrcan-dostrncan.canada.ca/entities/publication/6968cc8f-20b5-4a0c-a967-bff9540a22dd?_gl=1*lchbhm*_ga*MTY1NTM0NDE0LjE3NTk2OTk4Mjk.*_ga_C2N57Y7DX5*czE3NzEzNTM3NDckbzExJGcwJHQxNzcxMzUzNzQ3JGo2MCRsMCRoMA.

According to data from the Ministry of Agriculture, in 2021, Port Hope had 142 farms covering 28,901 acres. Of the reported farmland, 7,046 acres were planted for corn, and 4,273 acres were for hay. Approximately 29 per cent of the farms reported an income over $100,000.00, and 11 per cent had an income over $500,000.00.

4.3 Fire Weather Indices

Twice a day, weather observations are used to create values that guide fire service professionals and the public regarding the wildland fire hazard in their area. These values are used to calculate fire intensity and growth using the 16 fuel types classified by the CFFDRS.

Figure 3 illustrates the Canadian Forest Fire Weather Index System.[6]

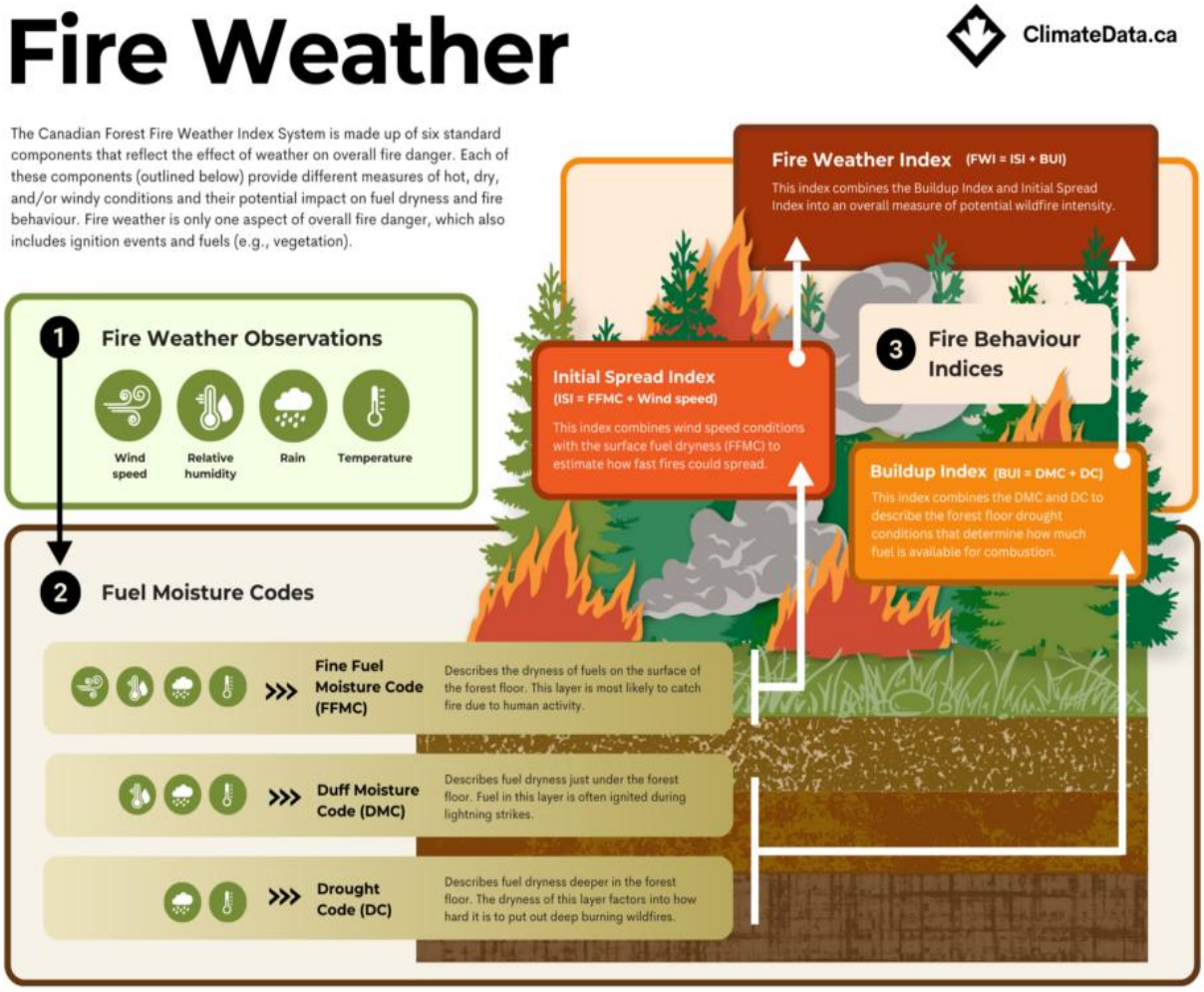


Figure 3. Canadian Forest Fire Weather Index System.

[6] https://climatedata.ca/resource/understanding-fire-weather-and-climate-change-basics/

4.4 Fire Behaviour Rating System

In Canada, the CFFDRS is the standard for determining forest fire risk. The CFFDRS is used to identify the following risks:

- the likelihood of fire ignition
- the fire behaviour for specific fuel types
- the level of difficulty related to controlling fires

The risks listed above are evaluated using a range of qualitative and quantitative factors.

Two key factors for developing the proper strategy and tactics for fighting wildland fires are the predicted fire intensity class ("**FIC**") and the build-up index ("**BUI**"). More information about the FIC and BUI is provided in the following subsections.

4.4.1 Fire Intensity Class

The FIC helps firefighters identify the expected flame type on the fire's edge.

Table 2 lists the six FICs used by the AFFES. The information in the table is adapted from the SP230 student reference notes on fire behaviour that were developed by the MNR (see Appendix P).

Table 2. Wildfire intensity classes.

Fire Intensity Class	Frontal Fire Intensity (kW/m)	Surface Head Fire Flame Length (m)	Surface Head Fire Flame Height (m)	Type of Fire & Fire Suppression Difficulty	Fire Weather Index (FWI)
1	< 10	< 0.2	< 0.1	Smouldering sub-surface or creeping surface fire. Firebrands and going fires tend to be virtually self-extinguishing unless drought conditions prevail, in which case fires will burn deeply and extensive mop-up is generally required. Hand tools, back pumps, and pump and hose can be used for suppression.	0 – 3
2	10 – 500	0.2 – 1.4	0.1 – 1.0	Low vigour creeping surface fire. Direct manual attack at the fire's head or flanks by firefighters with hand tools or power pumps is effective. Constructed fireguard should hold.	4 – 13
3	500 – 2,000	1.4 – 2.6	1.0 – 1.9	Moderately vigorous surface fire. Hand-constructed fireguards are likely to be challenged. Heavy equipment (bulldozers, water bombers, and helicopter with bucket) and power pumps are generally successful in controlling the fire.	14 – 23
4	2,000 – 4,000	2.6 – 3.5	1.9 – 2.5	Highly vigorous surface fire or intermittent crown fire. Control efforts at the fire's head may fail. Spotting should occur.	24 – 28
5	4,000 – 10,000	>3.5 – 5	>2.5 – 4	Intermittent to continuous crown fire. Very difficult to control. Suppression action must be restricted to the fire's flanks. Indirect attack with aerial ignition may be effective.	29 – 49
6	>10,000	>5	>4	Continuous crown fire. "Blow-up" type fire run with violent physical behaviour probable. Suppression actions should not be attempted until burning conditions become more favourable.	50+

Figure 4 illustrates the six levels of FIC in the Canadian Fire Intensity Ranking System.

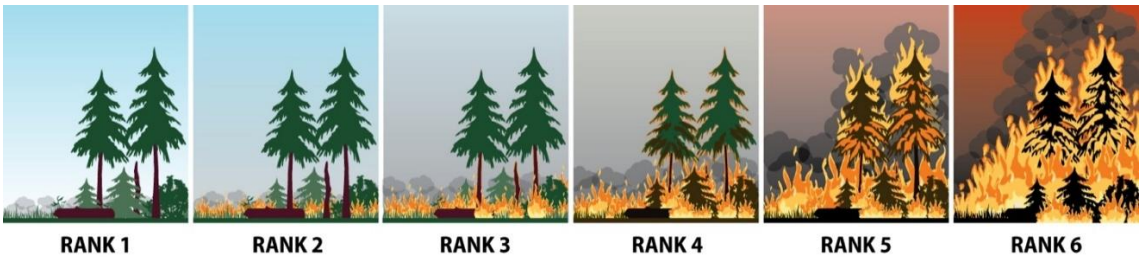


Figure 4. Canadian Fire Intensity Ranking System.[7]

Each of the FIC ranks requires different fire suppression tactics. For instance, FIC 1 and FIC 2 fires are relatively easy to contain with an adequate water supply and nozzle pressure when the rate of spread is below 1 metre per minute.[8]

FIC 3 fires will challenge ground firefighters using hose lines. The difficulty in fighting a rank 3 wildland fire is due to increased spotting caused by the torching of individual trees and clusters of trees outside the fire's edge. The rate of spread can also increase beyond that at which a hose line can be established.

An Incident Commander ("**IC**") should consider a spread rate above 1 metre per minute as potentially challenging for ground crews with nozzles, given the rate of progression versus fire growth in moderate to heavy fuels. When high to extreme burning conditions exist (as characterized by FIC ranks 4, 5, and 6), ground suppression tactics are likely to fail.

4.4.2 Build-Up Index

The BUI is a numerical rating of the amount of fuel available for combustion. The BUI is derived from two other numerical values, the Drought Code and the Duff Moisture Code. The BUI values range from 0 to over 90, covering six levels.

The BUI provides personnel with guidance about how difficult a wildland fire will be to extinguish. An IC must consider the BUI value of the forest when developing an incident action plan ("**IAP**").

As the local conditions move into the high (and worse) extreme levels, a fire becomes much more labour-intensive to extinguish. More extreme fires mean nozzle crews move more slowly and require more water. Time objectives also increase, and additional resources are required.

[7] https://www2.gov.bc.ca/gov/content/safety/wildfire-status/wildfire-response/about-wildfire/wildfire-rank

[8] Natural Resources Canada: Fire behaviour. https://natural-resources.canada.ca/forests-forestry/wildland-fires/fire-behaviour

Figure 5 illustrates how different fuels can be arranged in a forest and how they affect fire spread.[9]

Figure 5. Example of the fuel arrangement in a forest.

4.5 Components of a Fire

Fire behaviour is rarely uniform along the entire edge of the fire. Fire growth is typically elliptical, but wind, changes in fuels, and topography contribute to the shape of a fire.

In simple terms, a fire has the following three parts:

1. **Head:** A fire's head is the portion of the fire that has the greatest rate of spread.
2. **Rear:** The rear of the fire is usually opposite to the head when wind direction has remained relatively constant through the burning period. (The point of ignition is generally located at the rear of the fire.)
3. **Flank:** The flanks are the sides of the fire between the rear and the head. These areas are usually referred to by compass direction (such as northwest flank and southeast flank) or—on a simple elliptical fire—as right and left (when looking at the fire from the rear).

Fire behaviour is greatest on the head, and it diminishes toward the rear. Fire spread accelerates in areas with specific fuel types and slopes, creating "fingers." The areas between the fingers, where there is less fire behaviour, are termed "bays."

[9] North West Fire Science Consortium Fire Facts: https://www.eoas.ubc.ca/courses/atsc413/fire_basics/images/FIREFACTS_FUELS.pdf

A spot or jump fire is a new part of the fire that occurs outside the main body of the fire due to burning embers being transported by the wind and thermal updrafts.

Figure 6 illustrates the parts of a wildland fire.[10]

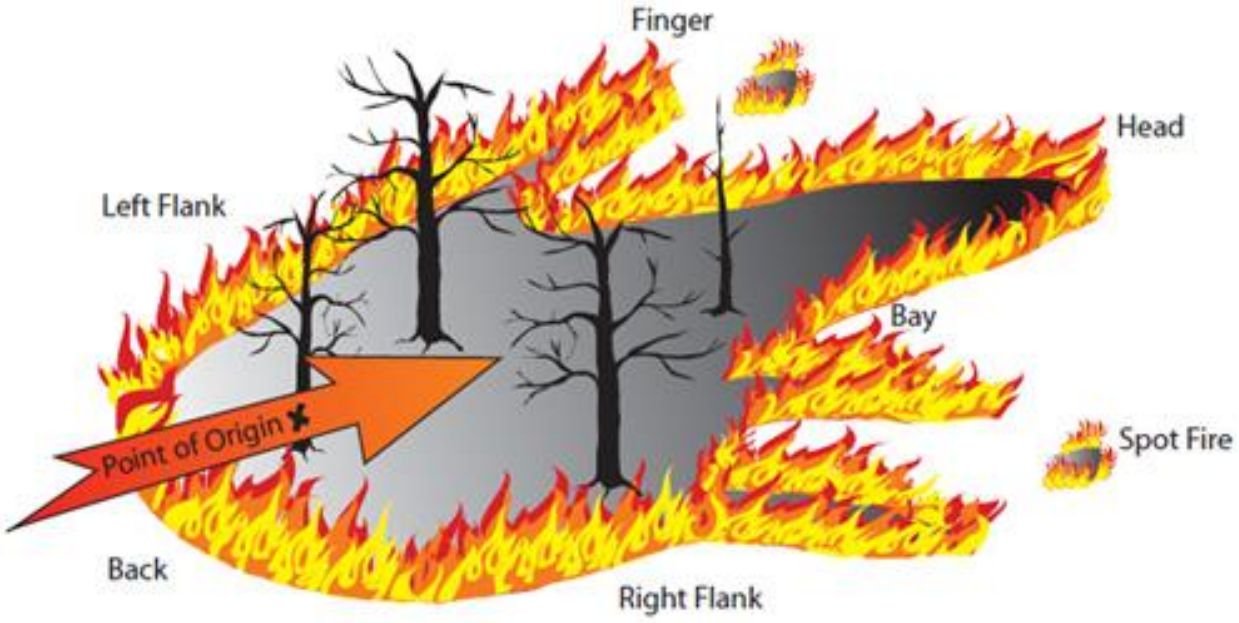


Figure 6. Parts of a wildland fire.

[10] NS DNR Media Guide to Forest Fires (2009): https://waterfrontmediahfx.the902hxir.ca/94502-2

5.0 Fireline Safety

5.1 Overview of Fireline Safety

Wildland fire safety is the responsibility of every firefighter involved in an incident. Successful wildland fire safety incorporates the following three components:

1. Knowledge
2. Personal protective equipment ("**PPE**")
3. Policy

More information on these three areas is provided in the following subsections.

5.1.1 Knowledge

Knowledge of forest fuel types and how fires ignite, spread, and behave under certain weather conditions is the first step in fireline safety.

Wildland fire agencies commonly use the acronym "LACES" to address the key areas of hazard assessment that need to occur on every wildland fire response. LACES stands for the following concepts:

- Lookouts
- Anchor points
- Communications
- Escape routes
- Safety zones

All of the areas listed above must be addressed in a wildland fire IAP. Using the LACES concept before and during fire responses will help save the lives of firefighters.

5.1.2 Lookouts

Situational awareness is critical in any emergency response. Firefighters responding to a wildland fire in a forest, open field, or along the urban interface can only assess the situation that is visible to them.

The ability to observe the entire fire's behaviour, as well as the incoming weather, is important for firefighter safety. Smoke and forest cover obscure approaching weather from view. However, in some places, the topography can allow a trained firefighter to be posted in a position where they can survey the fire and its surroundings. In Port Hope, Richardson Lookout (near Garden Village and Fire Station 3) is an example of a vantage point.

Recent technological advances have enabled firefighters to observe fire behaviour using an aerial drone operated from the ground. However, drones are often limited by battery life unless tethered to a power source. In Port Hope, PHFES has established connections with several external agencies to aid in drone operations, including other emergency service providers and large companies.

5.1.3 Anchor Points

The location from which firefighters begin ground suppression activities when fighting a wildland fire is called an anchor point. Anchor points must be positioned in areas that are safe or can be made safe. Typically, an anchor point is positioned at the rear of a fire. If ground suppression begins on a fire's flank, a ground crew should start from a suitable water source or a land feature that will not burn.

Starting a hose line or fuel break from a safe location prevents a fire from flanking the ground crew's position and putting the firefighters in jeopardy. Many firefighters and fire apparatus have been lost to wildland fires because they were deployed to areas that did not provide adequate protection.

5.1.4 Communications

Proper communication is essential to ensuring a safe and effective response to any emergency. In order to communicate successfully during a response, every responder must be familiar with the IAP.

The way in which responding personnel communicate with each other during a response is also critical. Handheld radios are the most common tools for communication. Specific radio frequencies are designated by either area, team, or special operations. Responding personnel need to have an established check-in routine, criteria for special broadcasts, and protocols for radio failure.

Changes in weather during a wildland fire response often require making an all-channel broadcast. An all-channel broadcast should be followed by each station acknowledging the broadcast in a predetermined order.

If a communication failure occurs, firefighters should retreat from the fireline. Firefighters should use escape routes that lead to locations that provide a means to re-establish communications. Alternatively, personnel should hold in a known safety zone until the communication issue is corrected.

5.1.5 Escape Routes

The most common escape route from a wildland fire is along the hose line. Firefighters can follow the hose line back to a water source when pumping from a body of water. Similarly, the hose line can lead firefighters to their truck, allowing them to drive away.

Vehicles that are intended to offer a means of escape must be parked in such a way as to make leaving easy. Hazards along a vehicle's escape route must be accounted for, such as overhead wires, stretches of continuous conifer fuels, and narrow crossings that may become obscured by smoke and complicate navigation.

Ground crews must always consider the surrounding topography and forest fuel types when choosing an escape route, either on foot or by vehicle. Travelling uphill is hazardous because the rate of fire spread and intensity increase. Thick conifer forests (such as a stand of Christmas trees) are difficult to navigate on foot and can also increase the rate of fire spread/intensity, making roads unpassable. In certain forest conditions (such as a blowdown), it is standard practice to use chainsaws to clear the path of obstructions so firefighters can easily navigate (especially when a wind shift creates smoke conditions that reduce visibility).

An IAP must include more than one escape route. It is critical for response personnel to know the locations of natural and human-made openings that are perpendicular to the fireline and its direction of spread. All responders heading into the fire must know where the escape routes are located and which safety zones are connected to those routes.

5.1.6 Safety Zones

A safety zone is a location where firefighters can take refuge if the conditions of a wildland fire change. An IAP should identify safety zones that firefighters can use if the fire's direction of spread changes or if the fire breaks out and flanks the area where firefighters are working.

When determining suitable safety zones, the IC should consider areas where fire behaviour is minimal or absent. The size of the safety zone should be at least four times the expected flame height.

Ideally, safety zones are not located in the path of the fire, and they are free of smoke and falling embers. However, a safety zone may not meet those criteria. As such, wet areas (such as marshes and bogs) may provide enough change in forest fuel types to offer safety, provided firefighters can get far enough away from the tree line without having to swim.

Railway lines can offer unique access to the centre of large marshes, which provide a strong safety zone. In extreme cases, firefighters have used low-intensity sections of the fireline to pass into the burnt centre of the fire in order to escape the fire's heat and intense smoke.

The centre of a fire is not considered a safety zone. Rather, moving into the burnt centre of a fire is a course of action only to be taken when there are no other options.

5.1.7 Fireline Safety – Environmental Concerns

5.1.7.1 Environmental

Working outdoors exposes response personnel to a variety of hazards that are common in rural areas, such as insects, animals, vegetation, and terrain.

Insects

Insects such as the black-legged tick (also known as a deer tick) can transmit Lyme disease or Anaplasmosis.[11] Ticks thrive in moist, shaded areas, especially with tall grasses present. Preventing tick bites involves wearing light-coloured pants that are closed/sealed at the bottom, eight-inch-high boots, and long-sleeve shirts.

It typically takes 24 hours or more for a tick to transmit a disease. As such, personnel working outdoors should conduct a visual self-examination for ticks at the end of each day. Clothing should be treated with high heat by washing in hot water or placing it in a dryer for 15 minutes on the high setting. There are also repellents (such as permethrin) that can be applied to clothing to help repel ticks.[12]

Figure 7 shows an example of a black-legged tick. Figure 8 shows black-legged ticks at various stages of feeding.

Figure 7. Example of a black-legged tick.[13]

[11] https://www.publichealthontario.ca/en/Diseases-and-Conditions/Infectious-Diseases/Vector-Borne-Zoonotic-Diseases/Lyme-disease

[12] https://www.canada.ca/en/public-health/services/publications/diseases-conditions/permethrin-treated-clothing.html

[13] https://www.ontario.ca/page/tick-borne-diseases#section-1

Figure 8. Black-legged ticks at various stages of feeding.[14]

Animals

Most animals will flee at the sound or sight of humans. Occasionally, rather than fleeing, an animal may become aggressive. For example, an animal may act aggressively to protect their young or when surprised. The worst case is that the animal is sick and seeks to attack, no matter the circumstance.

Understanding the basics of dealing with predatory animals reduces the risk of being harmed. For example, if confronted by a bear, the MNR recommends taking the following actions:

1. Back away slowly while keeping the bear in sight.
2. Make loud noises (such as using bear whistles).
3. Leave behind any food in hand (or food that is creating an odour).

In addition to the steps above, remember: When confronted by a bear, never run or climb a tree.

Vegetation

Poison ivy is a low-growing plant that can cause a skin rash. Poison ivy is often found in clusters across a range of site types (both moist and dry) throughout Ontario.

Poison ivy also has a surface oil that is harmful to humans. The oil can be absorbed into clothing or directly into the skin. When burnt, the oil releases toxic smoke, which can cause serious adverse reactions if inhaled.

In order to prevent the hazards posed by poison ivy, personnel should know how to identify the plant visually in order to avoid contact. Figures 9 and 10 show examples of the poison ivy plant.

[14] Ibid.

Figure 9. Example of poison ivy leaves.[15]

Figure 10. A cluster of poison ivy.[16]

Terrain

Responding to a wildland fire can involve navigating various terrain types. For example, moist clay soils or moss on rocks located on slopes present a significant fall hazard. Increased fatigue or smoky conditions can heighten the risk posed by terrain.

Ground crews may travel through the forest away from existing trails. Stepping over or under fallen trees while carrying a hose, hand tools, a chainsaw, or refreshments presents a challenge.

Firefighters need to know how to pace themselves, survey the forest for all types of hazards, and ensure their footing is secure as they go.

[15] https://www.ontario.ca/document/weed-identification-guide-ontario-crops/poison-ivy

[16] Ibid.

5.1.7.2 Wildland Fire Smoke

In recent years, the hazards associated with wildland fire smoke have received an increased amount of attention.

As of this WFMP, the Canadian Standards Association is developing occupational health and safety requirements for workers engaged in wildland firefighting.[17] The organization is also developing a standard for the use of PPE.[18]

The Province of Ontario directs outdoor workers to wear an N95 (or a better mask) when smoke levels warrant the use of this kind of PPE.[19] An N95 mask provides some protection against fine particulate matter (PM2.5) associated with wildfire smoke.

The Center for Disease Control and Prevention provides the following statement defining wildland fire smoke:

> Wildfire smoke is a mixture of gases, vapors, and particles, some so small they can only be seen with a microscope, that can irritate your eyes, nose, throat, and lungs, causing coughing, wheezing and difficulty breathing. Some people, such as children, people with asthma, chronic obstructive pulmonary disease (COPD), or heart disease, and pregnant women are at higher risk for health problems from wildfire smoke.[20]

The Center for Disease Control and Prevention also states the following regarding the use of N95 respirators:

> A NIOSH Approved® respirator (e.g., N95® or P100®) can provide workers protection from breathing in harmful substances, including wildfire smoke, ash, and very small particles. Most people refer to these as “masks.” While they may resemble other masks, these respirators are designed to form a seal to the face and have filter material with an electrostatic charge. Because of their design, they can filter out PM2.5 particles (particulate matter with a diameter of less than 2.5 micrometers), smoke, or ash particles before workers breathe them in.[21]

[17] https://scc-ccn.ca/standards/notices-of-intent/csa-group/management-occupational-health-and-safety-needs-workers

[18] https://scc-ccn.ca/standards/notices-of-intent/csa-group/personal-protective-equipment-ensembles-workers-engaged

[19] https://www.ontario.ca/page/wildfire-smoke-and-air-quality-health-reference-document

[20] https://www.cdc.gov/niosh/bulletin/2025/wildfire-smoke.html#:~:text=A%20NIOSH%20Approved%C2%AE%20respirator,before%20workers%20breathe%20them%20in.

[21] Ibid.

As of this WFMP, the MNR does not mandate the wearing of masks for its firefighting staff. However, the MNR is conducting research into the level of smoke to which its firefighters are exposed.

In Port Hope, PHFES provides its staff members with NIOSH-approved P100 respirators.[22] The staff members may voluntarily use the respirators while responding to wildland fires.

5.2 Personal Protective Equipment

According to Firefighter Guidance Note #4-7, "Wildland fire fighting and personal protective equipment," heat stress is a major cause of injury during wildland firefighting.[23] As such, fire departments must provide firefighters with appropriate PPE for specialized tasks.

It is important to note that the bunker gear used to protect firefighters during a structural fire is a hindrance to them during wildland fire suppression. A structural firefighting ensemble (including helmets, rubber boots, and gloves) can increase fatigue and heat stress if worn for extended periods. The PPE for wildland fires is significantly different from a structural firefighting ensemble. For instance, the clothing is lighter and designed for breathability, making it suitable for extended hours of working outdoors in the heat.

The MNR has an internal policy regarding PPE for its firefighters. The policy is linked to the Canadian Standards Association standards related to eye, helmet, footwear, and face protection.

NFPA 1950, *Standard on Personal Protective Equipment for Technical Rescue Incidents, Emergency Medical Operations, and Wildland and Urban Interface Firefighting* (2025) also outlines the recommended technical standards for various PPE used by structural firefighters for wildland firefighting purposes.

In Port Hope, PHFES provides its staff members with wildland firefighting coveralls for protection purposes. Coveralls are a better option when firefighters work outdoors in hot conditions for extended periods and perform physically demanding work. PHFES is researching options for more suitable eye and head PPE for firefighters working outdoors.

[22] https://www.ontario.ca/document/firefighter-guidance-notes/4-9-respiratory-protection-program

[23] Ministry of Labour, Immigration, Training and Skills Development, "Firefighter Guidance Note #4-7: Wildland fire fighting and personal protective equipment." https://www.ontario.ca/document/firefighter-guidance-notes/4-7-wildland-fire-fighting-and-personal-protective-equipment.

Recommendations

2. Port Hope Fire and Emergency Services should invest in appropriate wildland fire PPE—such as wildland fire helmets and eye protection—for its staff members (as per Firefighter Guidance Note 4-7, “Wildland fire fighting and personal protective equipment”).

5.3 Policy

PHFES staff members are governed by the policies set out by the Municipality of Port Hope, as well as other legislation (such as the FPPA).

5.3.1 Standard Operating Guidelines

PHFES has developed standard operating guidelines to direct its staff members. This WFMP is intended to complement those internal policies and guidelines.

During wildland fire operations involving MNR resources, responding personnel will follow the MNR Interagency Response Operating Guidelines. Appendix E details the requirements for interoperability.

Recommendations

3. The Port Hope Wildland Fire Management Plan should be used to help create standard operating guidelines that are specific to wildfire preparedness, response, and restoring equipment to service.

6.0 Wildland Fire Strategies and Tactics

6.1 Overview of Wildland Fire Strategies

Wildland firefighting strategies can be grouped into the following three types:

1. Direct attack strategies
2. Indirect attack strategies
3. Value protection strategies

A successful wildland fire IAP may involve one or more of the strategies listed above. Weather, fuel types, fire behaviour, and resource availability will guide the IC in deciding which strategy and tactics to choose.

6.2 Direct Attack Strategies

A direct attack is any suppression action taken on a fire's edge. A strategy for direct attack can involve partial or complete fire containment. The availability of water—in relation to fire size, fuel type, and behaviour—will influence the decision to partially or fully contain the fire.

6.2.1 Nozzle Crew Tactics

Nozzle Crew Size

A nozzle crew can consist of two, three, or four persons. It is recommended that a nozzle crew have at least three people for an initial attack on a wildland fire.

A three-person nozzle crew is organized in the following way:

- The first person operates the nozzle.
- The second person handles the hose behind the nozzle person.
- The third person handles the loop in the hose and lays out additional hose (as required).

The members of the nozzle crew can rotate positions in order to return to the truck to get additional bags of hose.

A four-person nozzle crew can typically contain a wildland fire with an FIC rank of 3 or lower in moderate forest fuels up to 1 hectare (2.5 acres) in size (or six ice rinks). A fire that meets these criteria would have approximately 400 metres (1200 feet) of perimeter. The nozzle crew will be able to contain the fire, provided the length of the hose line to the fire is less than 300 metres (1000 feet) and the water pressure and volume allow for the use of a ½ barrel nozzle tip.

Nozzle Crew Equipment

Ontario Fire Ranger crews use Mark 3 Wajax pumps. These pumps deliver 250 to 300 psi at 80 to 100 gpm. The Mark 3 Wajax pump will deliver adequate water pressure and volume for an initial attack on a fire with an FIC rank of 3 or lower in relatively level terrain (less than 100 feet of elevation change) up to 2500 to 3000 feet.

In most cases, the Mark 3 Wajax fire pump is not run at full throttle until 800 feet of 1.5-inch forestry hose is in place, and a 1/2 nozzle is attached. Reducing the nozzle size to 3/8 or 1/4 can extend the pump's maximum distance, but the rate of progress will be significantly reduced by friction losses in the hose line.

Nozzle Techniques

The nozzle techniques used by a ground crew to apply water to a wildland fire involve both parallel and right-angle methods. For instance, a nozzle crew will spray water parallel to the fire's edge—in the direction of its travel—to reduce flame intensity (often fanning the water stream). Then the ground crew will apply water directly to the fire's edge at a right angle into the fire, separating the ground fuels using a back-and-forth pattern. It is important to note that when using either of these techniques, the water flow should be directed so that burning materials are driven into the fire, not out.

ICs tend to want to attack the head of a fire as soon as possible in order to stop the forward rate of spread. Using this tactic is suitable when low to moderate burning conditions exist to prevent firefighters from being flanked by the fire and having their hose line burnt. However, the best practice is to attack the fire in an area on the flank with low fire behaviour. Doing so will ensure that the fire does not threaten to flank the nozzle crew as it works up toward the fire's head.

When fighting a fire with an FIC rank 3 or 4 that is burning heavy fuels, the best practice is to split the hose line into a "Y" at the point where it meets the fire. Splitting the hose line will allow two nozzle crews to begin working the fire's edge. A minimum of six people is required to implement this tactic.

When using a split hose line, the initial nozzle crew should move quickly to suppress the fire's forward rate of progression by wetting flames. The second nozzle crew should follow behind the first crew, ensuring the fire's edge will hold by separating and drowning the forest fuels.

The two nozzle crews must be mindful of the time lapse between them. The effects of applying water to the fire's edge change based on factors such as time of day, BUI value, exposure to wind and sun, and fuel type. Once a fire is contained, a second forward pass by a nozzle crew is usually preferable to a back pass (so that water can be reapplied where it has already evaporated the most). When multiple nozzle crews are used, a second forward pass and a back pass can occur simultaneously.

All techniques that nozzle crews can use should be outlined in the IAP.

Fire Hose Packing Configuration

The MNR packs its fire hose into cardboard boxes, which are then placed in standard hose bags. A 1.5-inch fire hose comes packed in two configurations, labelled Part 1 and Part 2. Each hose bag contains four lengths, providing approximately 400 feet (120 metres) of hose. The Part 1 and Part 2 packing configurations contain the same hose type, which can be used either to reach the fire or on the fire's edge. Each standard initial attack unit is provided with six bags of hose.

Part 1: This hose configuration is used to travel from the pump to the fire location. The hose is designed to come out of the box as a single continuous length. Two bags of Part 1 hose are the standard complement for an initial attack unit. This gives the crew 800 feet (240 m) to lay out in a straight run from the pump or pumper toward the fire.

Figure 11 illustrates a hose line as it would be placed in a Part 1 hose pack.

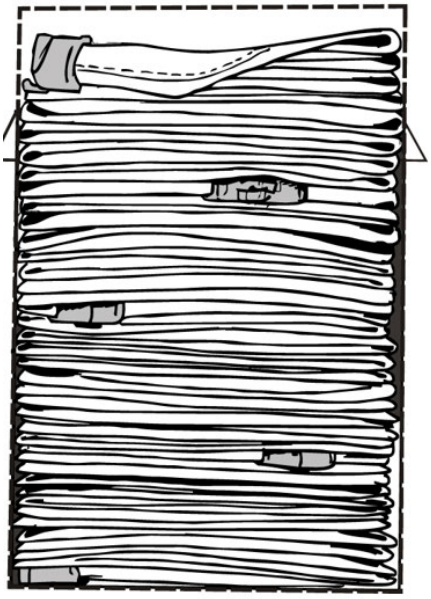


Figure 11. Hose line configuration in a Part 1 hose pack.[24]

Part 2: This hose configuration is typically used on the fire's edge. The hose is designed to come out of the box with both couplings attached, forming a single loop. One length of Part 2 hose is 50 feet (15 m). Four bags of Part 2 hose are the standard complement for an initial attack unit.

Typically, the nozzle person steps on the couplings while the hose layer walks ahead, letting the hose fall to the ground at a safe distance from the fire's edge. (Typically, that

[24] Image credit: Ministry of Natural Resources SP103 student reference notes.

distance is 1 to 2 metres, depending on the fire's rate of spread.)

After the hose comes out of the bag, the hose layer continues to walk until that length is completely stretched out before starting another. Once the hose is fully extended, the line is connected to the water line to charge the hose and begin suppression using the new length.

There are occasions when the hose layer walks back along the fire's edge, where the fire is already suppressed. The hose layer may walk back due to fire intensity, or if they wish to cross the base of a finger on the fire.

The Part 2 hose can be used to reach the fire when the Part 1 hose is not enough. In this case, one coupling is attached to the already-laid hose, and the other is held by the hose layer.

Figure 12 illustrates a hose line as it would be placed in a Part 2 hose pack.

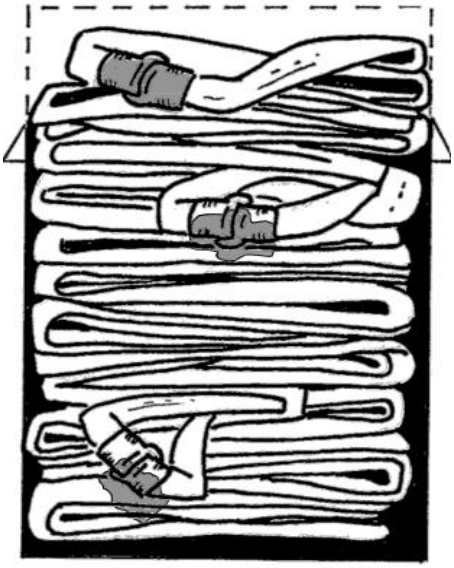


Figure 12. Hose line configuration in a Part 2 hose pack.[25]

2.5-Inch Hose

A 2.5-inch hose is not part of a standard initial attack unit. However, this hose can be used in initial attack situations where the distance to the fire results in friction loss with a 1.5-inch hose, significantly reducing water volume (approximately 2500 feet, depending on elevation change). A 2.5-inch hose is also commonly used in setting up sprinkler systems in order to protect values at risk. Three lengths of 2.5-inch hose fit into the standard cardboard hose box, providing 300 feet (90 metres) of hose line.

[25] Image credit: Ministry of Natural Resources SP103 student reference notes.

6.2.2 Hand Tool Tactics

Direct ground attacks can also be conducted using backpack water pumps with hand tools (such as the shovel or Pulaski). Portable hand-operated devices can be used for slow-moving, low-intensity fires in light fuels (such as grass or the forest understory of leaves or needles).

The shovel and Pulaski are used to move larger pieces of burning fuel (such as tree branches lying on the ground) back into the burnt area once the flame has been reduced enough. In some cases, the duff layer of leaves and other organic material should be removed to create a narrow fuel break down to the soil around the fire. Creating a fire break helps prevent sub-surface fire spread.

Firefighters who use hand tools should work in teams of two and be assigned defined sections of the fire. Each team should work parallel to the fire's edge, so water is directed at the flame and outside, ahead of the burnt edge, rather than applied inside the burn.

In Ontario, hand tools are commonly used after a fire has been contained by a hose line. During the mop-up stage, firefighters use hand tools to extinguish hot spots within the interior of the burn.

6.2.3 Air Attack Tactics

Conducting an air attack on a wildland fire involves the use of fixed-wing aircraft or rotary-wing aircraft.

The volume of water delivered in each aircraft load ranges from 225 litres (60 imp. gallons) to 6000 litres (1350 imp. gallons). Depending on the distance to the water source, aircraft can deliver loads as often as every three minutes.

In Port Hope, there are three water bodies that fixed-wing water bombers can use as pick-up lakes for reloading:

1. Lake Scugog (to the northwest)
2. Rice Lake (to the east)
3. Lake Ontario (to the south)

With 25 kilometres as the average turnaround distance from the location of the Ganaraska Forest Centre to the nearest water source, a CL-415 water bomber could deliver a load every 10 minutes. Two CL-415s would likely be sufficient to combat an FIC rank 3 fire under 25 hectares in size. (For comparison, the typical air attack bombing circuit using CL-415 water bombers in the Northern Ontario boreal forest is approximately four minutes. The shorter time is due to the greater availability of lakes suited for scooping water.)

A 25-kilometre water bomber circuit would take 14 minutes for the De Havilland Twin Otter water bomber. The Twin Otter would deliver only 2000 litres (460 imp. gallons) per load. Twin Otter aircraft are suited for small, low-intensity fires.

Due to the longer distance to a pick-up lake in the Port Hope area, using the MNR Twin Otter water bomber is **not** recommended.

Air Attack Safety

The area where a water bomber releases the water it is carrying is referred to as the "drop zone." In Ontario, the drop zone is 350 metres (1200 feet) long by 120 metres (400 feet) wide. This number makes the drop zone 11 acres in size (or 11 hockey rinks).

For safety purposes, firefighters must be out of the drop zone when an air attack is performed. The IC for the fire is required to communicate with the Bird Dog aircraft on 154.070 (OFM channel 25 on PHFES zone 2 radio) prior to any drops to ensure all ground staff are aware of where the bombing action will occur.

Figure 13 shows a CL-415 water bomber conducting an air attack.

Figure 13. A CL-415 water bomber conducting an air attack.[26]

For a better understanding of the drop characteristics of a CL-415 water bomber, see the following YouTube video: https://www.youtube.com/watch?v=-ZkV64GJihA. The video shows a CL-415 dropping a foam load on a burning vehicle and the resulting small fire in the adjacent forest.

Additional air attack safety information is provided in Appendix E.

[26] Photo credit: AVIONEWS – World Aeronautical Press Agency www.airliners.net

Rotary-Wing Aircraft

When conducting air attacks, rotary-wing aircraft primarily use a rubberized bucket. The bucket is suspended 15 to 30 metres below the helicopter, dipped into ponds and lakes to refill, then flown to the fire to make its drop. Larger rotary-wing aircraft have belly tanks and a 3-metre suction hose. These aircraft require a larger body of water to draw from than the suspended buckets.

The MNR has a fleet of intermediate-sized Airbus/Eurocopter helicopters. These aircraft use a 680 litre (150 imp. gallon) water bucket. Medium-sized Bell 204, 205, and 212 helicopters use an average bucket size of 1600 litres (350 imp gallon).

Medium and intermediate rotary-wing aircraft are effective at reducing the intensity of fire in mixed wood stands, and they are also effective at locating and suppressing spot fires outside the fire's edge. Rotary-wing aircraft are highly accurate and work best on fires without continuous conifer fuels.

Figure 14 shows an Airbus AS350 helicopter with a Bambi bucket conducting an air attack.

Figure 14. An Airbus AS350 conducting an air attack.[27]

Working with rotary-wing aircraft for bucketing purposes requires knowing the location of everyone responding to the fire and which priority targets to bucket. The first priority is usually to bucket the head of the fire or an area on the flank that is threatening values at risk. The pilot must be in direct contact with the IC to confirm the target areas and the location of firefighters. The pilot will be able to identify other concerns to the IC (such as the presence of members of the public or spot fires).

[27] Photo credit: Rural Municipalities of Alberta Wildfire Working Group Report.

Having the IC take a short helicopter flight before aerial suppression begins may be an option (often dependent on fuel levels and flight time). A reconnaissance flight always provides a valuable perspective for the IC. The IC should be aware of standard helicopter safety prior to any flight. Additional helicopter safety information is provided in Appendix E.

Ground-to-air communications can occur by radio on 126.7 MHz, which is the standard frequency that aircraft monitor when flying in uncontrolled airspace in Canada. The MNR's fixed-wing air attack aircraft will have the ability to use 126.7 MHz, as well as 154.070 MHz.

Air Attack Bases

The closest MNR air attack base to Port Hope is in Haliburton, at Stanhope Municipal Airport. The airport is also where the MNR Fire Management Headquarters for Southern Ontario is located.

The MNR routinely has rotary- and fixed-wing aircraft on alert at its headquarters when the risk of wildfires warrants this precaution. The distance between Stanhope Municipal Airport and the Ganaraska Forest Centre is approximately 100 km. The EC130 intermediate helicopter, which is typically on alert, would require approximately 30 minutes to travel to the Ganaraska Forest Centre. An MNR Air Attack Bird Dog with a CL-415 water bomber would make the trip in approximately 20 minutes.

The next closest air attack base that routinely has MNR aircraft is in Sudbury. The Sudbury base is 330 km from the Ganaraska Forest Centre, which is approximately a 1-hour flight for a CL-415 water bomber.

6.3 Indirect Attack Strategies

An indirect attack is a suppression action taken away from the fire's edge.

Indirect attacks are generally used on the rear and flanks of a wildland fire. Indirect attacks have a limited chance of success on the head of the fire due to spotting. An indirect attack should be supported by an aerial or ground water-delivery system in order to extinguish any spot fires beyond the fuel break.

FIC 1 and 2 fires are best suited for indirect attacks when no burnout operation is planned, and the fire is expected to burn up to the fuel break on its own.

6.3.1 Fuel Break Tactics

A fuel break can be created as near as a few metres away from a fire (such as when a farm tractor drags a set of discs across a field along the flank of a fire). Conversely, forestry equipment can be used a thousand metres away in order to cut a fuel break in the forest, which can be ignited when conditions are suitable for a burnout operation.

In Port Hope, the most likely use of an indirect attack area is when responding to agricultural fires. Using farming equipment to create a fuel break along the flanks of a grass or crop fire is often very effective.

Note: Using heavy equipment (such as skidders, bulldozers, or farm tractors hooked to a disc furrow) is **not** recommended directly on the fire's edge. Direct contact with flames puts the equipment at risk. (For instance, hydraulic fluid and oil leaks make equipment vulnerable to catching fire.)

6.4 Value Protection Strategies

A best practice for protecting values at risk during a wildland fire is to create a microenvironment with increased Rh. It is also important to ensure that flammable materials are removed or pre-wetted in order to withstand the expected heat and barrage of embers.

The AFFES is a world leader in value protection using pumps, hoses, and sprinklers. In many cases, the AFFES has pre-planned the deployment of equipment in northern First Nations communities so that fire service personnel know exactly how much equipment is required, as well as how and where to set it up, should the need arise.

When pre-planning is not established, a site risk assessment should be conducted in order to develop a suitable values protection plan. Assessing the flammability of values at risk can be done using an existing process known as the FireSmart Home Ignition Assessment (see Appendix G). The value's protection plan will be based on the FireSmart assessment, available resources, and the amount of time and time of day the fire is expected to arrive at the value. A site risk assessment for a structure should be conducted well in advance of an approaching wildfire to ensure firefighter safety.

When firefighters arrive on the scene at a structure ahead of the main fire, several safety factors must be assessed before any suppression or mitigation actions are taken. These factors are as follows:

- the presence of an anchor point
- escape routes
- safe areas
- current and predicted fire behaviour
- direction of fire
- smoke and ember spread

6.4.1 FireSmart for Structural Protection Tactics

FireSmart Canada is an organization that helps homeowners and communities increase their resilience to wildland fires and minimize the negative impacts of those incidents. FireSmart Canada has a national program that provides resources and strategies to mitigate wildfire risks to infrastructure and residential properties. (In the United States, the NFPA uses the Firewise USA program.)

FireSmart was founded in 1993 in order to address common concerns about wildfires in the WUI. The program is fundamental in understanding how wildland fire causes homes to burn. For more information on FireSmart, see section 11 of this WFMP.

Dr. Jack Cohen, an American fire scientist, was one of the first people to research the science of wildfires and how they spread to structures.[28] He has created YouTube videos that are some of the best resources on wildfire protection.[29] Using FireSmart principles, firefighters can assess the risk to a structure that could be burned by a wildfire.

The FireSmart program evaluates risk based on a “home ignition zone” assessment. The FireSmart Home Ignition Assessment categorizes the area around a structure into the following three zones: the Extended Zone, the Intermediate Zone, and the Immediate Zone. Figure 15 shows the three distinct sub-zones involved in the assessment.

[28] https://www.youtube.com/watch?v=IvbNOPSYyss

[29] https://www.youtube.com/watch?v=vL_syp1ZScM

Figure 15. FireSmart Canada Home Ignition Zone Self-Assessment.[30]

Extended Zone

The extended zone includes the area within 10 to 30 metres of a structure. In rural areas, the extended zone includes forested or agricultural fuel types. In some cases, the extended zone encompasses a neighbour's property. This zone assessment is intended to evaluate the intensity of the fire that will exist when it is burning.

FireSmart recommends mitigation practices that promote reducing fire intensity by thinning the understory and creating space.

An extended zone that consists of extremely flammable fuels (such as spruce, jack pine, or balsam fir) that have branches from the base to the top of the trees will produce intense heat and a large volume of embers. A field of tall, dry grasses or corn stalks poses a similar hazard.

Spring conditions, when the leaves have not flushed out on deciduous trees, create a situation where an intense ground fire can occur if there are sufficient fuels on the surface (such as a mix of leaves, branches, and needles). A neighbouring house or outbuildings that are built with highly flammable materials and have no FireSmart mitigation measures in place also represent a risk.

When assessing the extended zone, the direction of the wind relative to the fire spread

[30] Image credit: FireSmart Canada.
https://firesmartcanada.ca/wp-content/uploads/2023/07/HIZ-Self-Assessment-8.5x11-WEB.pdf.

and the presence of slope will determine the extent to which these factors affect the likelihood that the structure is defensible.

Radiant heat from a wildland fire can also pose an ignition risk to structures (as illustrated in Figure 16).

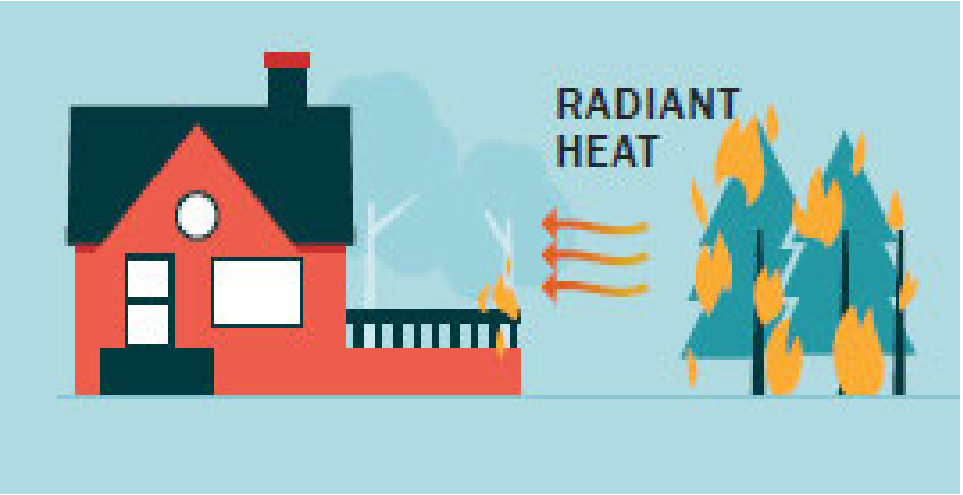


Figure 16. Ignition by radiant heat from a wildland fire.[31]

Figure 17 shows an assessment of the Ganaraska Forest Centre's extended zone conducted using Google Earth imagery. The prevailing winds are indicated by the white arrows, and the areas highlighted in red are evaluated as being high risk.

[31] Image credit: FireSmart Canada.

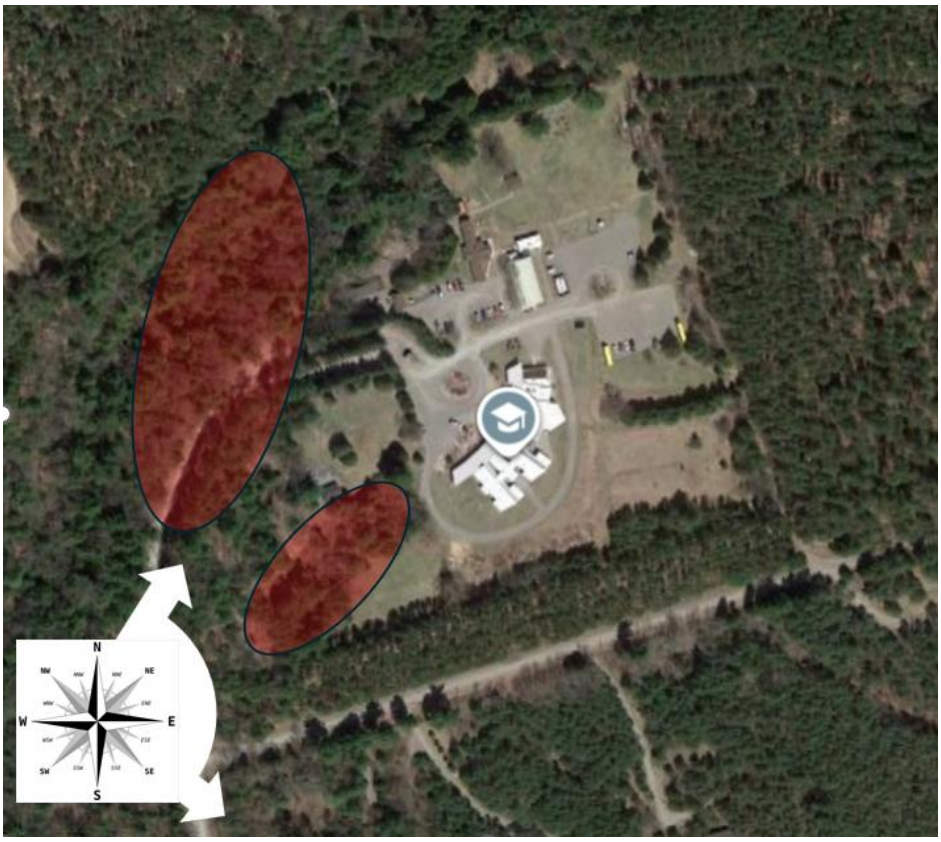


Figure 17. Ganaraska Forest Centre extended zone assessment.[32]

As shown in the figure above, the prevailing winds blow from the southwest to the northwest. As such, the highest risk to the Ganaraska Forest Centre comes from a fire approaching from the southwest direction. Based on that assessment, the areas in red are considered high risk during the spring and times of drought. Thinning the understory and removing surface litter buildup would reduce the hazard posed by a wildland fire.

Intermediate Zone

The intermediate zone includes the area within 1.5 to 10 metres of a structure, and it typically comprises the yard.

An assessment of the intermediate zone includes the following factors:

- presence and flammability of fencing
- play and leisure structures
- outbuildings
- RV trailers, ATVs, or snowmobiles

[32] Image credit: Google Earth.

- landscaping plants, lawn, and trees
- large decks (such as those with hot tubs or outdoor cooking areas)

An assessment of the intermediate zone should answer the following questions:

- Will the fire be able to spread across the lawn?
- Will embers landing in the yard find places to collect and ignite?
- Are the conifer trees pruned at the base up to 2 metres and spaced 3 metres apart?
- Is there time to relocate flammable objects, prune trees, and move cut branches to a low-hazard area away from the structures?

Figure 18 illustrates the risk of ignition posed by a structure coming into direct contact with a wildland fire (known as conduction).

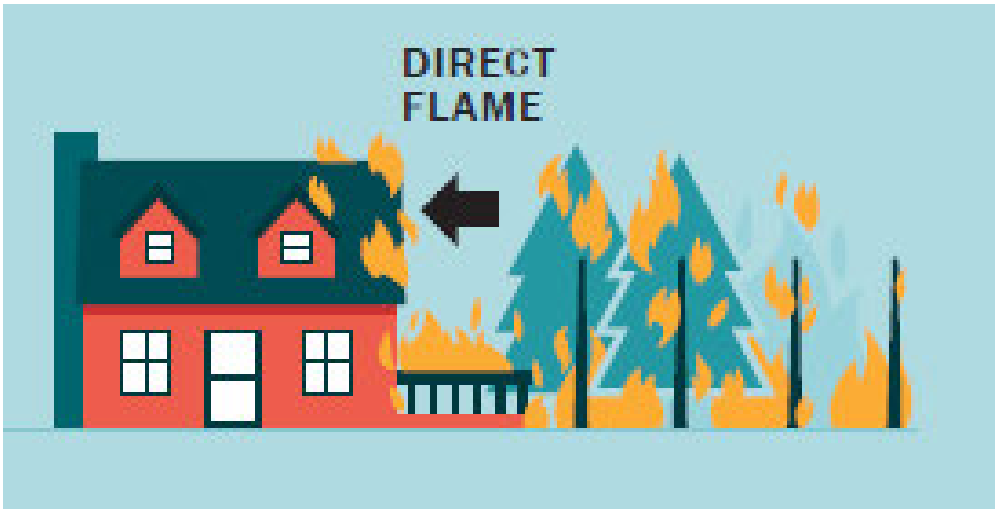


Figure 18. Ignition by conduction from a wildland fire.[33]

Figure 19 shows an assessment of the Ganaraska Forest Centre's intermediate zone conducted using Google Earth Imagery. The areas highlighted in yellow are evaluated as containing potentially hazardous fuels.

[33] Image credit: FireSmart Canada.

Figure 19. Ganaraska Forest Centre intermediate zone assessment.[34]

As shown in the figure above, there are several areas containing potentially hazardous fuels within 10 metres of structures. Pruning trees up to 2 metres and removing surface litter would reduce the hazard posed by wildland fire embers and direct flames.

Immediate Zone

The immediate zone includes the structure and the area within 1.5 metres of the structure.

There are a few simple mitigation measures that firefighters can take to reduce ignition sources. These measures include removing outdoor furniture, using gutter tools to clean from ground level, and removing flammable vegetation/materials adjacent to the home.

An assessment of the immediate zone should answer the following questions:

- Is the roof fire-rated, as in asphalt, metal, or clay tile?
- Do the buildings have gutters, and, if so, are they metal or plastic?
- Are the gutters clean or filled with needles and dried leaves?
- Can embers pass into the attic? (Is there 1/8 to 3 mm metal mesh covering vents? Are there metal soffits under the eaves?)

The FireSmart Home Ignition Zone Self-Assessment is provided in Appendix G. The assessment provides a clear picture of how likely the home will ignite from a passing wildfire.

[34] Image credit: Google Earth.

Figure 20 illustrates the risk of ignition posed by embers being transferred from a wildland fire to a structure.

Figure 20. Ignition by ember transfer from a wildland fire.[35]

Figure 21 shows part of the immediate zone of a building at the Ganaraska Forest Centre.

Figure 21. Ganaraska Forest Centre structure immediate zone.[36]

[35] Image credit: FireSmart Canada.

[36] Photo credit: Ganaraska Forest Centre Visitor Information.

As shown in the figure above, the structure has flammable siding and a wooden deck. Depending on the wind direction, the structure may be susceptible to ignition from wildland fire embers. For instance, if the deck were on the leeward side, embers would collect on and around it, increasing the risk of ignition and spread to the structure.

Summary

Based on the results of the FireSmart Home Ignition Assessment for the three zones—as well as the time objective and available resources—a decision can be made on how defensible a home or homes are in a given neighbourhood, and which strategies or tactics can be used to reduce the risk of structures being lost.

6.5 Structure Protection Strategies and Tactics Using Fire Apparatus

Numerous groups use common concepts and terminology regarding WUI strategies and tactics. These groups include the International Association of Fire Fighters, the National Wildfire Coordinating Group in the United States, and the British Columbia Wildfire Service. Many of the tactics applicable to Port Hope will be covered in the following subsections.

6.5.1 Wildland Urban Interface Strategies

When discussing WUI strategies, the terms “offensive” and “defensive” are commonly used. In Ontario wildland firefighting, offensive strategies are synonymous with direct attack strategies, and defensive strategies are synonymous with indirect attack strategies. For more information on direct and indirect attack strategies, see sections 5.2 and 5.3 of this WFMP.

6.5.2 Wildland Urban Interface Tactics

American WUI structural firefighting departments teach eight different tactics. Four of the tactics are considered primary. The other four are secondary. Many of these WUI tactics involve substantial ground and aerial resources.

Based on the wildfire situation in the Port Hope area, the way that situation is likely to evolve, and the number of resources normally available to respond, five of the eight WUI tactics may be useful. These tactics are as follows:

- Anchor and Hold
- Prep and Defend
- Prep and Go
- Check and Go
- Evacuation

The tactics listed above can be assigned by the IC or the commander on the fire apparatus (based on the assessment of each structure encountered). Each of the five tactics is detailed in the subsections below.

An overview of the WUI tactics training provided by the International Association of Fire Fighters is outlined in Appendix L.

6.5.2.1 Anchor and Hold

The anchor-and-hold tactic may be used when a fire apparatus arrives at a scene where a fire has encroached on the site, but a structure may or may not already be on fire. When using the anchor-and-hold tactic, firefighters begin their suppression activity from an anchor point to ensure their escape route is not cut off by the wildfire flanking them.

The anchor-and-hold tactic benefits from using more than one fire apparatus. For instance, one apparatus can focus on the approaching wildfire, and the other can defend the structure.

6.5.2.2 Prep and Defend

The prep-and-defend tactic is suited for low- to moderate-intensity wildfires that threaten only a few structures, and there are sufficient resources to dedicate to meeting the objectives. Prep and defend can also be used on larger wildfires that will have reduced intensity by the time they arrive at the site due to changes in fuel type.

Prep and defend should only be used if there is a suitable safe zone and escape route for the firefighters (in the event that there is a complete failure of the fire apparatus or its water delivery system).

Using the prep-and-defend tactic involves establishing hose lines to pre-wet the area around the structure and attack the fire directly when it arrives at the site. If required, simple FireSmart mitigation practices can be performed next to the structure (such as moving flammable materials).

6.5.2.3 Prep and Go

The prep-and-go tactic is intended for situations where it is not safe to remain at the site when the fire arrives, but there is sufficient time to complete simple FireSmart mitigation practices (such as moving flammable materials away from the structure and applying water or foam to vegetation in the immediate zone next to the structure).

If occupants are on site, they may assist with moving flammable materials and other FireSmart mitigation practices. If the occupants choose to remain at the site (despite the hazard to themselves) after PHFES departs, the Fire Chief or his designate needs to be advised.

6.5.2.4 Check and Go

The purpose of the check-and-go tactic is to alert occupants to the potential threat of a wildland fire, as well as to perform a site evaluation to determine whether it requires defending, and—if so—what that defence would entail.

Assuming a fire apparatus crew of four personnel arrives at a rural residence or business, two individuals would brief the occupants about the situation, while the other two complete a FireSmart Home Ignition Zone Assessment (see Appendix G) along with an Urban Interface Structure Defense Fire Fighter Safety Assessment (see Appendix H).

6.5.2.5 Evacuation

In Port Hope, an evacuation should be conducted if a wildland fire poses an imminent risk to the homes or businesses in its path, and the fire cannot be mitigated by PHFES. Using PHFES resources to conduct an evacuation should only be done if the actions taken do not put PHFES staff members in a situation that threatens their lives.

PHFES personnel should have an “evacuation speaking notes” template to assist with evacuations. The template should be designed to address many of the common concerns evacuees have regarding the following topics:

- the authority to direct them to evacuate
- where to go and how to register as an evacuee
- what to bring (such as prescription medicine, cell phones, and chargers)
- concerns for their pets or livestock
- concerns for their home and valuables
- transportation for those who do not have their own
- assistance for anyone with special needs

An evacuation requires that the Port Hope Municipal Emergency Control Group (“**MECG**”) be activated to support evacuation efforts.

Until the MECG becomes operational, a centralized command and control for the evacuation is needed. The personnel responsible for command and control coordinate the actions of all the responders (such as police, paramedics, and public works) and collect information related to the evacuation.

Command and control should collect the addresses that are being evacuated, the number of people evacuating, and the names and addresses of persons declining to evacuate. Appendix C outlines considerations for conducting an evacuation and includes a first responder evacuation guide with speaking notes.

7.0 Port Hope Wildland Fire Operations Guidelines

7.1 Pre-planning Information

Completing pre-planning initiatives for wildland fires involves providing the most up-to-date information to responders before they leave the station. Pre-planning information includes maps that show the following information:

- suitable water sources (see Appendix D for dry hydrant locations)
- accessible roads and trails (identified for various-sized response vehicles)
- location of values
- areas of cell and radio dead zones
- contact information for key organizations and agencies that may be affected or potentially provide support
- daily sources of information for weather, road conditions, and public or special event activities

Knowing the weather that is predicted for the following 12- to 48-hour period is essential for planning appropriate preparedness and potential response plans. The weather forecast for a 48-hour period is generally reliable for anticipating the likelihood of fire occurrence, its behaviour, and the direction of its spread.

There are numerous websites that provide weather predictions. For instance, the Government of Canada provides a full spectrum of weather products. NAV Canada also provides detailed weather analysis for flight planning.

Existing hazard and forest fuel conditions are provided by the AFFES and Natural Resources Canada. Both organizations produce daily fire hazard and behaviour maps. The AFFES also provides access to hourly weather station readings through the Ontario Forest Fire Info Map.[37]

The Ontario Forest Fire Info Map provides a variety of layers for viewing (as shown in Figure 22).

[37] https://www.lioapplications.lrc.gov.on.ca/ForestFireInformationMap/index.html?viewer=FFIM.FFIM

Figure 22. Ontario Forest Fire Info Map legend.[38]

As indicated in the figure above, the map can display colour-coded fire hazard risks for areas within the fire region, as well as show fire locations and their status. The map can also display the current temperature, humidity, wind speed, and wind direction being recorded at various weather stations.

The AFFES maintains 130 weather stations in Ontario. Five of those stations are located north of Port Hope in the fire region (as shown in Figure 23).

Figure 23. AFFES weather stations in southern Ontario.[39]

[38] Image credit: Ontario GeoHub Forest Fire Info Map
https://www.lioapplications.lrc.gov.on.ca/ForestFireInformationMap/index.html?viewer=FFIM.FFIM

[39] Ibid.

As shown in the figure above, the closest weather station to Port Hope is Galloway Lake, just north of Peterborough (shown as GAL on the map).

The area of Ontario considered outside the fire region is shown in Figure 24. The AFFES is not responsible for conducting primary responses to wildland fires outside the fire region. As such, the AFFES does not have weather stations outside the fire region.

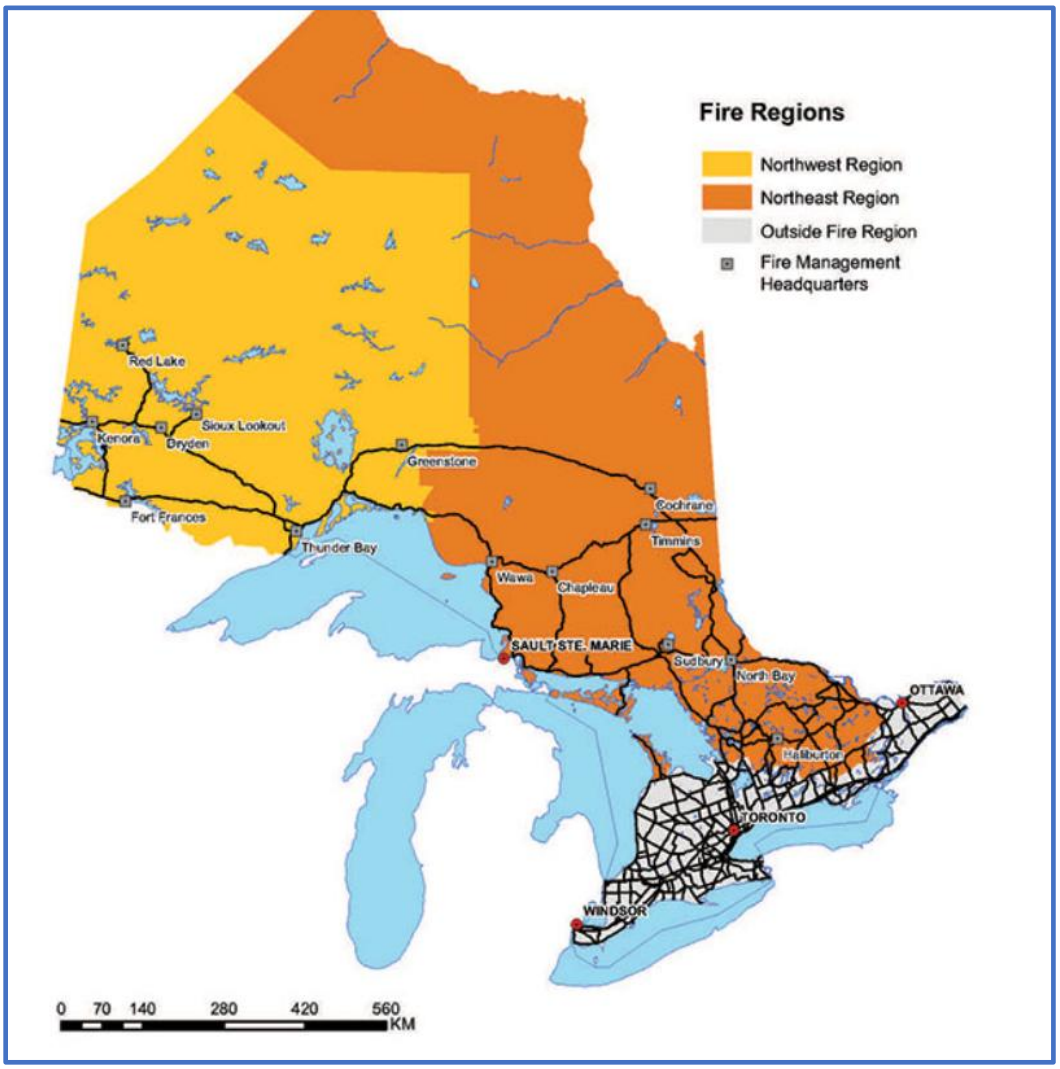


Figure 24. Ontario fire regions.[40]

Because Port Hope is outside the fire region, Natural Resources Canada's fire weather maps provide a more detailed analysis of the current wildland fire hazard in the Port Hope area. An example of a fire weather map from Natural Resources Canada is shown in Figure 25.

[40] Image Credit Ontario Ministry of Natural Resources.

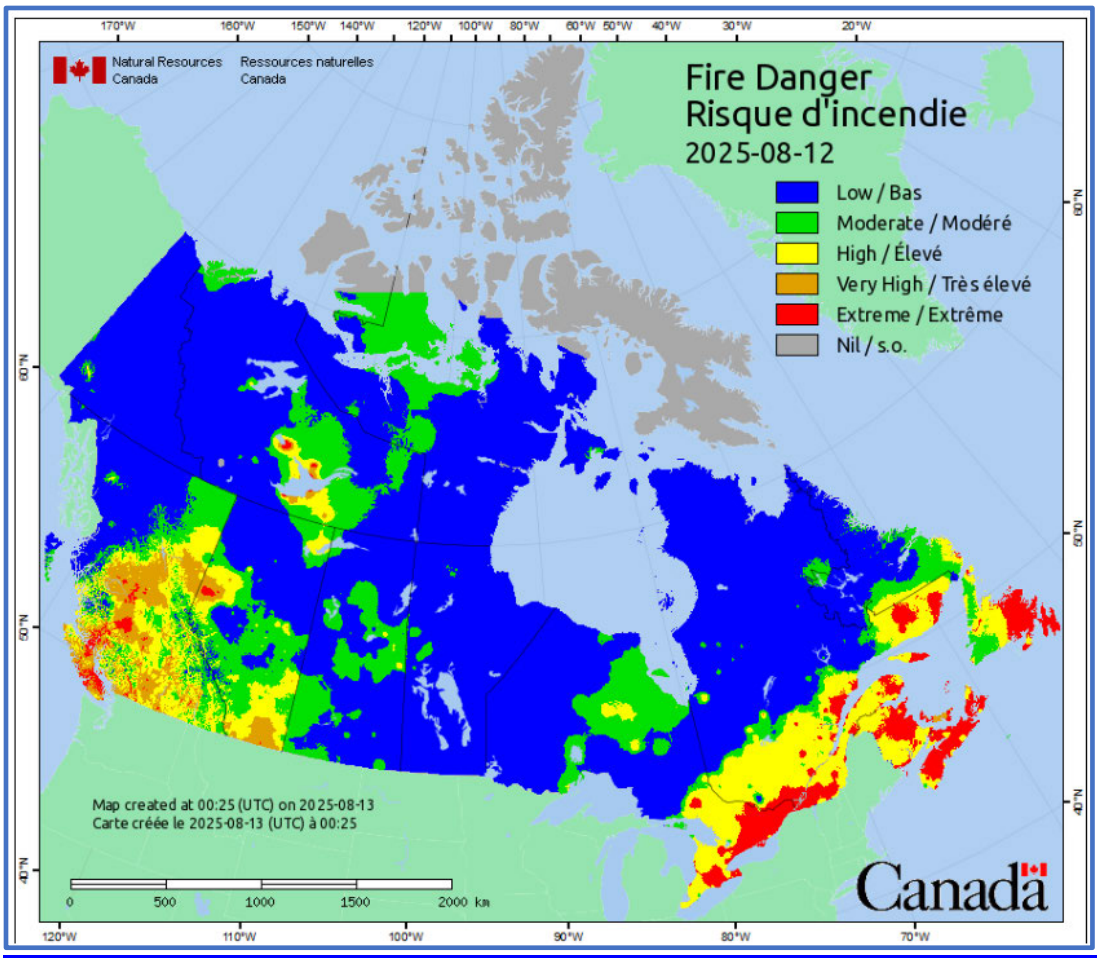


Figure 25. Natural Resources Canada fire danger map.[41]

The Natural Resources Canada website provides a wide range of information, including seasonal weather forecasts. For daily use during the fire season, the “fire danger” map layer will provide the easiest way to assess wildland fire risk in Port Hope and the surrounding areas.

Recommendations

4. Ensure that supervisory staff members from Port Hope Fire and Emergency Services review Natural Resources Canada’s Canadian Wildland Fire Information System link (https://cwfis.cfs.nrcan.gc.ca/en) every day during the fire season in order to determine the wildfire hazard for the Port Hope area.

[41] Image credit: Natural Resources Canada.

7.1.1 Equipment Readiness

Part of the pre-planning process is to ensure that all necessary firefighting equipment is ready. Making sure equipment is ready to be used is a seasonal and situational practice for wildland firefighters. Wildland firefighting equipment is typically stored for the winter, and it requires a spring-readiness program to be implemented according to weather conditions.

An equipment readiness program involves the following tasks:

- Run fire pumps and chainsaws.
- Test backpack pumps.
- Ensure shovels and Pulaski axes are sharp and have the proper guards in place.
- Check the inventory of kits and trailers.
- Check the condition of fireline clothing and PPE.

Wildland firefighters go through quiet periods with little activity. As the fire hazard level increases to high or extreme, the wildland fire equipment should be retested and inspected.

For a list of the equipment the MNR uses for its pumper trucks, pump tool kits, and value protection sprinkler kits, see Appendix M.

7.1.2 Seasonal Key Contact Lists

Additional non-typical resources may be required for response purposes. As such, a master list of key individuals and organizations to contact is vital. These contact lists include numbers that need to be checked annually to verify accuracy and to remind the contacts that they may be called at any time, 24 hours a day, 365 days a year.

PHFES’s confidential contact lists can be found in Appendix N.

7.1.3 Hydrants

Port Hope has a large network of hydrants to support wildland fire activities. In the rural-urban interface, PHFES has four dry hydrants located throughout the municipality.

Figure 26 shows the location of the dry hydrants in Port Hope.

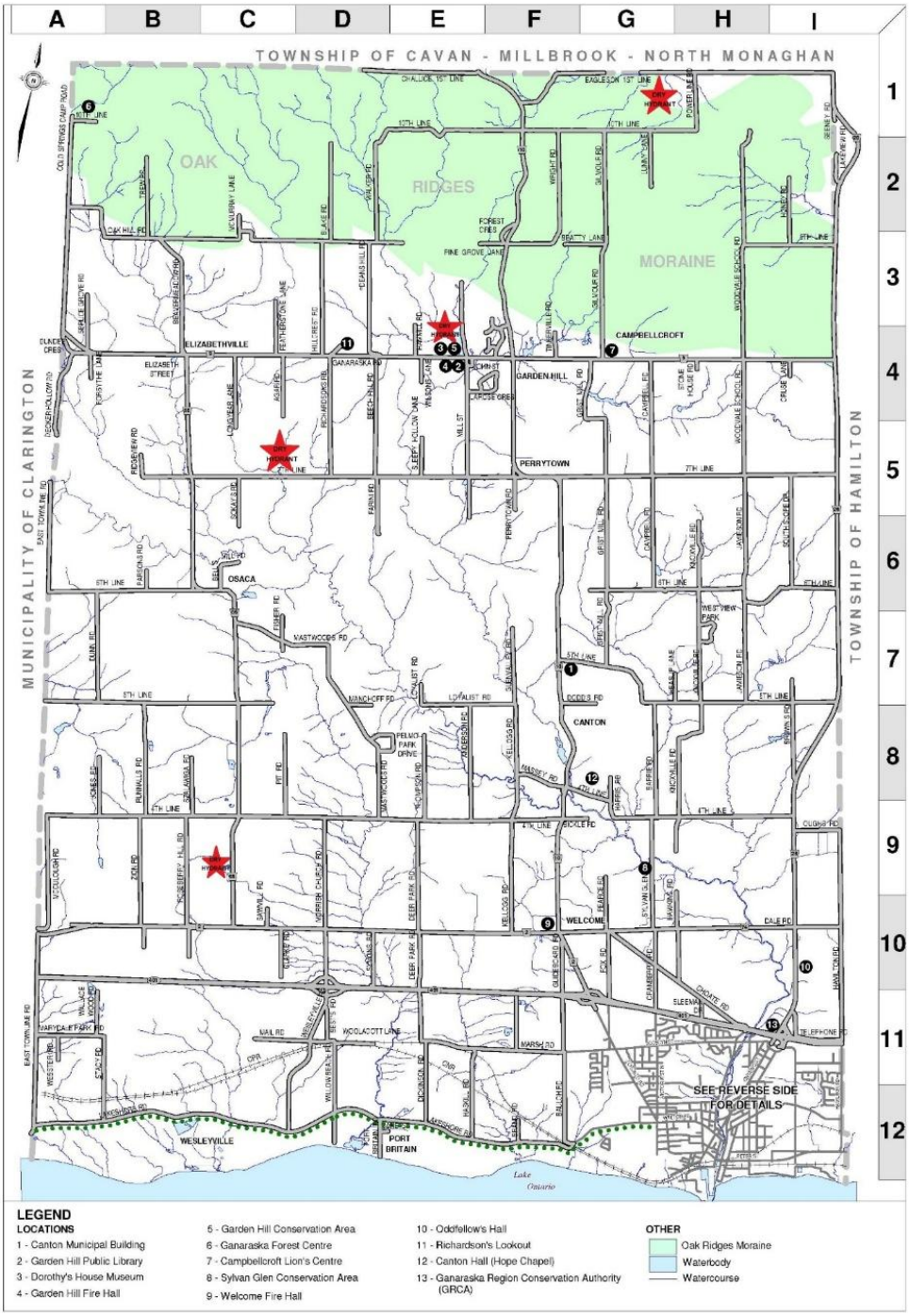


Figure 26. Dry hydrants located in Port Hope.[42]

In addition to the dry hydrants in Port Hope, there is one dry hydrant in Bewdley (on Rice Lake) within Hamilton Township. Port Hope also has three known locations where a portable pump can be set up to facilitate filling a fire apparatus.

[42] Image credit: Northumberland County GIS.

An effective wildland fire response in remote areas and the urban interface relies on access to water. Figure X displays a 10-minute travel time from each of Port Hope's four dry hydrants.

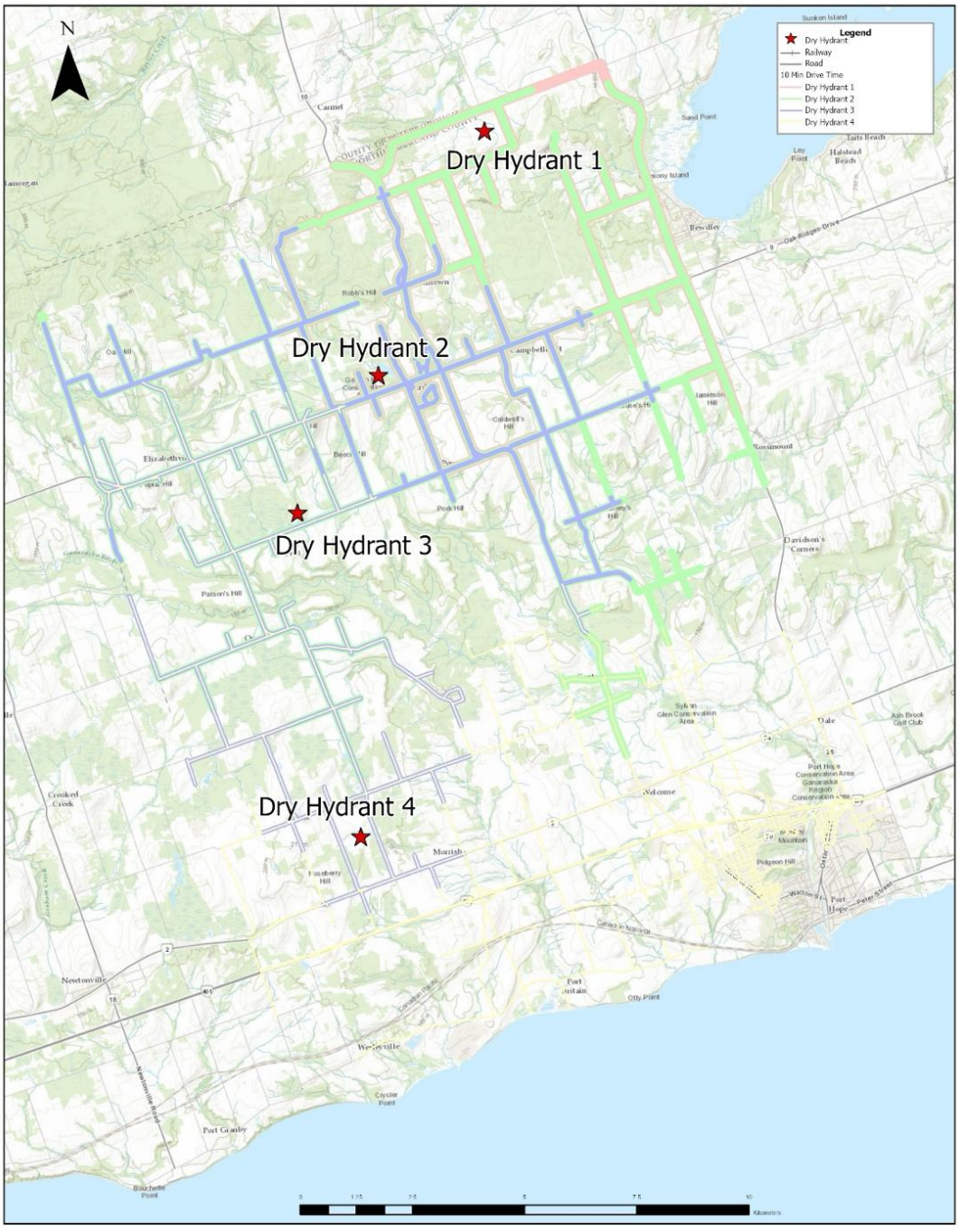


Figure 27. Ten-minute travel time from each dry hydrant location.[43]

[43] Image Credit: Northumberland County GIS.

Using the map above as a visual aid, an IC can estimate how many fire apparatus or water tenders are required for the incident they are responding to (based on water flow usage).

Appendix D provides images of Port Hope's dry hydrant sites.

7.1.4 Superior Water Tanker Shuttle Accreditation

As of this WFMP, PHFES has achieved the Fire Department Superior Water Tanker Shuttle Accreditation. PHFES attained an enhanced level of accreditation for Port Hope. As such, the fire department is capable of supplying a consistent water supply to both residential and industrial/commercial structures in the municipality's rural areas.

The letter of recognition from Fire Underwriters Survey is included in Appendix J.

7.1.5 Water Tanks for Structure Protection

Storing a large quantity of water for firefighting purposes is a recognized practice by insurance companies that reduces insurance premiums. NFPA 22, *Standard for Water Tanks for Private Fire Protection*, and NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, outline the requirements of storing water (such as design, functionality, and installation).

NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, includes the following statement:

> Note that the owner or designated representative is the only person to whom specific responsibility is assigned by this standard. Although authority having jurisdiction (AHJ) is defined in Chapter 3, and several sections require the involvement of the AHJ, it is only in the context of the owner seeking AHJ approval or consultation. Likewise, while the qualified person conducting inspections and tests is often a contractor, the responsibility for all tasks in NFPA 25 is that of the owner or designated representative.

It is within a fire department's jurisdiction to request proof of an annual maintenance program and records for water storage tanks to support response planning. Insurance companies require accredited organizations to validate all aspects of the water tank.[44]

7.1.6 Foam Delivery Systems

Foam is an additive that reduces water's surface tension, allowing it to penetrate forest fuels more effectively.

[44] Verisk Fire Underwriters Survey. https://fireunderwriters.ca/grading/superior-tanker-shuttle-service.html

Using foam extends the “cycle of water effectiveness” by capturing water in the foam bubbles and slowly releasing it, slowing the evaporation rate of the water. Water can also form a “foam” when it mixes with the air as it passes through specialized nozzles.

Class A foams are the choice of most Canadian agencies that fight wildland fires because they are non-toxic. The MNR uses a Class A foam in all its water bombers and on pumper trucks. The use of foam significantly reduces smoke levels during low- to moderate-intensity fires and is often used to prewet areas around structures to reduce the risk of ignition from embers. There are several inline systems that can be attached to fire pumps or pumper trucks when needed.

PHFES maintains a county foam bank of both Class A and Class B products. The foam is stored in pails at Station 1. These products are added directly into the pumper tank to create a 0.1 per cent solution.

Recommendations

5. Port Hope Fire and Emergency Services should explore additional options for foam delivery systems (such as nozzles and inline injectors) to add to its wildland fire trailer inventory. The delivery systems should be acquired in order to enhance wildland fire and wildland urban interface structure protection.

7.2 Information Gathering En Route

The initial dispatch information for wildland fire reports from the Peterborough Fire Services dispatch is based on calls transferred by 911 services.

Callers are asked the following questions:[45]

- What is burning?
- How large is the fire (in acres)?
- Are any structures in danger?
- Is anyone trapped? How many people are trapped? What is their location?
- Are there any injuries? How many people are injured? What is the type and severity of the injury?
- What caused the fire?
- Is the fire spreading? In what direction? How quickly?
- What is the best access route/point for the firefighters?

[45] Information received from Peterborough Fire Services dispatch.

In addition to asking the questions listed above, Peterborough Fire Services dispatch personnel will attempt to determine the compass direction the caller is facing when reporting the fire.

Peterborough Fire Services dispatch will plot the location of the fire using the information provided, and then it will dispatch the appropriate fire hall. Peterborough Fire Services may receive multiple calls regarding the same smoke from different areas. Receiving multiple calls can be beneficial or detrimental in determining the location of the fire, depending on each caller's perspective and competency.

The IC may briefly survey the fire area at the station using a wall map or a desktop computer. However, using electronic devices to view mapping layers or satellite imagery (such as Google Earth) allows the IC to conduct a more detailed assessment of the area. The use of satellite imagery is further discussed in the following subsection.

Once the reported smoke column becomes visible to the IC, an important assessment can be made of the fire's intensity, potential size, and the best road access location.

7.2.1 Assessing Fire Location Using Satellite Imagery

Using a smartphone or tablet, an IC can view satellite imagery to view the area around the reported fire location. Examining satellite imagery can allow the IC to assess the following information:

- general forest fuel types (such as deciduous, conifer, or agricultural)
- possible anchor points
- safety zones
- values at risk
- hazards
- water sources
- access points

Accessing historical views in Google Earth can provide images in spring or fall conditions, when leaves are shedding or changing.

Figures 28, 29, and 30 show three satellite views of the area surrounding the Ganaraska Forest Centre at different times of the year. As the images show, the area looks significantly different depending on the season.

Figure 28. Spring view of wildland fuel types in northwest Port Hope.[46]

Figure 28 shows a satellite image taken during the spring. The image shows that the leaves are off deciduous trees, allowing easy recognition of coniferous fuel types, which often pose a greater wildland fire risk. The lack of leaves also provides better visibility of structures, trails, and other features hidden by the trees and undergrowth in the summer.

[46] Image credit: Google Earth.

Figure 29. Fall view of wildland fuel types in northwest Port Hope.[47]

Figure 29 shows a satellite image taken during the fall. The image shows how the surrounding agricultural lands are used. Fields that have been harvested, plowed for planting next season, left fallow, and used for grazing are identifiable.

[47] Ibid.

Figure 30. Summer view of wildland fuel types in northwest Port Hope.[48]

Figure 30 shows a satellite image taken during the summer. The image illustrates how summer views tend to be the most difficult to interpret due to the presence of lush vegetation.

Recommendations

6. Port Hope Fire and Emergency Services should acquire the necessary tablets and data to support wildland fire responses and enable the viewing of “leafless imagery” for Port Hope without internet connectivity.

7.2.2 Assessing a Wildland Fire Smoke Column

Reading a smoke column correctly can provide several important pieces of information. The MNR fire program teaches the “ABCs” of assessing a smoke column in the SP230 course.

[48] Ibid.

When assessing a smoke column, “ABC” stands for the following:

- “A” stands for the angle of the column with respect to the surrounding terrain.
- “B” stands for the body of the smoke column (its characteristics).
- “C” stands for the colour of the smoke column.

Angle of Smoke Column

The angle of the smoke column can indicate the strength of the wind near the fire. The stronger the wind, the lower the angle of the smoke column.

The strength of the wind can be determined by the following angles:

- A 90-degree angle (going straight up) indicates zero wind.
- A 50-to-60-degree angle indicates a moderate wind.
- A 45-to-30-degree angle indicates a strong wind.

The angle of the smoke can also indicate the direction of the wind. Determining the wind’s direction can be challenging, depending on a person’s position relative to the smoke (such as higher or lower, parallel, or in front).

Body of Smoke Column

The body of the smoke column provides information about how intensely the fire is burning.

Different types of fires can be identified using the following indicators:

- Wispy smoke that dissipates as it rises generally indicates a low-intensity fire.
- A concentrated, thick smoke that includes wider cloud-like billowy sections indicates the fire is intense.
- Swirling smoke indicates the presence of rapid heating and corresponding updrafts being funnelled by cooler surface air rushing into the base of the fire.

Colour of Smoke Column

The colour of the smoke column is the easiest of the three characteristics to evaluate. A smoke column’s colour provides details about moisture content, fuel type, and fire intensity.

For instance, white smoke in the part of the column closest to the ground indicates a significant amount of moisture in the fuel. A white smoke column is associated with FIC 1 and 2 fires.

Large, intense fires will generate white smoke at higher altitudes due to rising hot air condensing at cooler temperatures aloft.

Grey smoke indicates the presence of a dryer or more volatile fuel. A fire that starts in mixed wood may produce white smoke until it comes into more concentrated patches of conifer trees, which can produce grey smoke. Grey smoke is associated with FIC 3 fire behaviour.

Black smoke in a forest fire is generated by conifer trees with high sap content (such as balsam fir and white spruce). The fire behaviour of FIC 4 and 5 fires will create black smoke. In the urban interface, black smoke is also associated with structures, vehicles, RVs, and household debris.

7.3 Arrival At the Site – Wildland Fire Suppression

Based on all the information the IC has acquired, the IC usually arrives at the closest point to the fire. As a best practice, it is critical to park vehicles in a way that allows responders to depart rapidly and safely.

If the fire is not visible from the arrival site, the IC can use a drone to scout the fire quickly. The drone can be used to assess the following information:

- the best path to the fire
- the current fire situation
- the presence of members of the public or other responders
- the fire’s proximity to values, hazards, and water sources

If aerial reconnaissance is not an option, an initial ground scouting of the fire by foot is required. The scouting path should be based on the knowledge gained about the terrain gathered en route using smartphone or tablet mapping features.

Wildland firefighters often use flagging tape to mark the path to the fire’s edge so the nozzle crew can follow it to lay the hose line up to the fire. The marked path should be made as straight as possible (using a magnetic compass or electronic GPS).

The forest fuel types and current and expected fire behaviour will govern where on the fire’s edge suppression activities begin, just as they did in selecting the arrival site. An operational briefing should occur at the arrival site before response begins.

Appendix I includes an example of the information a wildland fire briefing should cover.

7.4 Arrival At the Site – Wildland Urban Interface Structure Protection

7.4.1 Initial Assessment

During an initial assessment, determining whether home or business occupants are present is a first priority. Depending on the WUI tactics being implemented, the IC will develop the IAP for the responders (as outlined in section 7.5 of this WFMP). The direction given to the occupants will depend on the WUI tactics and timelines, their capacity to assist, and the threat to life safety.

7.5 Developing and Communicating the Incident Action Plan

The IC will begin formulating an IAP as soon as the call reporting the fire is received. Each piece of information the IC has gathered to the point of arriving at the fire has been factored into the IAP.

The IAP must clearly identify the following information:

- command structure and location of the command post
- knowledge about the weather, fire, fuel type and terrain, hazards, escape routes, safety zones, and values at risk or in proximity to the fire
- water sources or a plan for replenishing the pumpers
- overall strategy for attack, including planning for the following events:
    - potential weather changes (such as a wind shift or thunderstorm activity)
    - the onset of darkness
    - the arrival of aerial support or other departments
    - evacuation activities that are underway or being considered
- resources assigned or requested (with an estimated time of arrival), including the following details:
    - individual staff member or group assignments
    - time objectives
    - communication channels and protocol for loss of communications
    - time of next check-in or operations update briefing

7.6 Incident Action Plan Implementation and Monitoring

An in-person staff briefing session is a common occurrence at the start of any response. Arriving resources report directly to the IC at the incident command post or a designated staging area.

Resources that are arriving at a different location on the fire or performing a non-fireline support role can be briefed over the radio. The radio channel chosen for a briefing should not interfere with ongoing operations.

Technology enables the easy sharing of images and text between locations when cellular coverage is available. A cell phone picture of written documents and hand-drawn maps sent between responding agencies helps ensure the same information is used.

Regularly scheduled check-ins are critical for the IC when an operation involves several groups that are not easily observed in person. The timing of check-ins can be based on the clock and or objectives met. A common check-in milestone is when water is first applied to the fire's edge.

7.6.1 Staging Area

A staging area is a secure location near an incident that temporarily holds personnel, equipment, and resources, enabling rapid deployment and tactical coordination. Depending on the complexity of the incident, an IC can choose to use one or more staging areas where resources can report prior to or after responding to the incident. The incident command post may or may not be located in the staging area.

Staging areas can be used by the IC as a means to evaluate the resources arriving at the incident and then decide where and how those resources will be used on the incident. A staging area also provides a location during demobilization to consolidate, assess, and debrief the resources being released.

7.7 Communications

When operating at the scene of a wildland fire incident, responders should use the same communication procedures outlined in the PHFES standard operating guidelines, "Communication and Radio Procedures" and "Incident Command."

7.7.1 Radio Communication Protocols

The PHFES standard operating guideline "Incident Command" states the following:

> Adequate communication is necessary to allow the IC to gather and analyze sufficient information to plan, issue orders, and supervise the operation.
>
> 1. Use the OPS Frequency, assigned for the incident (TAC) at the discretion of IC.
> 2. Use only plain language to communicate (i.e. Pumper 171 to Incident Command" or "Incident Command to Accountability Officer"). Communications directed to the Incident Commander will use an identifying designation.

3. Communications to Command should include.
    a. Assignment status update
    b. Assignment completion
    c. Additional resources required
    d. Inability to complete assignment
    e. Special information (safety issues, information unknown by Command, etc.)

Upon arrival after Incident Command has been announced Accountability shall be established.

Sectors:

Sector procedures provide an array of major functions which may be selectively implemented according to the needs of a particular situation.

When effective Sectors have been established, the Incident Commander can concentrate on overall strategy and resource assignments, allowing the Sectors to manage their assigned units. Sectors are also responsible for communicating needs and progress to the Incident Commander.

Routine communicating within a Sector may be done face-to-face or via radio communication.

When establishing a Sector, the Incident Commander will assign each Sector

a) Tactical objectives
b) A radio designation (e.g., Ventilation Sector, Sector A, Rescue Sector, etc.)
c) The identity of ALL resources assigned to the Sector
d) Geographically

The Sector Officer must be able to supervise and monitor all operations of that Sector and be trained and equipped with the appropriate protective clothing and equipment for their area of responsibility.

For the Incident Command System to function properly, the Incident Commander MUST be advised immediately of significant changes, particularly those involving the ability or inability to respond to Sectors or Personnel to complete an objective, any hazardous conditions, accidents, structural collapse, etc., affecting personal safety.

PHFES has repeater units installed in all its class A pumpers to support handheld radio operations at an incident.

7.7.2 Cellular Communications

Cellular communication devices are not a reliable means of communicating during an emergency. Power failures, malicious hackers, and the impact of a wildfire on cellular tower facilities can lead to a loss of coverage.

Like many areas across Ontario, Port Hope does not have consistent cellular communications coverage. As such, there are areas in Port Hope with connectivity gaps.

A recent technological advancement in cellular communication has enabled users to text via satellite connectivity in areas without reliable cellular coverage. Many emergency response organizations are subscribing to satellite services to provide an additional layer of redundancy for their command staff.

Recommendations

7. The senior staff at Port Hope Fire and Emergency Services should have cellular plans with satellite connectivity for use during cellular outages and incidents in remote areas with no cellphone coverage.

7.7.3 Digital Radio Communications

In 2024, PHFES entered into a renewed agreement with Northumberland County to manage its network of repeater stations on towers throughout the municipality.

The agreement enables PHFES to use towers in neighbouring municipalities to improve its communications coverage using the two-zone system. Zone 1 supports seven normal operational channels and seven tactical channels. Zone 2 supports escalated and interagency channels (such as those used by the OFM, Public Works department, and helicopters).

The radio channels Port Hope uses are outlined in Appendix O.

Figure 31 shows the locations of the cellular towers and service providers in the Port Hope area.

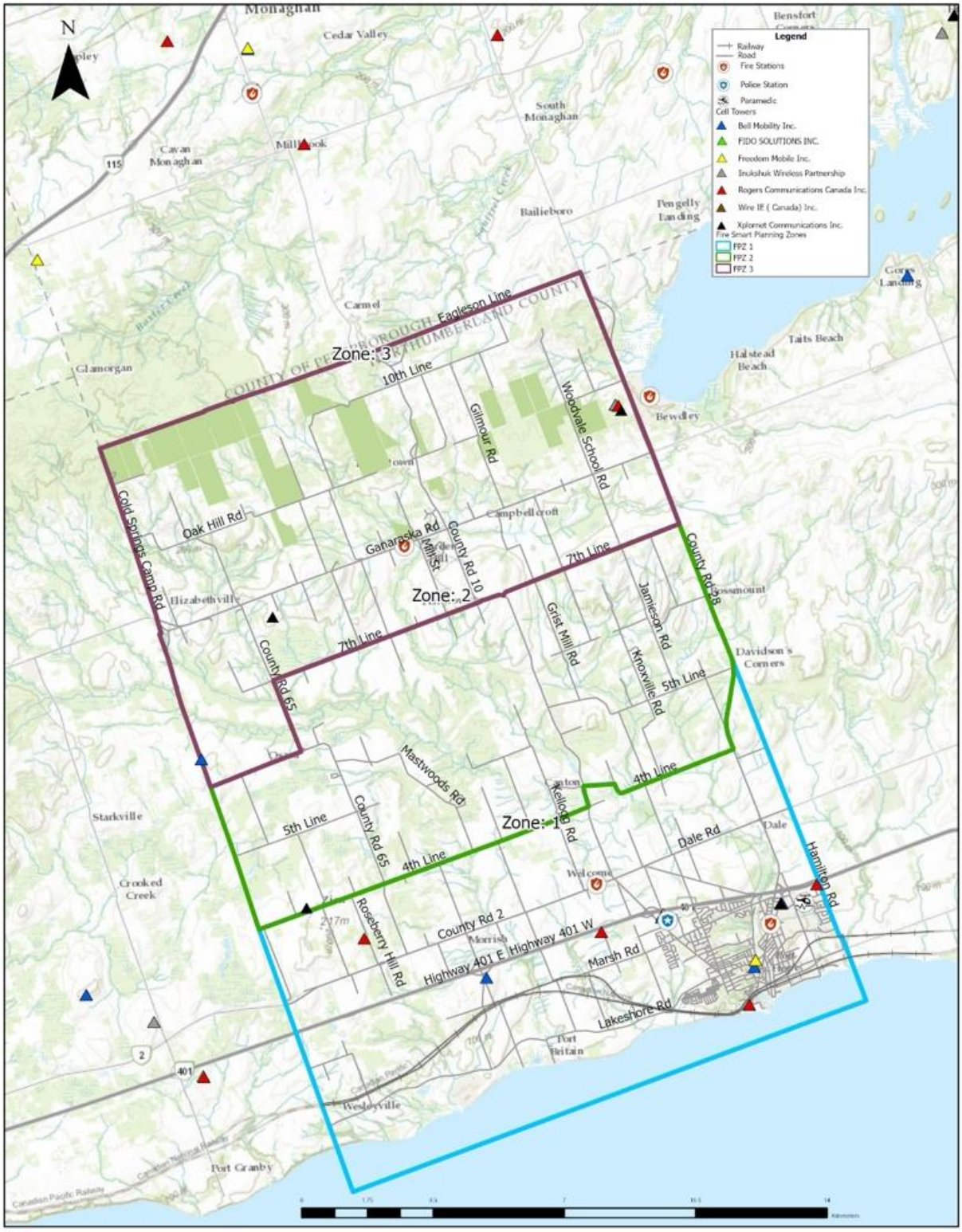


Figure 31. Cellular tower locations and service providers.[49]

[49] Image credit: Northumberland County GIS.

7.8 Extended Operations Planning

A wildland fire response can involve operations that continue for an extended period, sometimes stretching over days. The IC is responsible for identifying the possibility of conducting extended operations. Once determined, the IC needs to communicate the likelihood that a response will involve extended operations to the PHFES command as early as possible, so that appropriate staffing and resource levels can be planned.

7.9 Wildland Fire Investigation

Investigation Responsibilities

Under the FPPA, the duty to investigate fires is a key responsibility of the Fire Marshal and the Fire Chief. The Fire Chief is responsible for ensuring that all incidents are investigated to determine the cause of the fire. The Fire Chief is also responsible for taking steps to prevent similar incidents by ensuring that fire prevention and public education initiatives are implemented.

Fire Marshal Directive 2023-01 outlines the fires and explosions that require investigation, providing direction to Assistants to the Fire Marshal on the Fire Marshal's duties under the FPPA. This directive supports the Fire Marshal’s prescribed duties and ensures that all fire incidents are investigated properly.

Specific to wildland fires, the Fire Chief is responsible for reporting to the Office of the Fire Marshal when one of the following occurs:

- A wildland fire results in a fatality.
- A wildland fire results in a person being admitted with life-threatening injury.
- A wildland fire where an explosion is suspected or known to be the primary event.
- A wildland fire is suspected of being incendiary (criminal). Discretion to notify the Office of the Fire Marshal may be used: when the cause, origin and circumstance have been determined; when there is no impact to buildings; or, in circumstances where there is no clear threat to life due to a wildfire.
    - All incendiary fires and explosions must be reported to the police authority having jurisdiction.
- A wildland fire where the loss is significant to the community.
- A wildland fire involving circumstances that may result in widespread public concern (for example, environmental hazard).
- A wildland fire involving clandestine and illegal drug operations, cannabis/marijuana grow operations.

Wildfire Behaviour

Understanding wildfire behaviour is critical to an investigation. Wildfires are influenced by fuel, weather, and topography.

Chapter 27 of NFPA 921 focuses on how to investigate fires that occur in wildland environments (such as forests, grasslands, and interface zones). This standard adapts general fire investigation principles to the unique behaviour and scale of wildfires.

Wildfire and structural fire investigations differ. The differences are due to the following wildfire characteristics:

- wildfires cover large, open areas
- wildfires are influenced heavily by weather and terrain
- wildfires often destroy or obscure physical evidence
- wildfires may involve multiple ignition points or spot fires

Wildfires spread in patterns that differ from other types of fires. The spread of a wildfire includes the following movements:

- backing fire (against wind/slope)
- heading fire (with wind/slope, fastest spread)
- flanking fire (sideways movement)

Indicators like the fire’s rate of spread, flame length, and intensity help investigators reconstruct the fire’s origin point.

In order to understand burn patterns, investigators classify fuels in the following ways:

- ground fuels (such as roots and peat)
- surface fuels (such as grass, leaves, and shrubs)
- aerial fuels (such as trees and canopy)

Fuel type affects how evidence is burned and how fire spreads. Identifying the area of origin and, if possible, the point of ignition includes the following methods:

- fire pattern analysis (such as V-patterns, angle of char, and depth of burn)
- protection indicators analysis (such as objects shielding areas from fire)
- vector analysis (directional indicators, such as grass lay and char patterns)

Investigators typically start from the least-damaged area, work backward against the spread of the fire, and narrow the investigation down to a specific origin zone. Once the origin zone is identified, investigators assess ignition sources.

A wildfire may be ignited by natural causes (such as lightning), accidental human causes (such as equipment, campfires, or power lines), or incendiary causes (such as arson).

In order to draw final conclusions, the investigator should use the following information and methods:

- physical evidence (if available)
- witness statements
- weather and lightning data
- elimination of alternative causes
- use systematic grid or strip searches
- flag and document evidence carefully
- consider wind shifts and spotting
- aerial reconnaissance (such as drones and aircraft) may assist

Accurate documentation is critical during an investigation. Using photos (both ground and aerial), sketches and maps, GPS coordinates, and notes on fire behaviour and environmental conditions is imperative.

Safety should always be the number one priority for investigators. A wildfire scene poses unique hazards. Rekindling fires, falling trees (snags), rough terrain, and heat exposure are among the additional risks investigators will face. Investigators must follow safety protocols and often coordinate with wildfire suppression teams.

Like all NFPA 921 investigations, wildfire analysis follows the scientific method. The scientific method involves the following steps:

1. Define the problem.
2. Collect data.
3. Analyze data.
4. Develop hypotheses.
5. Test hypotheses.
6. Select a final conclusion.

Wildfire investigations rely heavily on fire behaviour analysis and environmental interpretation, often with limited physical evidence. Determining a fire's origin and cause requires combining pattern recognition, scientific reasoning, and contextual data.

7.9.1 Wildland Fire Investigation Practices

The AFFES provides training on wildland fire investigations at various levels within its organization.

If an IC is responding to a wildland fire suspected of being caused by a person, they should adhere to the following best practices:

- Take photos immediately upon arrival—the photos should include the fire and its surroundings, persons or vehicles present, tire tracks (if warranted), signs of human activity (such as camping gear or industrial operations) and the point of origin (likely near the rear of the fire). Note the time and location of each photo.
- Interview potential witness, obtaining their name, address, phone number, vehicle details, and what they saw or heard and when.
- Mark off the fire's point of origin with caution or flagging tape, ensuring the area is not disturbed.

The MNR uses conservation officers to investigate wildland fires when legal action is expected. Conservation officers receive advanced investigation training that teaches them how to identify the point of origin using burn indicators. Detailed information on similar wildfire investigation techniques can be found in the National Wildfire Coordinating Group Guide to Wildland Fire Origin and Cause Determination.[50]

Recommendations

8. Port Hope Fire and Emergency Services should ensure that it has a sufficient number of staff members trained to the standard of NFPA 921, *Guide for Fire and Explosion Investigations*.

7.10 Demobilization

As the situation at the incident stabilizes, the IC needs to develop a plan for releasing resources. Mutual and automatic aid resources are often the first resources to be considered for release. Support vehicles (such as water tenders and industrial equipment) may remain at the incident site to conduct mop-up activities after a fire apparatus leaves.

[50] https://fs-prod-nwcg.s3.us-gov-west-1.amazonaws.com/s3fs-public/publication/pms412.pdf

Large five-ton rental vehicles are often used to transport fireline equipment back to where it will be serviced during demobilization.

Part of the recommended demobilization process involves conducting an after-action review. When conducting an after-action review, wildland fire agencies often use the following format:

1. What did we set out to do?
2. What actually happened?
3. Why was there a difference?
4. What actions are proposed (to sustain or implement) for future responses?

In non-complex, routine responses, the questions listed above are often answered verbally, giving staff members a platform to speak openly about the response.

In other cases, an after-action review is mandatory when a situation arises that poses a safety concern. For instance, air attacks in Ontario mandate an after-action review after every mission, which may or may not involve ground personnel (depending on the circumstances).

For an example of a generic after-action review used by the MNR, see Appendix B.

The NFPA refers to the after-action review process as a post-incident analysis (as referenced in both NFPA 1500, *Standard on Fire Department Occupational Safety, Health and Wellness Program*, and NFPA 1521, *Standard for Fire Department Safety Officer Professional Qualifications*).

8.0 Wildland Fire and Urban Interface Structure Protection Training

8.1 Overview of Structure Protection Training

NFPA 1140, *Standard for Wildland Fire Protection*, lists a variety of training standards for municipal firefighters. In Ontario, the MNR provides training materials and in-class training courses. As cited in Appendix E, it is recommended that fire departments arrange to deliver SP103: Wildland Fire Fighter Training for Fire Agencies. This training can be arranged in-house or through an approved contractor.

The MNR also offers SP230: Wildland Fire Strategies and Tactics, which is a follow-up course to the SP103 course. This follow-up course has an in-class delivery format, and it is for fire department staff in leadership positions. SP230 training is facilitated by the Ontario Association of Fire Chiefs.

As of this WFMP, the MNR does not provide urban interface structure protection training. However, the International Association of Fire Fighters provides a course on urban interface structure protection. That course is facilitated by the Government of Canada.

8.2 Port Hope Fire and Emergency Services Wildland Fire Training Plan

As of this WFMP, PHFES has the following wildland fire training plan in place:

2026

- “Responding to the Interface” training is planned in Port Hope in spring 2026. The course will be delivered in conjunction with the International Association of Fire Fighters, and it will be sponsored by the Government of Canada. This course will enhance PHFES’s ability to respond to structures threatened by wildfire in the urban interface.
- SP103 course materials are being acquired from the MNR. SP103 training is the Ontario standard for interagency wildland fire agreements with the MNR.

2027

- PHFES plans to have supervisory staff attend SP230 training (delivered by the MNR). Successful completion of SP103 is a prerequisite.

Wildfires are not contained by jurisdictional boundaries, and they can move between forested lands and neighbourhoods. In many cases, WUI events require many emergency response organizations. Planning and training must be completed in advance, as training cannot be effective when done in isolation.

Cross-training is conducted to bring emergency response organizations together. Allowing different organizations to train together helps identify potential weaknesses and gaps in response efforts. Joint training also allows emergency response organizations to become familiar with the equipment, procedures, and strategies of other agencies that may be involved in a response.

Recommendations

9. Port Hope Fire and Emergency Services should allocate funding to obtain the recommended ongoing wildland fire training and equipment to support wildland fire responses.

9.0 Fire Detection and Reporting

9.1 Fire Detection and Reporting Methods

Detecting forest fires in Southern Ontario relies on the public, industry, and organizations to report wildfires using 911. The 911 system consists of 108 “public safety answering points” across Ontario.[51]

The 911 communications officer who responds to a call will be based on the reported incident location. Upon receiving a call regarding a wildfire, the communications officer will either transfer the caller or send the information to the appropriate fire dispatch communications centre.

In Northern Ontario, a separate centralized reporting center handles wildfire calls, using the 310-Fire (3473) phone number. The MNR promotes this phone number through many media streams. Figure X shows an example of an infographic used by the MNR to raise public awareness regarding forest fire reporting.

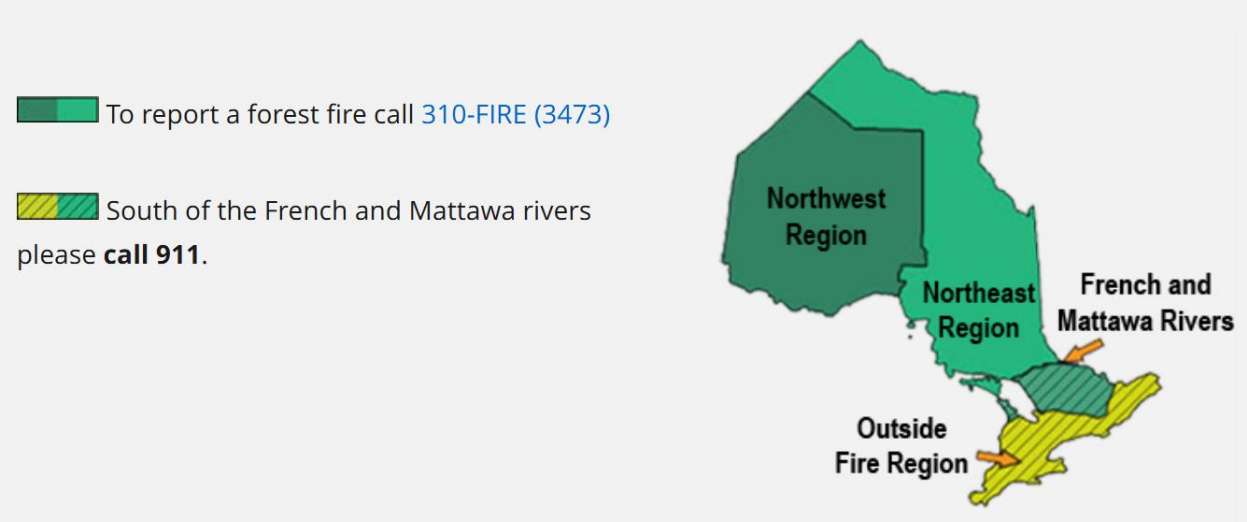


Figure 32. Forest fire reporting infographic.[52]

It can be challenging for call centres to obtain an accurate location for a reported wildfire. Callers using cell phones are directed to the 911 public safety answering point associated with the cell tower they are connected to (based on their location). However, the cell tower’s location does not always correspond to the wildfire’s location.

[51] https://news.ontario.ca/en/release/1005929/ontario-supporting-new-emergency-communications-system-to-protect-people-families-and-communities

[52] Image credit: Ministry of Natural Resources. https://www.ontario.ca/page/forest-fires

To complicate matters further, estimating where wildfire smoke is from a distance is difficult, especially for people unfamiliar with the area. Even callers near the fire may not know their location, as is often the case for people discovering the fire while travelling in a forest.

An application called What Three Words offers the public a means to pinpoint their location. The system is designed to provide a location to the user even if no cell signal is present. A user can then move to an area of reception to call 911 and provide the report of the wildfire along with its “three-word” location. There are a number of alternatives to using this application (such as Google Maps or Waze), but the purpose of the What Three Words application is to simplify the reporting process for users during times when they are under stress.

Recommendations

10. Due to the size of the Ganaraska Forest and the number of municipalities within its boundaries, standardized messaging for users of the forest should be promoted in order to improve the accuracy of wildfire reporting, as well as any other emergency that occurs in remote areas. This initiative could be accomplished through the Ganaraska Forest Committee.

10.0 Open Air By-Law and Enforcement

10.1 Open Air By-law

As of this WFMP, Port Hope enforces By-law 79/2023, which is a by-law designed to regulate open-air burning.

The authority of By-law 79/2023 comes from the following pieces of legislation:

1. Fire Protection and Prevention Act, 1997, S.O. 1997, c. 4[53]

   7.1 (1) A council of a municipality may pass by-laws;

   (b) regulating the setting of open air fires, including establishing the times during which open air fires may be set;

2. O. Reg. 388/97 FIRE CODE[54]

   Subsection 2.6.3 Incinerators

   2.6.3.4 Open air burning shall not be permitted unless approved, or unless such burning consists of small, confined fire, supervised at all times, and used to cook food on a grill or barbecue

Section 3 of By-law 79/2023 – Regulations for Burn Permits, identifies the following three types of burn permits:

1. Recreational Burning – allowed in both the urban (Ward 1) and rural (Ward 2) area of the Municipality.
2. Brush Pile Burning – only allowed in the rural area of the Municipality.
3. Land Cleaning Burning – only allowed in the rural area of the Municipality.

As of this WFMP, there is no charge for a burn permit within Port Hope. Permits are valid for the calendar year, and they expire on December 31st. Additionally, permit holders are required to call a 1-800 number before they start burning.

The following considerations can be used to enhance PHFES:

- Add daytime restriction consistent with the MNR WFMA (formerly FFPA).[55]
- Consider adding April 1 to October 31 as a period of no daytime burning.
- Consider implementing an automatic fire ban when fields become snow-free in the spring until green-up occurs.

[53] https://www.ontario.ca/laws/statute/97f04

[54] https://www.ontario.ca/laws/regulation/970388

[55] https://www.ontario.ca/laws/statute/90f24

- Consider removing yard waste that is burnable.
- Consider implementing a fee for permits.

10.2 Enforcement

Penalties for issues of non-compliance with By-law 79/2023 are set through the Municipality of Port Hope Fees for Services By-law. The costs associated with activating the MNR are also addressed under the penalties section of this by-law.

11.0 Urban Interface Wildland Fire Risk Assessment

11.1 Wildland Fire Risk Assessment Process

This section of the WFMP describes the process that is used to assess the overall level of wildland fire risk in Port Hope. The methodology and explanations for this process are based on the MNR Community Wildland Fire Protection Planning Guide.

The information used to assess the level of wildland fire risk comes from the following sources:

- the MNR
- Canadian Forest Service
- County of Northumberland GIS department
- Ganaraska Forest Conservation Authority

Figure 33 shows the process used to determine the overall level of risk to the Fire Planning Zones ("**FPZs**") in the planning area.

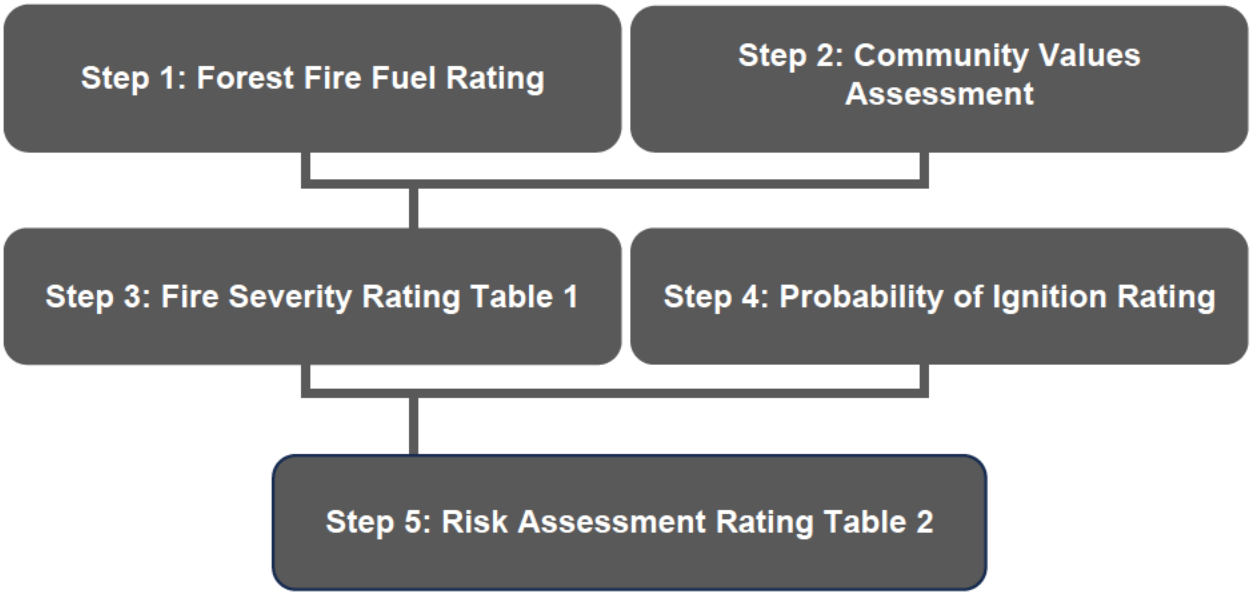


Figure 33. Risk assessment analysis process.

The MNR Community Wildland Fire Protection Planning Guide 2025 offers the following explanation of this assessment process:

> A forest fuel risk rating is a system that is used to evaluate and categorize potential fire hazards based on the types, amounts, and conditions of combustible materials present in a forested area. This rating helps predict how easily a fire might ignite, how quickly it could spread, and how intense it might become.

The following factors are considered when determining a forest fuel risk rating:

- density and type of vegetation (such as grasses, shrubs, or trees)
- moisture content of forest fuel
- weather conditions (such as temperature, wind speed, and humidity)
- topography of the area

High-risk ratings typically indicate dry conditions, abundant fine fuels (such as dead leaves or dry grass), and the presence of dense understory vegetation. These factors can contribute to the rapid spread of fire.

Conversely, low-risk ratings may reflect moist conditions, sparse vegetation, or recent efforts to reduce fuel loads (such as thinning, controlled burns, or removal of dead and decaying plant material).

Firefighters, land managers, and emergency planners must understand the forest fuel risk rating of an area when preparing for (and responding to) potential wildfire incidents.

During times of extreme fire hazards, all fuels are potentially high risk. Also, the hazard level of all fuel values can increase if horizontal fuels accumulate. For example, mixed-wood fuels with storm damage may move from a moderate hazard to a high hazard.

High Forest Fuel Rating

Examples of areas with a high forest fuel rating are as follows:

- unmanaged conifer plantations, such as:
  - areas with spruce and pine that have branches (ladder fuels) that reach the ground
  - areas with slash build-up under the tree canopy
- conifer forests (natural areas with pine, spruce, or balsam fir)
- mixed-wood forests (50 to 75 per cent conifer) with accumulated surface fuels and laddering, including forests with the following types of trees:
  - white or black spruce
  - balsam fir
  - jack, red, or white pine
- slash- or storm-damaged fuel areas with fuels lying horizontally on the ground
- areas with grass fuels (including heavy accumulation of dead material in the spring and fall), such as unmanaged farmlands or meadows

Note: Areas of cedar, hemlock, and tamarack are typically not a fire concern.

Figure 34 shows an example of an area with a high forest fuel rating.

Figure 34. Example of an area with a high forest fuel rating.

Moderate Forest Fuel Rating

Examples of areas with a moderate forest fuel rating are as follows:

- conifer plantations that are managed and have some ladder fuels or slash on the ground
- mixed-wood forests (25 to 50 per cent conifer) with some accumulation of surface fuels, some storm damage, or insect damage

Figure 35 shows an example of an area with a moderate forest fuel rating.

Figure 35. Example of an area with a moderate forest fuel rating.

Low Forest Fuel Rating

Examples of areas with a low forest fuel rating are as follows:

- mixed-wood forest with 25 per cent conifer (or less)
- conifer plantations with park-like settings (clean, free of debris, pruned, and no understory regeneration)
- hardwood forests, including maple, birch, oak, and poplar
- green grass in open fields (or understory fuels within forested areas)

Figure 36 shows an example of an area with a low forest fuel rating.

Figure 36. Example of an area with a low forest fuel rating.

11.1.1 Potential Forest Hazard Classification

In Port Hope, the dominant types of vegetation were assessed using the methodology identified in the MNR Community Wildland Fire Protection Planning Guide. The assessment used data from Natural Resources Canada's *Canadian Forest Fire Danger Rating System (CFFDRS) Fire Behaviour Prediction (FBP) Fuel Types 2024, 30 M*,[56] Arc Enterprise data from the Ganaraska Region Conservation Authority, and Google Earth imagery to determine the wildland fire forest hazard classes.

Figure 37 shows a map of potential forest-hazard classifications for wildland fire in Port Hope.

[56] https://www.app.geo.ca/en-ca/map-browser/record/4e66dd2f-5cd0-42fd-b82c-a430044b31de

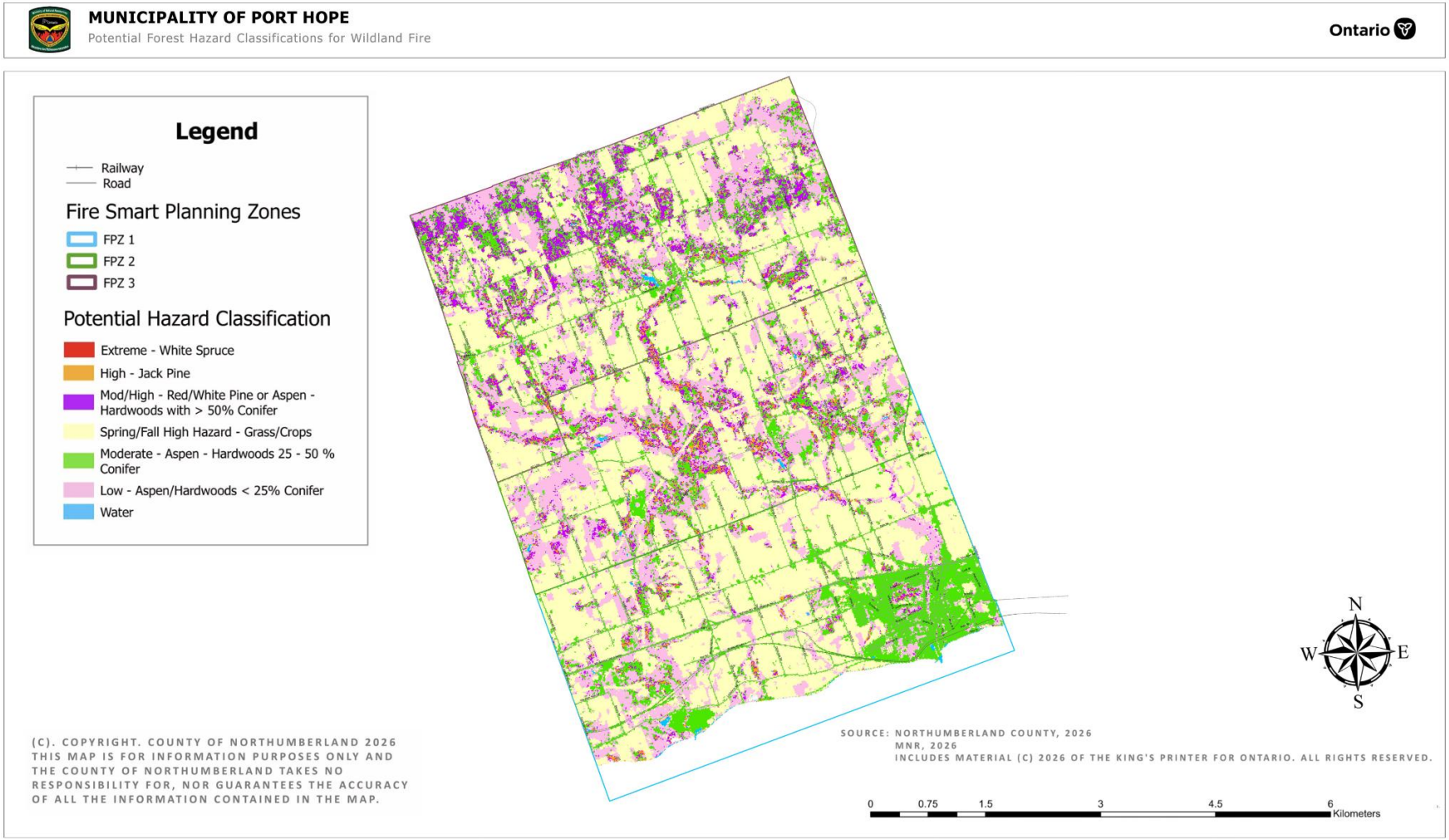


Figure 37. Potential forest hazard classifications for wildland fire.[57]

[57] Map credit: Northumberland County GIS.

As shown in the map above, there are small pockets of high-hazard jack pine mixed in with moderate- to high-hazard red/white pine. The map also shows mixed deciduous stands containing greater than 50 per cent conifer species (such as spruce and balsam). These areas represent the greatest concern for higher intensity forest fires.

It should be noted that Port Hope also has large tracts of grass and agricultural crops that may cause wildland fires in the spring and fall.

11.1.2 Fire Planning Zones Hazard Rating

The assessment of Potential Forest Hazard Classifications for Wildland Fire was used to establish three FPZs in Port Hope. The FPZs group areas with similar fuel-type risk. Each FPZ is evaluated to assign an overall forest fire fuel risk rating. This evaluation uses the vegetation types outlined in the Canadian Forest Behaviour Prediction System.

Table 3 outlines the relative forest fire fuel rating for Port Hope's FPZs.

Table 3. Forest fire fuel rating for Port Hope FPZs.

FPZ	Forest Fire Fuel Rating
1	**Low**
2	**Moderate**
3	**High**

Figure 38 shows a map of Port Hope's forest fuel risk ratings by FPZ.

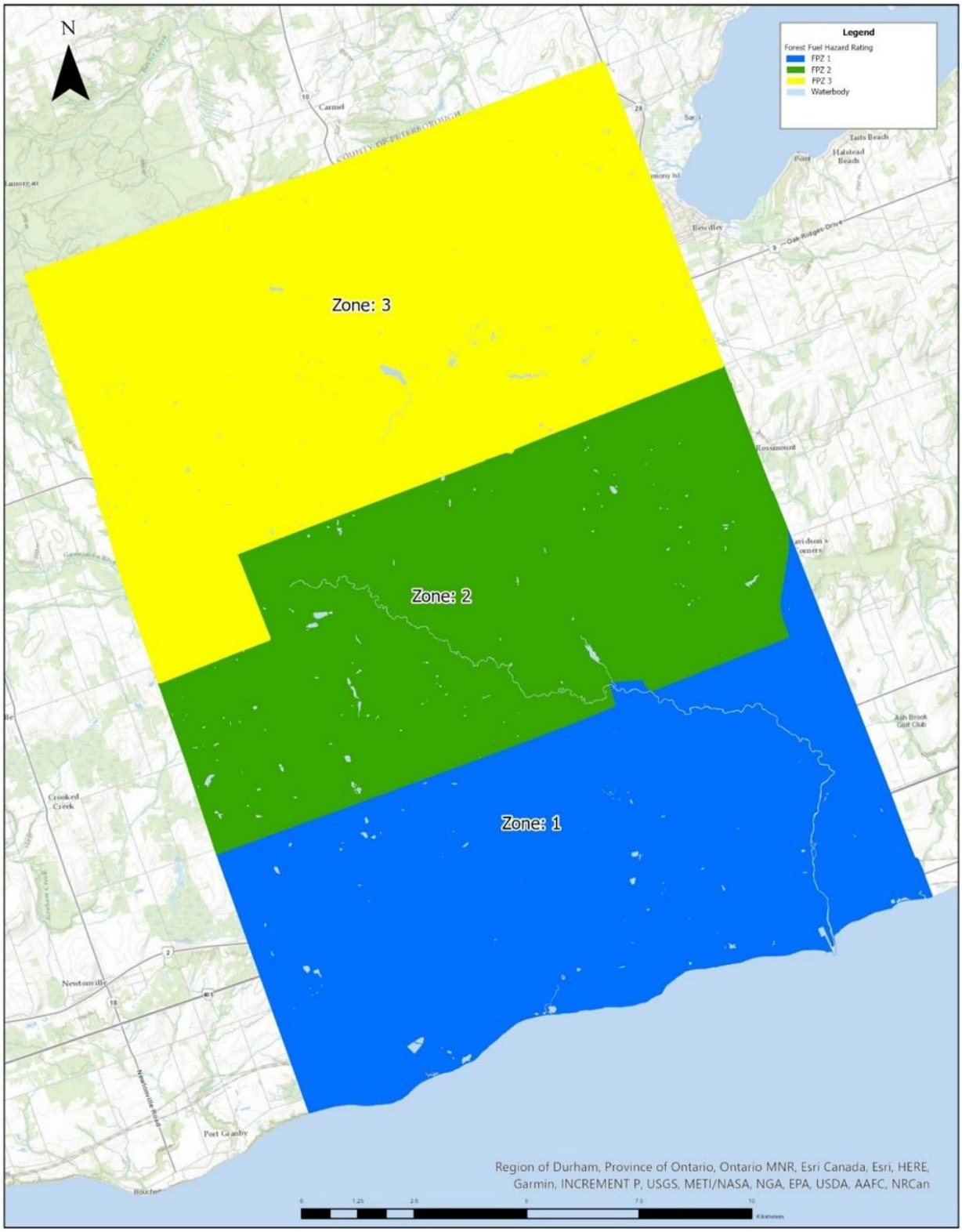


Figure 38. Forest fuel risk ratings in Port Hope (by FPZ).[58]

[58] Map credit: Northumberland County GIS.

11.1.3 Community Values Assessment

Community values were evaluated for each FPZ in Port Hope. The community values assessment included critical infrastructure (as defined by the criteria outlined by Emergency Management Ontario).[59] The assessment also considered forest fire fuel ratings and open-air burning fire responses.

Table 4 shows the data compiled for Port Hope's community values assessment and each FPZ's values risk rating.

Table 4. Port Hope community values risk ratings.[60]

FPZ	Forest Fuel Risk Rating	Critical Infrastructure Total (P1+P2+P3)	Civic Addresses	Building Footprint Count	2015-2024 Open-Air Burning Responses	Values Risk Rating
1	**Low**	56	9432	7408	208	**High**
2	**Moderate**	3	1296	1276	19	**Moderate**
3	**High**	18	1679	1938	34	**High**

The following maps illustrate data about the FPZs in Port Hope:

- Figure 39 shows the locations of the open-air burning fire responses conducted in Port Hope from 2015 to 2024. The map also shows the boundaries of each FPZ.
- Figure 40 shows the locations of civic addresses in Port Hope by FPZ.
- Figure 41 shows the locations of critical infrastructure in Port Hope by FPZ.

[59] https://www.ontario.ca/page/emergency-management-program-resources

[60] Table credit: Northumberland County GIS and The Loomex Group.

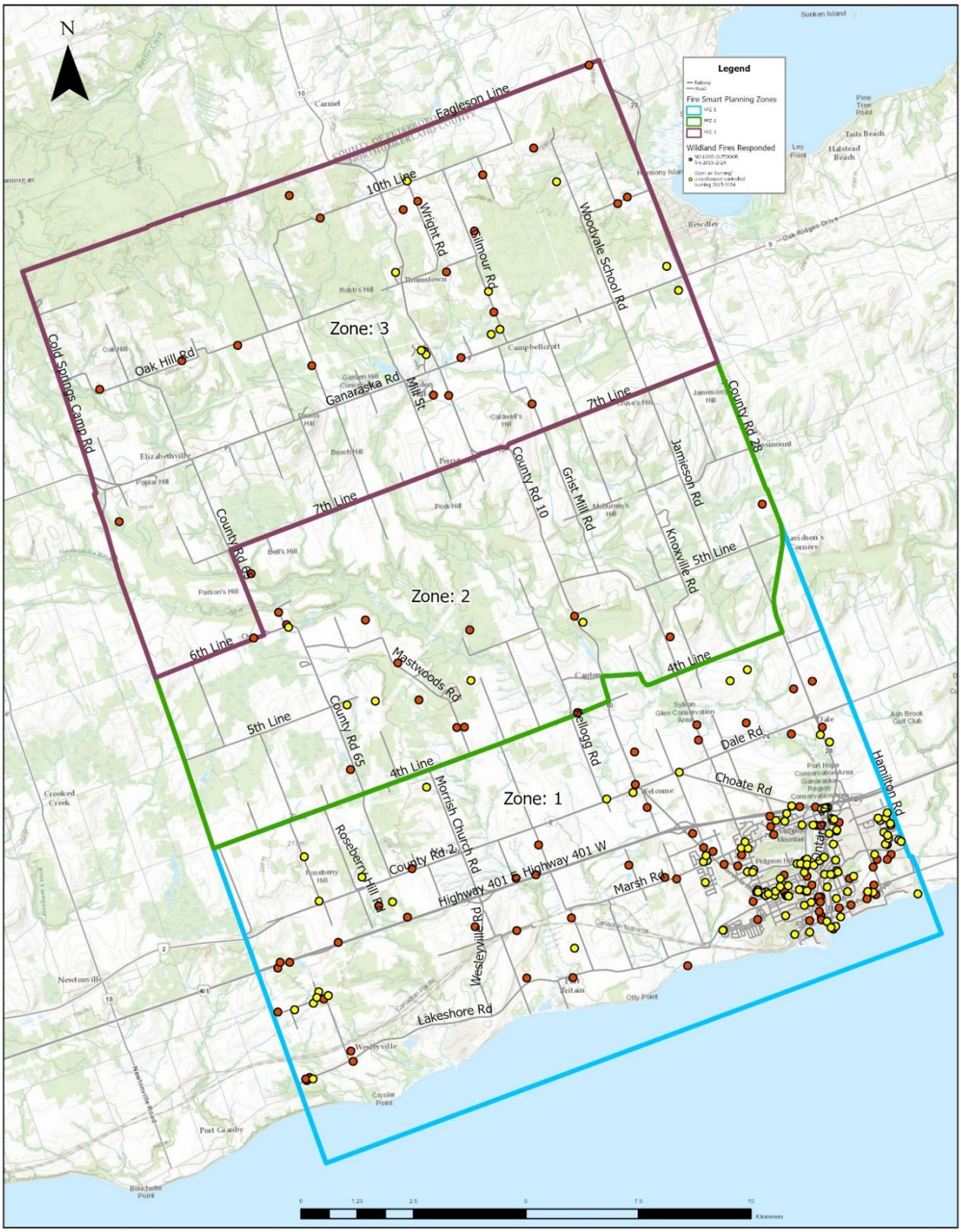


Figure 39. Port Hope open-air burning fire responses, 2015 to 2024.[61]

[61] Map credit: Northumberland County GIS.

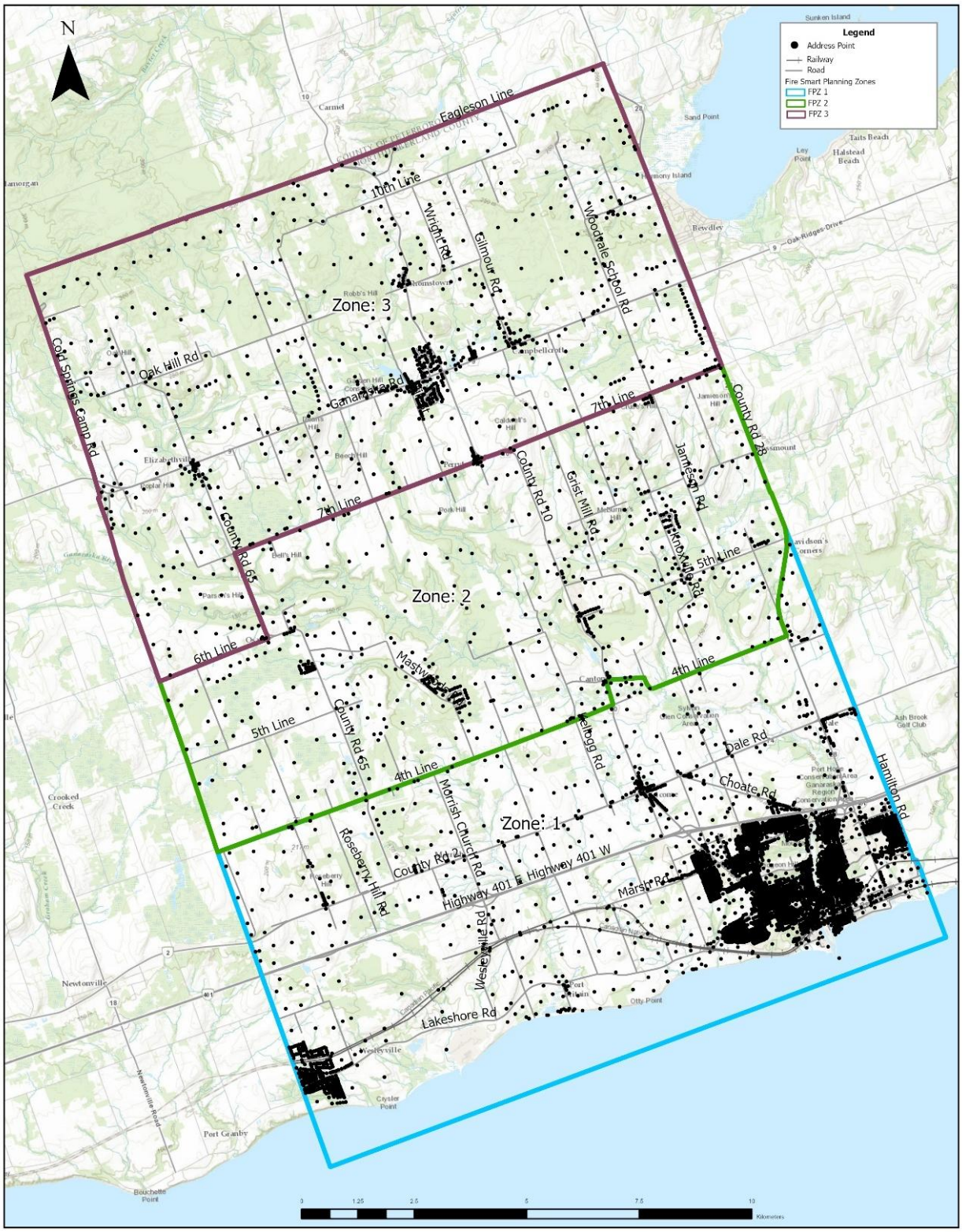


Figure 40. Port Hope civic addresses.[62]

[62] Map credit: Northumberland County GIS.

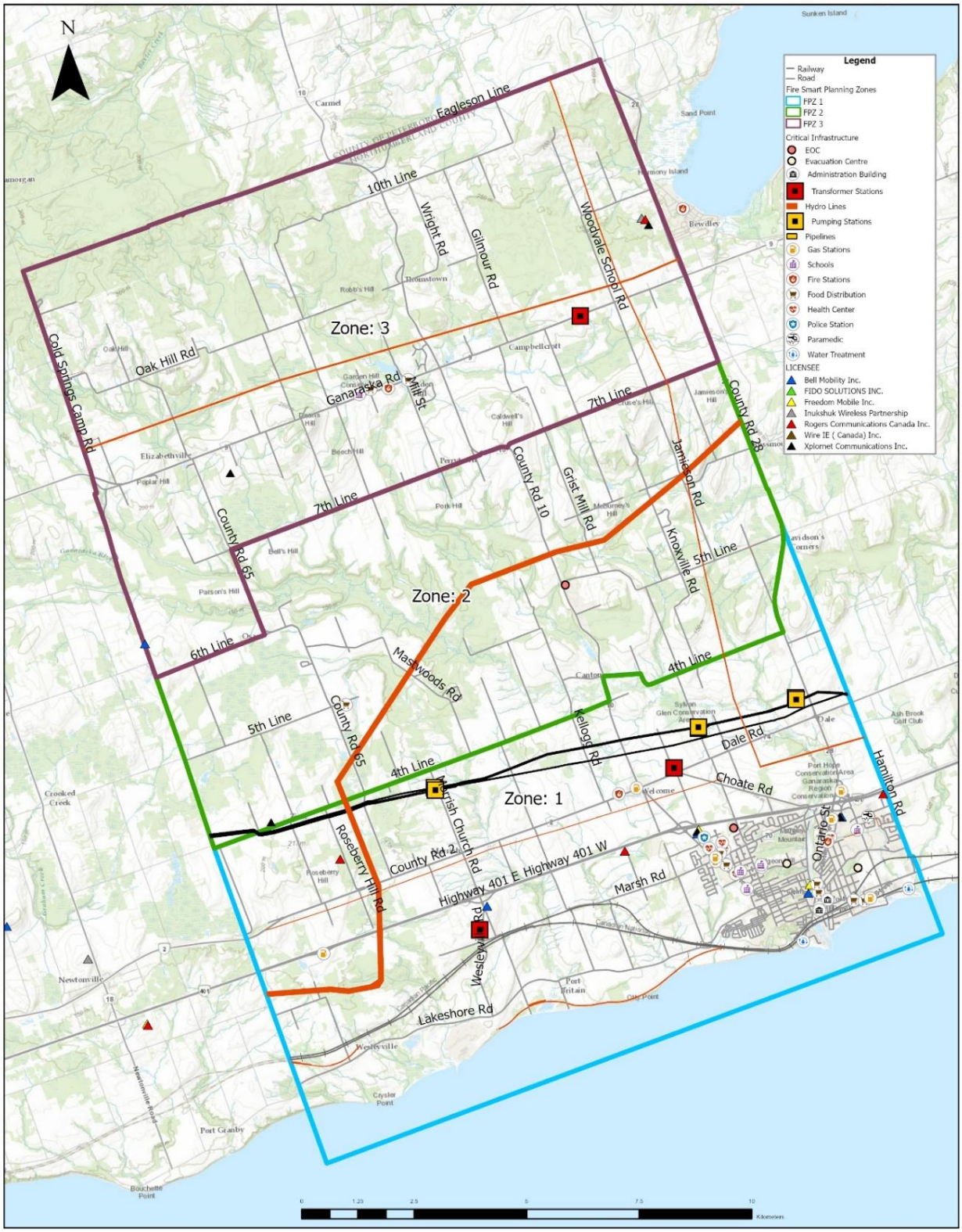


Figure 41. Port Hope critical infrastructure locations.[63]

[63] Map credit: Northumberland County GIS.

In addition to the values depicted in the figures above, Figures 42 and 43 show areas of concern associated with the Ganaraska Forest (as identified by the Ganaraska Forest Conservation Authority).

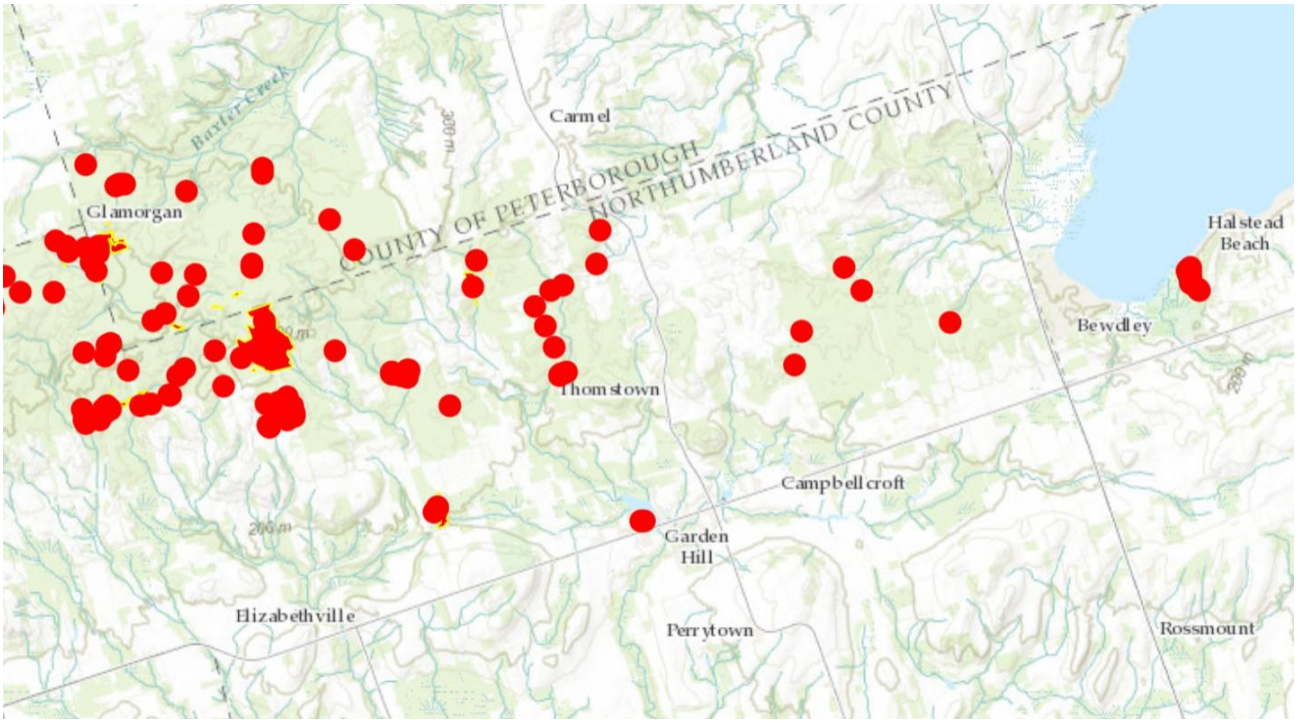


Figure 42. High-value conservation areas in the Ganaraska Forest.

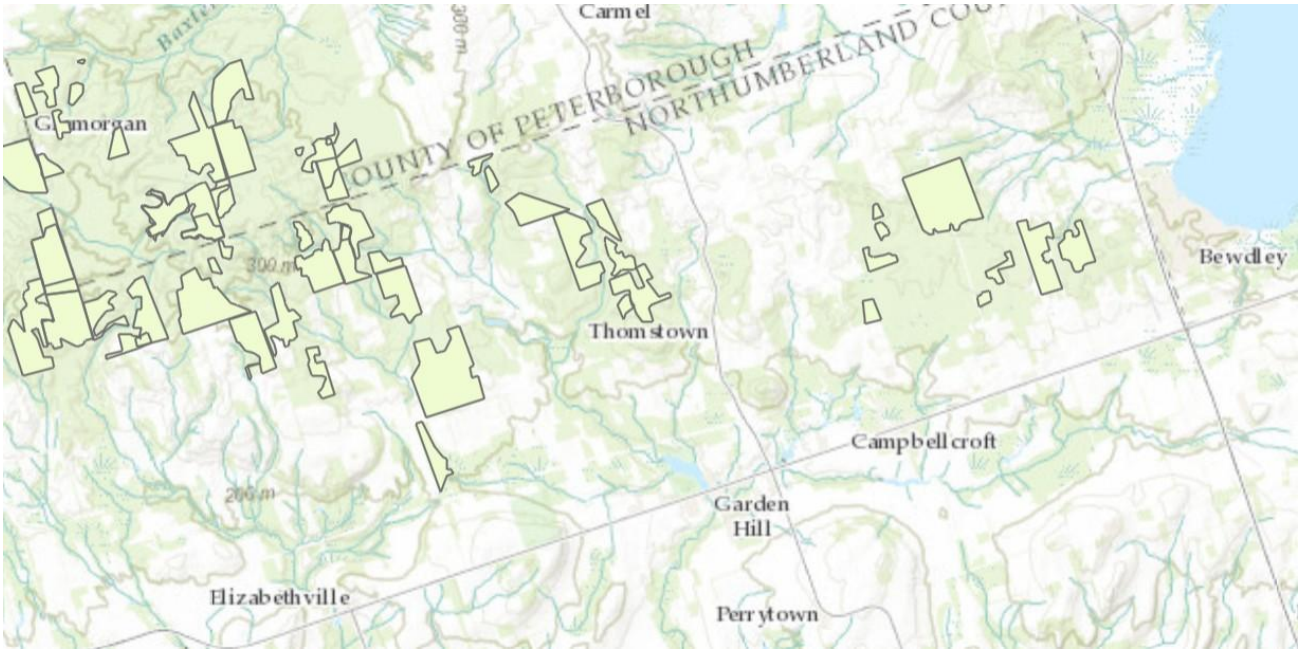


Figure 43. Harvesting operation areas in the Ganaraska Forest.

Figure 44 shows the overall community value risk rating for each Port Hope FPZ.

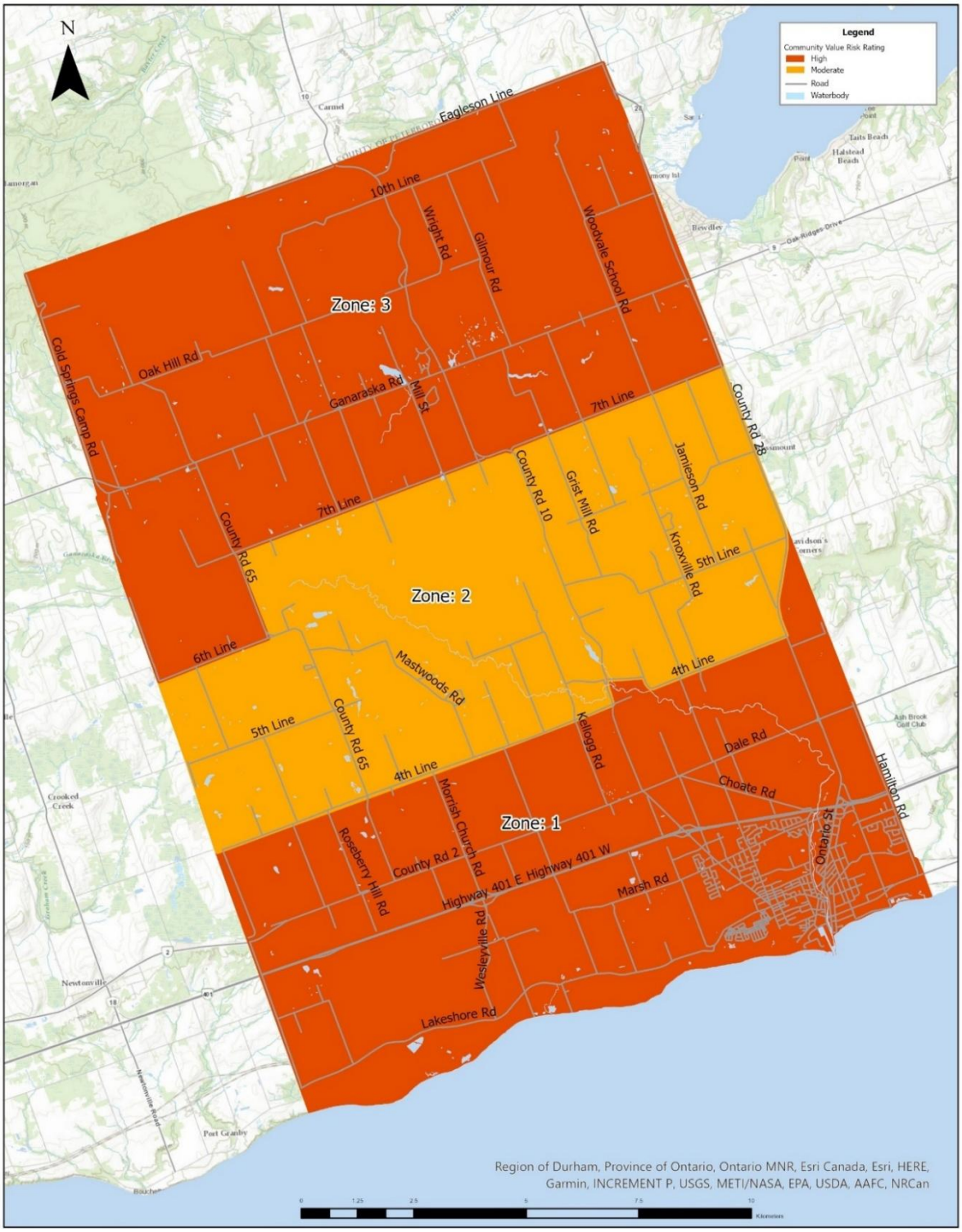


Figure 44. Port Hope community value risk rating.[64]

[64] Map credit: Northumberland County GIS.

11.1.4 Fire Severity Rating Assessment

Overview

A fire severity rating is a classification that measures the impact of a wildfire on an ecosystem (such as the degree of damage inflicted on vegetation, soil, and other natural resources). The fire severity rating provides valuable information about the intensity of a fire, its destructive potential, and the likely consequences for the environment and human infrastructure.

Conducting a fire severity rating assessment involves comparing the forest fuel risk ratings to the value risk ratings using a fire severity matrix.

Figure 45 shows the fire severity rating matrix included in the MNR Community Wildland Fire Protection Planning Guide.

severity

		FUEL TYPE HAZARD		
		LOW	MOD	HIGH
COMMUNITY VALUE	LOW	NEGLIGIBLE	NEGLIGIBLE	MARGINAL
	MODERATE	NEGLIGIBLE	MARGINAL	CRITICAL
	HIGH	MARGINAL	CRITICAL	CATASTROPHIC

Figure 45. Fire severity rating matrix.

Fire Severity Rating for Port Hope

Table 5 shows the fire severity rating for Port Hope's FPZs.

Table 5. Port Hope fire severity rating.

FPZ	Forest Fuel Rating	Value Risk Rating	Fire Severity Rating
1	**Low**	**High**	**Marginal**
2	**Moderate**	**Moderate**	**Marginal**
3	**High**	**High**	**Catastrophic**

Figure 46 shows the fire severity rating for Port Hope by FPZ.

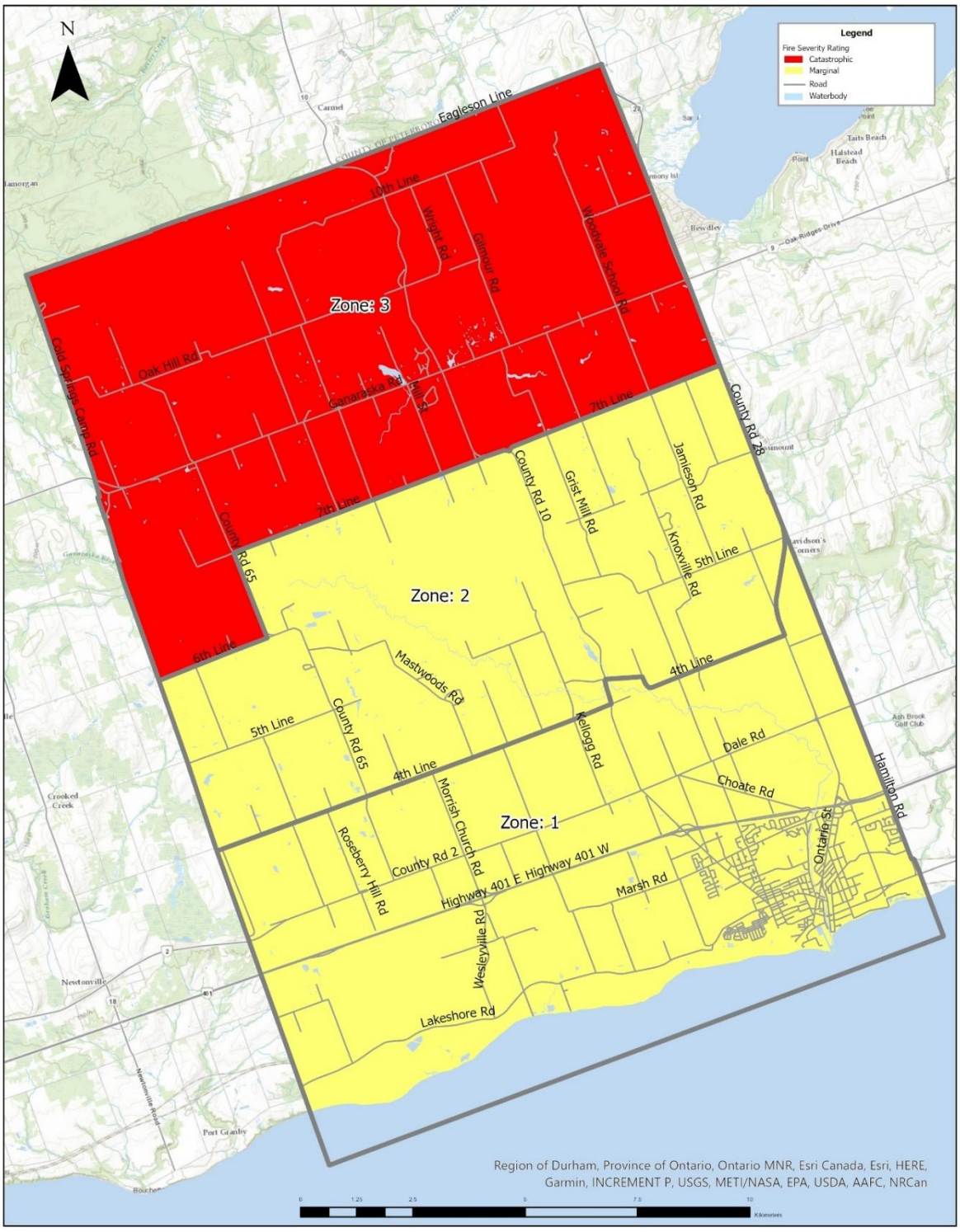


Figure 46. Port Hope fire severity rating.[65]

[65] Map credit: Northumberland County GIS.

11.1.5 Probability of Ignition Rating

The probability of ignition rating is calculated by estimating the land mass accessed by the public for recreational activities, and hazardous industrial operations (such as rail transport and forest harvesting), along with open-air burning response history.

Typically, information about trail lengths is available, but not information about trail width. In order to estimate the land area impacted by human presence, trails are assumed to be 10 metres wide.

Table 6 shows the probability of ignition rating for Port Hope. Percentages are created per FPZ.

Table 6. Port Hope probability of ignition rating.[66]

FPZ	2015-2024 Open-Air Burning Responses	Railroad (% of 100)	Parks (% of 100)	Mapped Trails (% of 100)	Probability of Ignition
1	208	0.3%	2.0%	0.3%	**Likely**
2	19	0.0%	0.0%	0.1%	**Occasional**
3	34	0.0%	11.0%	1.3%	**Occasional**

Figure 47 shows a map of Port Hope's land use by FPZ. The map was used to assess Port Hope's probability of ignition rating.

Figure 48 shows the probability of ignition rating for each FPZ in Port Hope.

[66] Table credit: Northumberland County GIS and The Loomex Group.

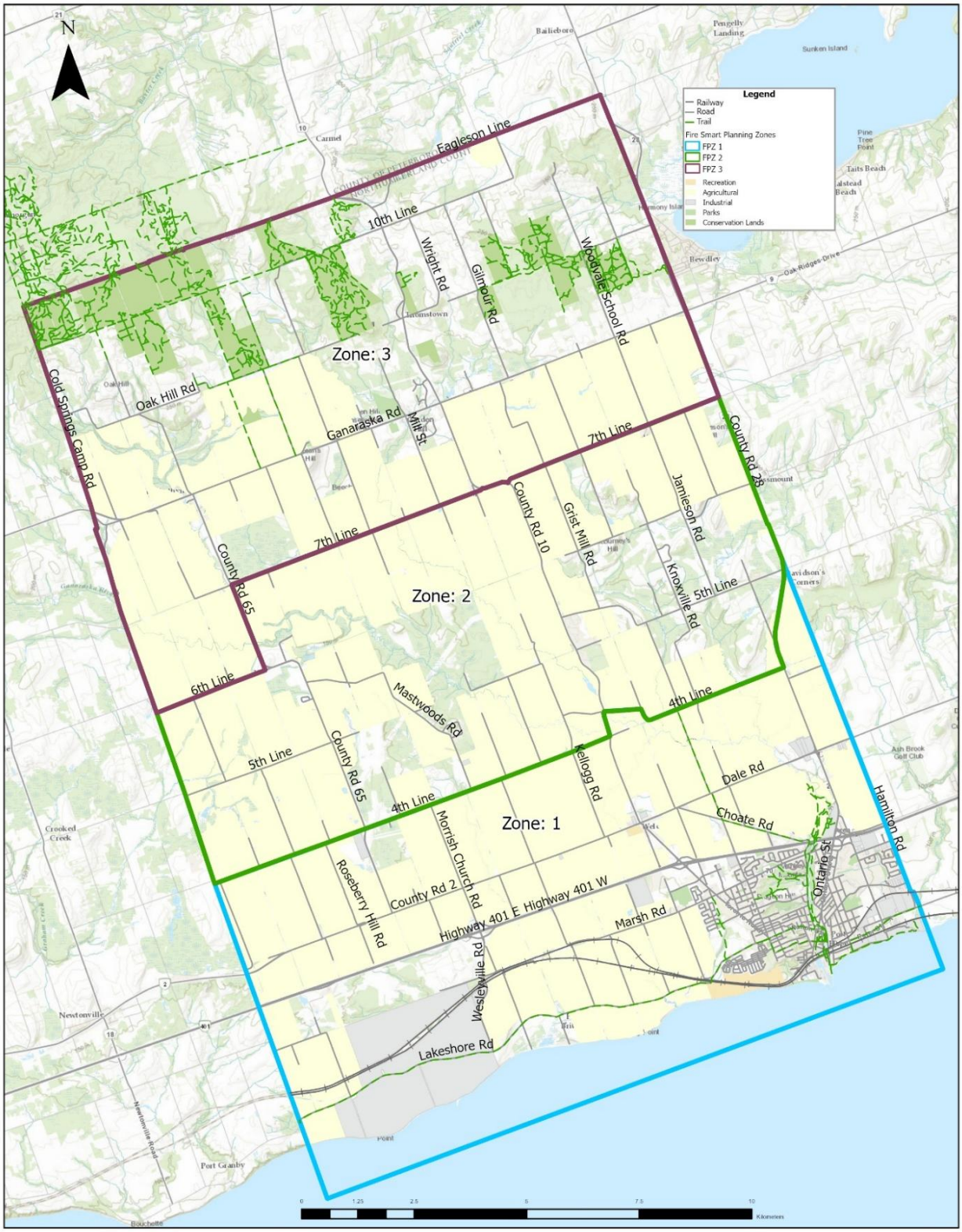


Figure 47. Port Hope land use by FPZ.[67]

[67] Map credit: Northumberland County GIS.

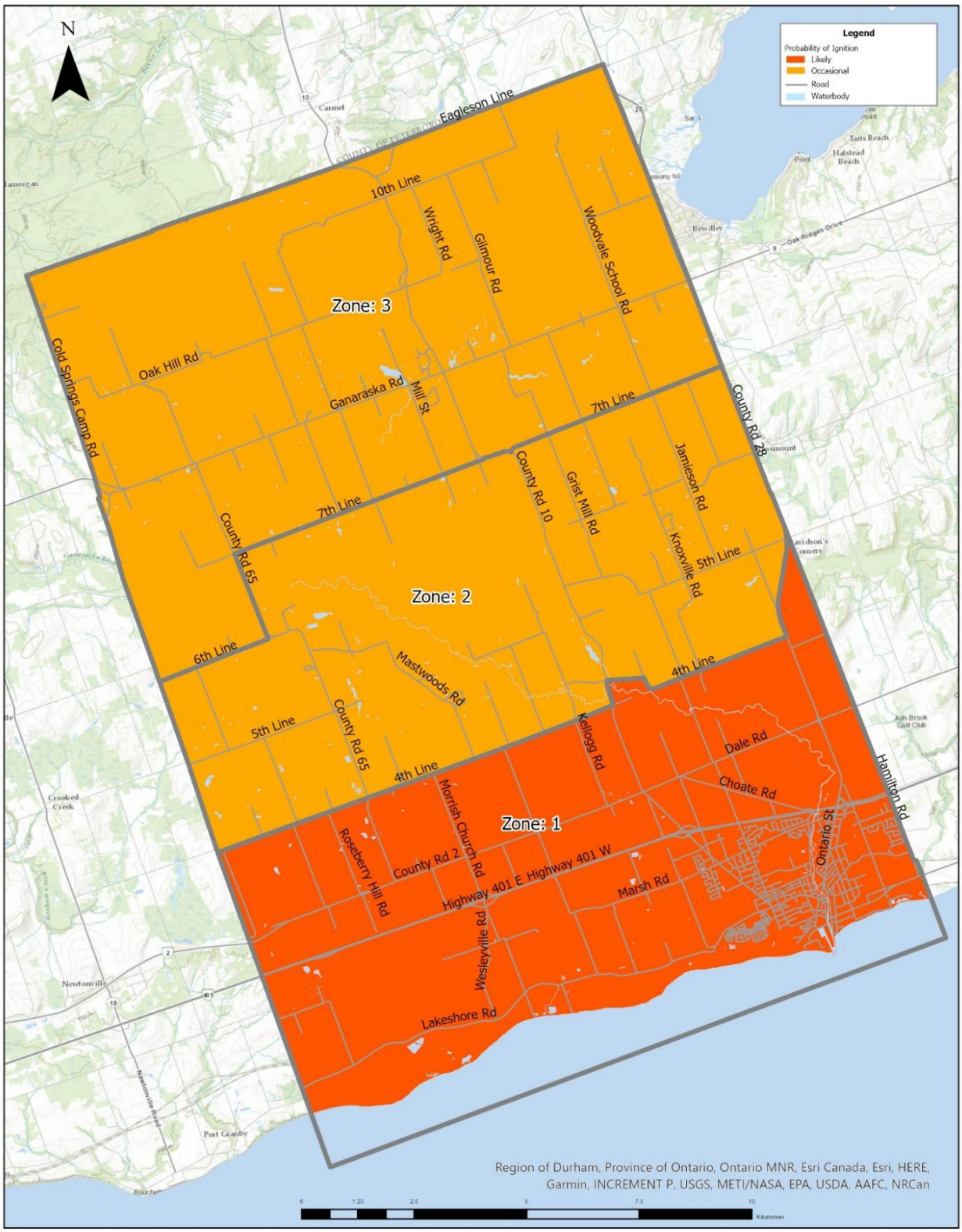


Figure 48. Port Hope probability of ignition rating.[68]

[68] Map credit: Northumberland County GIS.

11.1.6 Overall Risk Assessment Rating

The overall wildland fire risk assessment rating is determined by comparing the fire severity rating and probability of ignition rating using a matrix included in the MNR CWPP guide. This matrix is provided in Table 7.

Table 7. Fire severity vs. ignition probability matrix.

Fire Severity Rating	Unlikely	Seldom	Occasional	Likely	Frequent
Negligible	Low	Low	Low	Low	Moderate
Marginal	Low	Low	Moderate	Moderate	High
Critical	Low	Moderate	High	High	Extreme
Catastrophic	Moderate	Moderate	High	Extreme	Extreme

Table 8 provides an overall risk assessment for each FPZ in Port Hope.

Table 8. Fire severity vs. ignition probability matrix, Port Hope.

FPZ	Fire Severity Rating	Fire Ignition Probability	Overall Risk Assessment
1	Marginal	Likely	Moderate
2	Marginal	Occasional	Moderate
3	Catastrophic	Occasional	High

Figure 49 shows the overall wildfire risk assessment rating for each FPZ in Port Hope.

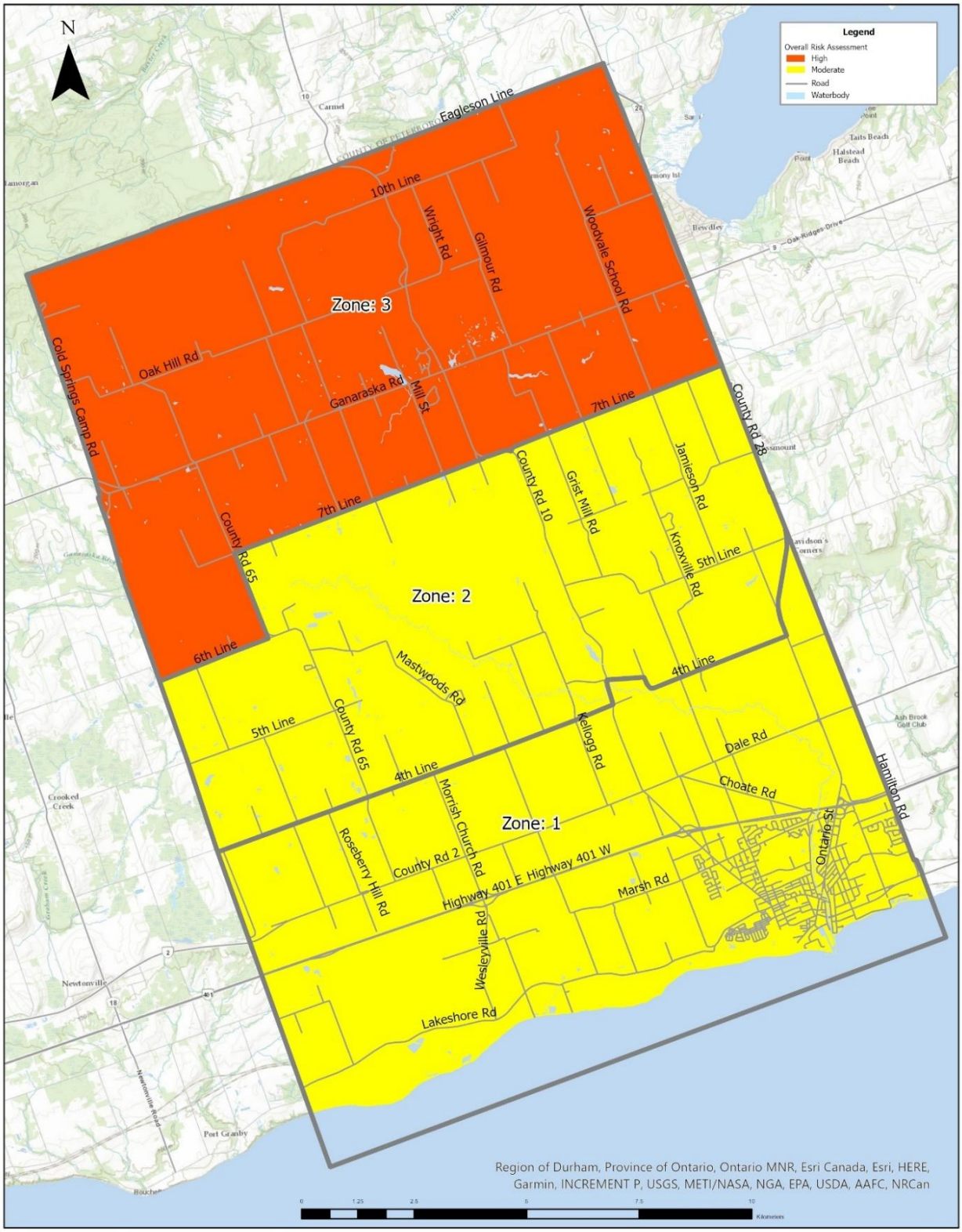


Figure 49. Port Hope overall wildfire risk assessment rating.[69]

[69] Map credit: Northumberland County GIS.

11.1.7 Urban Interface Wildland Fire Risk Assessment Summary

The results of the urban interface wildland fire risk assessment indicate that the highest risk to values from wildland fire is in FPZ 3, which is located in the northern portion of Port Hope.

The risk assessment should be used by the local FireSmart to prioritize and implement measures to mitigate wildland fire risk to homes and businesses in the urban interface.

In addition, PHFES can use the risk assessment to support the process of acquiring and positioning resources when responding to wildland fires in the urban interface.

12.0 Wildland Fire Prevention and Mitigation

12.1 FireSmart Program

The FireSmart program includes the following seven core disciplines:

1. Education
2. Emergency planning
3. Vegetation management
4. Legislation
5. Development
6. Interagency cooperation
7. Cross-training

FireSmart education is a shared responsibility. Community preparedness requires collaboration among all groups, agencies, and organizations that might be affected by a wildland fire. Elected officials, community planners, developers, government officials, industry representatives, and residents all have important roles to play. Strong partnerships and interagency communication are essential to implementing an effective FireSmart program.

Public education is one of the most challenging components of implementing a FireSmart program. Many residents do not understand the local risk posed by wildland fires, and they assume that emergency services personnel will be able to protect their community.

12.1.1 Formation of a FireSmart Committee

By developing a FireSmart committee, a community can coordinate and manage the implementation of its FireSmart program. A local FireSmart committee should include representatives from key municipal departments, emergency services providers, industries, and other relevant community organizations.

In Port Hope, the FireSmart committee could include representatives from the following organizations:

- Municipality of Port Hope – Municipal Office
  - Emergency Management Program Committee
  - Planning and Zoning
  - Parks and Recreation
  - Public Works

- Port Hope Fire and Emergency Services (Fire Prevention Officer)
- Emergency Management Ontario (in an advisory role)
- Ministry of Natural Resources (in an advisory role)
- Community organizations
- Utility infrastructure providers
- Forestry industry businesses
- Conservation authorities
- First Nations communities

Suggested Options for Assigning Responsibilities

Table 9 shows examples of the primary organizations responsible for implementing each major category of mitigation actions. The table also indicates which supporting stakeholders Port Hope can contact for expertise, technical support, or other resources.

Table 9. Examples of responsible groups (by mitigation category).

Category	Lead Responsible Parties	Supporting Organizations
Fuel reduction and modification	• Fire Department • Public Works	• MNR • Local user groups • Conservation authorities
Facilities, equipment, and personnel enhancements	• Fire Department	• FireSmart Committee • Emergency Management Committee
Infrastructure improvements	• Public Works Department	• Planning and Development Department
Wildfire prevention education and awareness	• FireSmart Committee • Fire Department	• Conservation authorities • Community organizations
Historical data monitoring	• Fire Department	• MNR
Public engagement in FireSmart practices	• FireSmart Committee	• Local service groups • Cottage and lake associations
Demonstration and education sites	• FireSmart Committee • Parks & Recreation	• Conservation authorities

Resource Requirements

The successful implementation of a local FireSmart program depends on the availability of adequate resources to support planned activities. Although many initiatives can be supported through existing municipal outreach programs, identifying additional resources will enhance the program's effectiveness and expedite risk reduction.

A FireSmart program will require the following key resources:

- specialized wildland firefighting equipment
- training programs for wildland firefighting operations (such as SP103 and SP230 certifications) and FireSmart training for community groups
- infrastructure funding for dry hydrant installations, rural access road improvements, and FireSmart vegetation management
- GIS maps and related maps to assist in ongoing wildfire risk monitoring and project planning
- partnership agreements with equipment vendors and service providers to provide surge capacity during wildfire events

Prioritization Approach

In some cases, a municipality may not have the resources to implement wildland fire mitigation actions simultaneously. As such, mitigation efforts should be prioritized using a risk-informed, community-centred approach. The following factors should be considered when determining the sequence of implementation:

- FPZ risk rankings (such as extreme, high, and moderate) based on the wildfire risk assessment
- proximity to critical infrastructure, population centres, and identified values at risk
- consequences of wildland fire risk ratings assigned to critical infrastructure (with higher-rated assets prioritized for protection and mitigation actions)
- availability of internal and external funding and technical support
- opportunities to coordinate mitigation projects with ongoing forestry operations, conservation initiatives, or community development activities
- seasonal wildfire risk trends, historical fire activity, and emerging hazards identified through monitoring activities

A municipality should regularly review and adjust its prioritization process during the FireSmart program monitoring and evaluation periods. Implementing a review schedule will help ensure that resources are allocated efficiently and responsively as conditions evolve.

Monitoring and Evaluation

The FireSmart committee is responsible for monitoring and evaluating the progress of the FireSmart efforts undertaken in Port Hope.

Annual Review and Reporting

The FireSmart committee is responsible for coordinating an annual review of the FireSmart program (including its implementation activities).

The FireSmart committee review should include the following tasks:

- Assess any completed mitigation actions (relative to the goals outlined in a community wildland fire plan).
- Identify any outstanding priorities and barriers to implementation.
- Evaluate any emerging wildfire risks, changes in community development patterns, or environmental factors that may affect wildfire exposure.
- Collect and analyze local wildfire occurrence data, training records, public education activities, and community engagement results.
- Prepare an annual report summarizing progress, lessons learned, and recommended updates in a community wildland fire protection plan.
- Ensure the FireSmart program reflects the direction provided in other relevant municipal plans (such as the Port Hope Emergency Management Plan).
    - These reports will be prepared for review by Port Hope Council and other key stakeholders.

12.1.2 FireSmart Committee Promotional Opportunities

Community Engagement Preparedness Days

Hosting an annual Community Wildfire Preparedness Day can provide residents with opportunities to participate in workshops, demonstrations of fuel management techniques, and neighbourhood clean-up events.[70] By incorporating wildfire preparedness and education events into fire prevention activities, Port Hope can cultivate awareness of proactive wildfire mitigation actions.

[70] https://firesmartcanada.ca/programs/wildfire-community-preparedness-day/

FireSmart Neighbourhood Recognition Program

The FireSmart Neighbourhood Recognition Program empowers communities to work together to reduce wildfire risks.[71] Identifying local leaders of wildfire mitigation in high-risk neighbourhoods ensures FireSmart initiatives are community-led and sustainable.

New Resident Packages

Port Hope can provide “new resident packages” to community members (specifically those in high-risk areas). Each package can include FireSmart education materials about FireSmart principles, site hazard assessments, and local regulations (such as the open-air burning by-law and the property maintenance by-law).

Promoting “Free Chipper Days”

Offering “free chipper days” provides residents with an opportunity to dispose of woody debris safely and efficiently. These events can help reduce the amount of combustible material on private properties, promote community participation in wildfire mitigation, and reduce landfill waste. However, it should be noted that chipped wood should not be present within 1.5 metres of any structure.

Historical Data Monitoring

Establishing a comprehensive database to track wildfire incidents, seasonal trends, and mitigation outcomes is essential. This information will enable the FireSmart committee to refine prevention strategies, allocate resources effectively, and respond to emerging risks. Insights from local forestry and conservation groups can also be incorporated into these analyses to ensure they reflect the unique characteristics of Port Hope.

Public Engagement in FireSmart Practices

Including FireSmart materials or presentations at local public events helps inspire community-wide participation in wildfire mitigation.

Home FireSmart Assessments

FireSmart Canada has developed a guide that homeowners can use to reduce wildfire risks. This guide is available on the FireSmart Canada website[72].

FireSmart Canada also promotes a home assessment program. The assessments focus on creating defensible spaces, clearing vegetation, and maintaining fire-resistant structures.

[71] https://firesmartcanada.ca/programs/neighbourhood-recognition-program/

[72] https://firesmartcanada.ca/resources-2/

The FireSmart committee should consider offering home FireSmart assessments within Port Hope. The initiative can be supported through partnerships with local organizations or stakeholders.

Once the FireSmart committee is established and knowledgeable, it could develop a voluntary home FireSmart assessment program during the wildfire season. The program can be facilitated by existing fire department staff members, summer students, or trained FireSmart committee volunteers. The initiative could focus on public education and early risk reduction, supported by free FireSmart Canada assessment tools and homeowner guides.

Using Digital Tools for Engagement

The “FireSmart Begins at Home” application provides residents with an interactive tool to assess and mitigate wildfire risks.[73] By integrating this tool into broader public outreach efforts, Port Hope can encourage active participation in wildfire mitigation.

Demonstration and Education Sites

Establishing FireSmart demonstration sites on public lands can provide residents with real-world examples of wildfire mitigation techniques.[74] The sites can also be used to showcase strategies such as ladder fuel removal, stand conversion, and the creation of a defensible space. Demonstration sites should have accessible locations and interpretative signage. Overall, these sites will allow residents to learn firsthand about FireSmart principles and their application.

Recommendations

11. Port Hope should establish a FireSmart committee to create and implement a FireSmart program that adheres to the practices outlined in the Port Hope Wildland Fire Management Plan.

12. Port Hope should seek to fund and hire a summer student position to facilitate the development and delivery of a FireSmart program (from 2027 to 2028).

[73] https://play.google.com/store/apps/details?id=ca.greathat.initialfiresmartassessment&hl=en-US

[74] https://www.elwoa.com/firesmart-commmittee.html

Appendix A: List of Abbreviations and Glossary of Terms

List of Abbreviations

AFFES: Aviation and Forest Fire Emergency Services

BUI: build-up index

CFFDRS: Canadian Forest Fire Danger Rating System

FIC: fire intensity class

FPPA: Fire Prevention and Protection Act

FPZ: Fire Planning Zone

IAP: incident action plan

IC: incident commander

MECG: municipal emergency control group

MNR: Ministry of Natural Resources

PHFES: Port Hope Fire and Emergency Services

PPE: personal protective equipment

Rh: relative humidity

WFMP: wildland fire management plan

WUI: wildland urban interface

Glossary of Terms

This glossary defines key terms used throughout this document. The glossary is intended to assist readers by clarifying technical terminology in order to support an understanding of wildland fire risk assessments, mitigation strategies, and emergency response planning.

Some of the terms in the glossary are general terms, while others are defined in a way that is specific to Port Hope.

After-Action Review: A structured review or debrief process of an event, focused on performance standards, that enables participants to discover for themselves what happened, why it happened, and how to sustain strengths and improve on weaknesses. After-action reviews, whether informal or formal, follow the same general format, involve the exchange of ideas and observations, and focus on improving performance.

Air Attack: A fire suppression operation involving the use of aircraft to deliver firefighting suppressants or retardants to a wildfire.

Air Attack Officer: The person responsible for directing, coordinating, and supervising a fire suppression operation involving the use of aircraft to deliver retardants or suppressants on a fire.

Airtanker: A fixed-wing aircraft fitted with tanks and equipment for dropping suppressants or retardants on fires. They are divided into two categories: land-based and skimmer.

Anchor Point: An advantageous location, usually a barrier to fire spread, from which to start or finish constructing a fireguard/control line. All suppression action must start from an anchor point.

Automatic Aid: Any agreement under which a municipality agrees to ensure provisions of an initial response to fires, rescues, and emergencies that may occur in a part of another municipality where a fire department in the first municipality is capable of responding more quickly than any fire department situated in the other municipality. Alternatively, a municipality agrees to provide a supplemental response to fires, rescues, and emergencies that occur in another municipality in the event that the first municipality can provide the quickest supplemental response.

Backfire: A fire spreading, or set to spread, into or against the wind.

Backfiring: A form of indirect attack where extensive fire is set along the inner edge of a control line or natural barrier, usually some distance from the wildfire and taking advantage of indrafts, to consume fuels in the path of the fire, and thereby halt or retard the progress of the fire front.

Bay: That portion of a fire edge, usually between fingers, where fire spread is slower. This pattern usually results from the forest fuel or slope being less conducive to fire spread in the area where the bay is formed.

Being Held: Indicates that with currently committed resources, sufficient suppression action has been taken so that the fire is not likely to spread beyond existing or predetermined control boundaries under prevailing or forecasted conditions.

Birddog Aircraft: An aircraft carrying the person (Air Attack Officer) directing the fire bombing action on the fire.

Blow-Up: A somewhat sudden and sometimes unexpected major increase in the rate of spread and fire intensity sufficient to upset the overall fire suppression plan of action.

Blowdown: A tree or trees that have been uprooted or broken off by wind or snow. Also referred to as windfall.

Breakover: A part of the fire perimeter that crosses a section of a control line intended to confine the spread of the fire.

Buildup Index: A numerical rating of the total amount of fuel available for combustion that combines the Duff Moisture Code and Drought Code.

Burning Out: A fire suppression operation where fire is set along the inside edge of a control line or natural barrier to consume unburned fuel between the line and the fire perimeter, thereby reinforcing the existing line and speeding up the control effort. Generally a limited, small-scale routine operation as opposed to backfiring.

Burning Period: That part of each 24-hour day when fires are generally the most active. Typically, this is from mid-morning to sundown.

Cold Trailing: A method of determining whether or not a fire is still burning, involving careful inspection and feeling for heat with the hand.

Conifer: A tree belonging to the order Coniferae, usually evergreen with cones, needle-shaped leaves and producing wood known commercially as softwood.

Control Line: A comprehensive term for all constructed or natural fire barriers and treated fire perimeter used to control a fire.

Council: The council of a municipality participating in the automatic aid program.

Creeping: A fire spreading slowly over the ground, generally with a low flame.

Crew, Type 1: A primary response force consisting of three to 20 personnel meeting all the requirements of the Interagency Exchange Standards. Type 1 crews may be configured as Initial Attack (three to five personnel) or Expanded Attack (17 to 20 personnel).

Crew, Type 2: Crews intended for utilization on low to moderate intensity (HFI class 1 to 3) sustained action operations that meet all the requirements of the Type 2 Interagency Exchange Standards. Type 2 crews may be configured with four to 20 personnel.

Crew, Type 3: Crews intended for utilization in a mop-up situation to completely extinguish a wildland fire or part of a wildland fire that has been fully contained. Type 3 crews meet all the requirements of the Type 3 Interagency Exchange Standards and may be configured in with four to 20 personnel.

Crossover: The point at which the relative humidity is less than, or equal to, the ambient air temperature. May be used as an indicator of extreme burning conditions.

Crown: the branches and foliage of a tree.

Crown Fires: fires that burn in the upper foliage and branches in addition to surface and ground fuels. Crown fire occurs when high-intensity surface fire spreads or “ladders upward through lower foliage into the canopy above. Driven by wind or influenced by upper-atmosphere disturbances, crown fires travel quickly and are difficult to control.

Crowning: A fire ascending into the crowns of trees and spreading from crown to crown.

Danger Tree: A tree that is hazardous because of location or lean, physical damage, overhead hazards, deterioration of the limbs, stem or root system, or any combination thereof.

Deciduous: Trees (commonly broad-leaved trees) that drop all their leaves sometime during the year.

Defensible Space: the area around a structure where fuels and vegetation have been treated, reduced or cleared, to provide separation and slow the spread of a wildland fire to a structure, and from a structure to surrounding vegetation.

Demobilization: The orderly, safe, and efficient return of an incident resource to its original location and status.

Depth of Burn: The reduction in forest floor thickness due to consumption by fire. Recommended unit is centimetres.

Detection Aircraft: An aircraft deployed for the express purpose of discovering, locating, and reporting wildfires.

Direct Attack: A method of suppression whereby suppression action is taken directly on the fire's edge. Burning fuels are separated from unburned fuels.

Drop Zone: The area immediately surrounding or adjacent to an airtanker's intended target.

Drought Code: A numerical rating of the average moisture content of deep, compact organic layers. This code indicates seasonal drought effects on forest fuels and the amount of smouldering in deep duff layers and large logs.

Duff Moisture Code: A numerical rating of the average moisture content of loosely compacted organic layers of moderate depth. This code indicates the fuel consumption in moderate duff layers and medium-sized woody material.

Engine: Specialized truck on which is mounted a water tank, pump, hose and supplementary equipment. It is used to bring a self-contained water source to a fire with the capability of pumping water through a hose line directly from the tank to a fire.

Entrapment: A situation where personnel are unexpectedly caught in a fire behaviour-related position where planned escape routes or safety zones are absent, inadequate, or compromised. These situations may or may not result in injury.

Escape Route: A planned route that is the shortest and best route of travel for firefighters to a safety zone. Firefighters must always be aware of where their escape routes are located.

Escaped Fire: A wildfire (or prescribed fire that has burned beyond its intended area) that remains not under control following initial attack.

Extreme Fire Behaviour: A level of fire behaviour that often precludes any fire suppression action. It usually involves one or more of the following characteristics: high rate of spread and head fire intensity, crowning, prolific spotting, presence of large fire whirls, and a well-established convection column. Fires exhibiting such phenomena often behave in an erratic and dangerous manner.

Fine Fuel Moisture Code: A numerical rating of the moisture content of litter and other cured fine fuels. This code indicates the relative ease of ignition and flammability of fine fuel.

Finger: An elongated burned area projecting from the main body of the fire resulting in an irregular fire perimeter. Each finger has its individual head and flanks. This fire pattern usually results from the forest fuel or slope conditions in the finger being more conducive to increased fire spread than the surrounding forest.

Fire Behaviour: The manner in which fuel ignites, flame develops, and fire spreads and exhibits other related phenomena as determined by the interaction of fuels, weather, and topography.

Fire Cause: Categories based on the cause of wildfires divided into: Natural (Lightning, Natural Other), Human (Forest Industry, Incendiary, Human Other, Other Industry/Government, Railroads, Recreation, Resident), and Undetermined.

Fire Danger Class: A segment of a fire danger index scale identified by a descriptive term (e.g. Low, Moderate, High, Extreme), and/or a colour code. The classification system may be based on one or more fire danger indexes (e.g. the Buildup Index is sometimes used in addition to the Fire Weather Index).

Fire Intensity: The amount of heat or energy released per unit length of fire front. Frontal fire intensity is a major determinant of certain fire effects and the difficulty of control. Numerically, it is equal to the product of the net heat of combustion, the quantity of fuel consumed in the flaming front, and the linear rate of spread.

Fire Intensity Class: Ranges in Byram's fireline intensity exhibiting similar levels of fire behaviour and implications for fire suppression. In the CFFDRS Fire Behaviour Prediction System, six classes have come to be commonly recognized (i.e., 10,000 kW/m).

Fire Weather: Collectively, those weather parameters that influence fire occurrence and subsequent fire behaviour(e.g. dry bulb temperature, relative humidity, wind speed and direction, precipitation, atmospheric stability, winds aloft).

Fire Whirl: A spinning, moving column of hot air and gases rising up from a fire and carrying aloft smoke, debris, flame and firebrands. These range from less than one metre to several hundred metres in diameter. They may involve the entire fire area or only hot spots within or outside the fire perimeter.

Flame Angle: The angle formed between the flame at the fire front and the ground surface, expressed in degrees.

Flame Depth: The width of the zone within which continuous flaming occurs behind the edge of a fire front.

Flame Height: The average maximum vertical extension of flames at the fire front; occasional flashes that rise above the general level of flames are not considered.

Flame Length: The length of flames measured along their axis at the fire front; the distance between the flame height tip and the midpoint of the flame depth at the ground surface. Flame length is an approximate indicator of head fire intensity.

Foam: A product that relies primarily on the water it contains for firefighting. These products contain foaming agents, which create air bubbles when aerated, and wetting agents, which allow the fluid that drains from the foam bubbles to be easily absorbed by fuel, soil and other materials that it comes in contact with.

Foam, Class A: Foam intended for use on woody fuels. Made from hydrocarbon-based surfactants possessing excellent wetting properties, it is also biodegradable.

Fuel Complex: The type, quantity, condition, arrangement and continuity of fuel available to burn.

Fuel Description: A description of the fuel properties that are important for assessing potential fire behaviour (e.g. fuel arrangement, fuel load, fuel moisture content).

Fuel Load: The dry weight of combustible materials per unit area. Recommended units are kilograms per square metre (kg/m2) or tonnes per hectare (t/ha). 1.0 kg/m2 is equivalent to 10 t/ha.

Fuel Moisture Content: The amount of water present in fuel generally expressed as a percentage of the fuel's dry weight when thoroughly dried at 100 degrees Celsius.

Fuel Type: An identifiable association of fuel elements of distinctive species, form, size, arrangement, and continuity that will exhibit characteristic fire behaviour under defined burning conditions.

Fire Chief: The person appointed by a by-law of the council of a municipality participating in the automatic aid program.

Fire Coordinator: The person appointed by a by-law of the council of a municipality participating in the automatic aid program.

Fire Department: The fire department of a municipality participating in the automatic aid program.

Fire Front: The strip of primarily flaming combustion along the fire perimeter; a particularly active fire edge.

Fire Perimeter: The entire outer edge boundary of a fire. Can also be referred to as the fire’s edge.

Fire Protection Services: Various programs and services necessary to protect the lives and property of the residents of and around the Ganaraska Region Conservation Authority and its properties from adverse effects of fires, sudden medical emergencies, and exposures to dangerous conditions created by humans or nature. The programs include rescue and suppression services.

Firebrand: A piece of flaming or smouldering woody material that is carried through the air and has the potential to ignite forest fuel when it lands causing a spot fire. Birch bark, dead twigs, bark and pinecones are common firebrands. Can also be referred to as an ember.

Fireline: That portion of the fire upon which resources are deployed and are actively engaged in suppression action. In a general sense, the working area around a fire.

FireSmart Extended Zone: The area located 10 to 30 metres (approximately 30 to 100 feet) from a home or structure. It is the outermost component of the three-part Home Ignition Zone system, designed to reduce wildfire intensity by managing vegetation and fuels.

FireSmart Home Ignition Zone: The area within 30 metres of your home and structures. It is made up of three priority areas: the Immediate Zone, Intermediate Zone, and Extended Zone.

FireSmart Immediate: The critical 0 to 1.5-metre (0–5 feet) non-combustible perimeter surrounding a home and its attached structures, including decks. As the most vulnerable area to ember-driven wildfire ignitions, it must be cleared of all combustible materials, vegetation, and mulch to prevent flames from transferring to the structure.

FireSmart Intermediate Zone: The area located 1.5 metres to 10 metres (approximately 5 to 30 feet) from a home or structure. This zone acts as a crucial buffer designed to reduce wildfire intensity, limit radiant heat, and prevent flames from reaching the home by removing or managing combustible materials.

Flank: The flanks are the sides of the fire between the rear and the head, running roughly parallel to the main direction of fire spread. Flanks are usually referred to by compass direction (such as northwest flank and southeast flank) or, on a simple elliptical fire, as right and left (when looking at the fire from the rear). The flanks generally do not burn as intensely nor spread as rapidly as the head.

Flare-Up: A sudden localized increase in fire intensity within or along the fire perimeter. It usually requires a temporary adjustment in fire suppression action in order to avoid a possible blow-up condition. Unlike a blow-up, a flare-up does not radically change existing suppression plans.

Fuel Break: An area (constructed or natural) on which there is no fuel available for burning. A fuel break acts as an obstacle to the spread of fire.

Fuel Loading: The overall amount of fuel.

Fuels: Wildland vegetation materials that can burn. While usually referring to above-ground living and dead wildland surface vegetation, roots and organic soils such as peat are often included.

General Area of Origin (Point of Origin): The general location within the fire perimeter where ignition started. For fires other than lightning-caused fires, the point of origin will normally be flagged off by the Incident Commander or Crew Boss as soon as possible during initial attack. Responding personnel should stay out of the flagged area until they are given the OK to enter. The supervisor's directions should be followed to modify suppression techniques so as not to disturb evidence that may be important to the fire investigation. Firefighters should ask before entering and suppressing the general area of origin.

Green Up: The appropriate time during the first half of the fire season in which deciduous trees and/or understory vegetation (such as grasses, herbs, shrubs) have more or less completed their flushing of new growth. This typically takes place in late spring/early summer.

Ground Fires: Fires that creep through the duff layer (organic soil) and decaying woody material beneath the forest floor. They are persistent, slow-burning, and difficult to detect and extinguish.

Hardwood Species: Generally, one of the botanical groups of trees that have broad leaves, in contrast to the needle-bearing conifers. Also, wood produced by broad-leaved trees, regardless of texture or density.

Hazard Reduction: A treatment of dead or dying forest fuels to diminish the chance of fire starting, and to lessen the potential rate of spread and resistance to control.

Hazardous Forest Types: Forest types assessed as being associated with the risk of high to extreme wildland fire using risk assessment tools established by the Ontario Ministry of Natural Resources, as amended from time to time.

Head: A fire's head is the most rapidly spreading part of the fire's perimeter and has the greatest fire intensity. It is usually driven by the wind, the uphill effects of slope, or the flammability of the forest fuel.

Heavy Helicopter: A 15-plus passenger helicopter that seats up to 25,000 lbs. external load (such as the Bell 214, Sikorsky 61 and 64, Vertol 107 and 234, and Kamov 32).

Helibucket: A specially designed rigid or collapsible container slung by a helicopter and used for picking up and dropping suppressants or retardants on a fire. The size of the bucket load is compatible with the size of the helicopter.

Helispot: Any designated location where a helicopter can safely take off and land. Some helispots may be used for loading of supplies, equipment, or personnel.

Helitack: Initial attack on wildfires involving the use of helicopters and trained crews, deployed as a complete unit.

Holdover Fire: A fire that remains dormant and undetected for a considerable amount of time after it starts (particularly lightning-caused fires).

Home Fire Chief: The fire chief of the fire department of the municipality whose area of the forest is experiencing the emergency.

Home Fire Department: The fire department of the municipality whose area of the forest is experiencing the emergency.

Hot Spot: (1) A particularly active part of a fire; (2) A small area of smouldering or glowing combustion, which may be exhibiting smoke, located on or within the fire perimeter. This term is commonly used during the mop-up stage of a fire (can also be referred to as a smudge); (3) A satellite detection of an area of active flaming combustion.

Incident Action Plan: An oral or written plan containing general objectives reflecting the overall strategy for managing an incident. It may include the identification of operational resources and assignments. It may also include attachments that provide direction and important information for management of the incident during one or more operational periods.

Incident Command Post: The field location at which the primary tactical-level on scene incident command functions are performed. The ICP may be co-located with the Incident Base or other incident facilities.

Incident Commander: The individual responsible for all incident activities, including the development of strategies and tactics and the ordering and release of resources. The IC has overall authority and responsibility for conducting incident operations and is responsible for the management of all incident operations at the incident site.

Incident Objectives: Statements of guidance and direction needed to select the appropriate strategies, and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives.

Indirect Attack: A method of suppression whereby the control line is strategically located away from the fire’s edge to take advantage of favourable terrain and natural fuel breaks in advance of the fire perimeter. The forest fuel between the control line and the fire is usually burned out or backfired.

Initial Attack: The action taken to halt the spread or potential spread of a fire by the first firefighting forces to arrive at the fire.

Initial Attack Crew: Personnel trained, equipped, and deployed to conduct suppression action to halt the spread or potential spread of a wildland fire within the first full burning period. Initial attack reflects the highest and best use of Type 1 firefighters configured as an initial attack crew.

Initial Spread Index: A numerical rating related to the expected rate of fire spread. It combines the effects of wind and Fine Fuel Moisture Code on the rate of spread but excludes the influence of variable quantities of fuel.

Intermittent Crown Fire: A moderate to high-intensity crown fire with crown fraction burned greater than 10 per cent and less than 90 per cent.

Intermix Areas: Areas where development and forest fuels intermingle with no clearly defined boundary or separation from the forest stand.

Immature conifer stand: A conifer stand (composed of more than 50 per cent conifer trees) of which greater than 50 per cent is composed of young trees or new growth.

Island: An area of unburned forest fuel located within the fire perimeter. These islands of unburned fuel may contribute to fire control problems at a later stage in the fire if they burn off.

LACES: A safety system used by wildland firefighters to protect themselves from entrapment in free-burning wildfires and other fireline hazards. Stands for Lookouts, Anchor points, Communications, Escape routes, and Safety zones.

Ladder Fuels: shrubs, immature trees and branches extending near the ground (e.g., within 2 m) that give surface fires a pathway to the upper canopies of the trees

Length to Breadth Ratio: For a simple elliptical (oval) shaped fire, the ratio of the fire's spread distance in the same direction as the wind (length) to the flanking spread distance (breadth).

Light Helicopter: A helicopter that holds one to four passenger seats and can carry up to approximately 1,500 lbs. external load (such as the Robinson R22, Bell 47 and 206B, Hiller 12E/T, and Hughes 500).

Line Holding: The act of consolidating the fireline after the initial spread of the fire has been halted. Suppression action works to continually suppress fire, working from the perimeter inwards.

Long-Term Retardant: Long-term retardants contain retardant salts, typically agricultural fertilizers, that alter the way the fire burns, decreases the fire intensity, and slows the advance of the fire, even after the water they originally contained has evaporated.

Lookout: A competent and trusted person located in an advantageous position who has the responsibility of watching for changes in fire behaviour that risk entrapment and relaying them to their supervisor.

Medium Helicopter: A helicopter that holds nine to 14 passenger seats and can carry up to approximately 6,000 lbs. of external load. (such as the Sikorsky S55T and 58T, Bell 204, 205, 212, and K-Max).

Mop-Up: The act of extinguishing a fire after it has been brought under control.

Mutual Aid: Providing/receiving assistance in the case of a major emergency in a municipality.

Mutual Aid Plan: The mutual aid plan that was developed under the authority of the Fire Marshals Act in order to facilitate the provision of fire protection services to the residents of the area of the Ganaraska Region Conservation Authority and its properties.

Not Under Control: Describes a wildfire not responding or only responding on a limited basis to suppression action, such that perimeter spread is not being contained.

Out: Describes a fire that has been extinguished.

Parallel Attack: An indirect attack method whereby a fireguard is constructed parallel to the fire perimeter as close to the fire as heat and flames permit. This generally creates a straighter control line. Forest fuel is burned out between the fireguard and the fire's edge. A parallel attack is used whenever the fire is too intense for direct attack or when the fire edge is so irregular that direct attack would result in excessive length of control line.

Percolating Forestry Hose: A self-protecting forestry fire hose with wetting or soaking characteristics which allow the hose material to become saturated with water when conveying water to help prevent it from burning.

Portable Tank: A portable, collapsible, open-top tank used as a reservoir to store water. Many tanks are self-supporting and include a foam-type collar that raises the walls as it is being filled to contain the contents. Framed tanks have a foldable solid structure supporting the liner, which is attached internally.

Project Fire: A fire of such size, complexity and/or priority that its extinguishment requires a large organization, high resource commitment, significant expenditure, and prolonged suppression activity.

Rate of Spread: The speed at which a fire extends its horizontal dimensions, expressed in terms of distance per unit of time. Generally thought of in terms of a fire's forward movement or head fire rate of spread, but also applicable to back fire and flank fire rates of spread.

Rear: The rear of the fire is usually opposite to the head when the wind direction has remained relatively constant through the burning period. The rear is usually the slowest spreading part of the fire. (The point of ignition is generally located at the rear of the fire.)

Safety Zone: A safety zone is a location where firefighters can obtain shelter from a wildland fire. Safety zones are areas that will not readily burn and need to be of sufficient size (4X's the flame length of the fire in every direction).

Slash: debris (such as stems, branches, and treetops with needles) lying on the ground resulting from tree harvesting activities.

Smoke Column: Smoke and other gases that form a column -shaped mass above a fire, characterized by sharply defined, billowed edges.

Snag: A standing dead tree or part of a dead tree from which at least part of the smaller branches have fallen. In Ontario, it is also referred to as a chicot.

Spot Fire: A fire ignited outside the main fire perimeter by burning embers (firebrands). If not located and contained while small, spot fires can lead to the fire escaping control. Spot fires are also known as jump fires.

Stand: an aggregation of trees occupying a specific area and uniform enough in composition (species), age and arrangement to be distinguishable from the forest in adjoining areas.

Suppression: all activities concerned with controlling and extinguishing a fire following its detection.

Surface Fires: fires that burn needles, twigs, branches on the forest floor, young trees, and the lower branches of standing timber. Surface fires are spread more quickly by wind

Surfactant: A surface-active agent or wetting agent. A formulation which, when added to water in proper amounts, will materially reduce the surface tension of the water and increase penetration and spreading abilities of the water.

Sustained Attack: The action taken on a fire that has not been contained or controlled by the initial attack forces.

Tactical Withdrawal: A planned departure from the fireline using pre established escape routes and safety zones. Departure is based on pre-established trigger points (e.g., time of day, observed weather or fire behaviour); or observations made on the fireline leading to a well communicated, orderly departure.

Tight Line: A fireguard that follows the edge of the fireline as close as possible without disturbing (contacting) the burning/burned fuels and where the remaining forest fuel between the fire and the fireguard may or may not be burned out. This use avoids the significant mop-up of dozer piles (unless the fire jumps the fireguard), because all the unburned material is pushed to the non-fire side of the line. Tight lining is used in direct attack with hand tools and heavy equipment. This method is used when low to moderate fire behaviour allows personnel and equipment to work close to the fire's edge.

Under Control: Describes a wildfire that has received sufficient suppression action to ensure no further spread of the fire.

Understory: the portion of trees or other vegetation in a forest stand below the forest canopy.

Values: the specific or collective set of natural resources and human-made development/ improvements that have measurable or intrinsic worth and that may be destroyed or otherwise altered by fire in any given area

Values Protection Unit: Combination of power pumps, hose, sprinkler heads and other accessories deployed together in value protection. May include personnel required to maintain the unit.

VHF-AM (Very High Frequency Amplitude Modulation): Aircraft radio operates in the 118 MHz to 130 MHz range.

VHF-FM (Very High Frequency Frequency Modulation): A radio commonly used for dispatch, land-based mobile, and airborne communications. Generally, 46 to 175 MHz.

Wildland Fire: any fire burning in forest, grass, or alpine/tundra vegetation—synonymous with forest fire and wildfire.

Wildland Urban Interface: An area where various structures (most notably private homes) and other human developments meet or intermingle with forest and other vegetative fuel types.

Appendix B: Example of Wildfire After-Action Review

Exercise/Incident Information

Date (MMM/DD/YYYY): _____

Facilitator: _____

Attendees: _____

Exercise or incident: _____

Type (e.g. exercise, fire, flood): _____

Number per calendar year: _____

1. What did we set out to do?

2. What actually happened?

3. Why was there a difference?

4. Proposed Action Items

Practices to sustain

Recommended new practices

Appendix C: Wildland Fire Evacuation Considerations

Authority for a Decision to Evacuate

There is legislation that supports emergency responders when they need to direct persons to leave their homes or businesses for their safety. Some residents may refuse to follow this direction, in which case the emergency responders need to document and report that scenario accordingly.

Excerpts from applicable acts are provided below. Collectively, the excerpts serve as a reference in regard to powers for evacuation.

Excerpts from Acts and Legislation

Fire Protection and Prevention Act

15 (1) If the Fire Marshal, an assistant to the Fire Marshal or a fire chief has reasonable grounds to believe that a risk of fire poses an immediate threat to life, he or she may, without a warrant, enter on any land or premises and, for the purpose of removing or reducing the threat, may,

(a) remove persons on the land or premises;

(b) post a fire watch;

(c) remove combustible or explosive material or anything that may constitute a fire menace;

(c.1) dispose of any material or thing that was removed under clause (c), in accordance with any directives issued by the Fire Marshal;

(d) eliminate ignition sources;

(e) install temporary safeguards, including fire extinguishers and smoke alarms;

(f) make minor repairs to existing fire safety systems;

(g) do any other thing that the Fire Marshal, an assistant to the Fire Marshal or a fire chief has reasonable grounds to believe is urgently required to remove or reduce the threat to life. 1997, c. 4, s. 15 (1); 2002, c. 18, Sched. N, s. 3; 2016, c. 37, Sched. 9, s. 1.

(5) A person who enters on land or premises under this section may call on police officers as necessary and may use force as necessary to make the entry. 1997, c. 4, s. 15 (5).

Emergency Management Civil Protection Act

Section 4(1)

[The] municipal head of council to declare an emergency and may take action/make orders as he/she considers necessary and are not contrary to law to implement the emergency plan of the municipality and to protect property and the health, safety and welfare of the inhabitants of the emergency area.

Mental Health Act

Section 17

Where a police officer has reasonable and probable grounds to believe that a person is acting or has acted in a disorderly manner and has reasonable cause to believe that the person,

> (a) has threatened or attempted or is threatening or attempting to cause bodily harm to himself or herself;
>
> (b) has behaved or is behaving violently towards another person or has caused or is causing another person to fear bodily harm from him or her; or
>
> (c) has shown or is showing a lack of competence to care for himself or herself,
>
> and in addition the police officer is of the opinion that the person is apparently suffering from mental disorder of a nature or quality that likely will result in,
>
> (d) serious bodily harm to the person;
>
> (e) serious bodily harm to another person; or
>
> (f) serious physical impairment of the person,
>
> and that it would be dangerous to proceed under *section 16*, the police officer may take the person in custody to an appropriate place for examination by a physician. 2000, c. 9, s. 5.

Importance of Timely Communications

Providing the public with details about an evacuation in a timely manner is of utmost importance. Emergency responders can share this information using prepared messages that are designed to cover the key points, such as:

- What is happening?
- What areas are impacted?

- What actions should the public take (routes, shelters, registration options)?
- Where is further information available?

In Port Hope, emergency responders can use a public alert app to broadcast information about evacuations. The responders can also contact Emergency Management Ontario to use the provincial Alert Ready notification system.

Communications of this nature should account for areas that do not have reliable cellular coverage. Also, plans should be established to disperse the messages through other means, including reliable partner organizations that can assist in door-to-door activities (such as Public Works, the Ministry of Transportation, and search and rescue clubs).

First Responder Evacuation Guide

An example of a first responder evacuation guide is provided on the following pages.

Evacuation Process Initiated at Incident

- Alert dispatch of intent to create an evacuation zone to evacuate residents. Identify the geographic area affected, resources involved, and where evacuees are being directed to go.
- Create a plan for available and requested resources to carry out evacuation notification. Assign evacuation sectors within the zone and set a timeline for responders to complete the evacuation of their sector.
- Establish a centralized method for tracking which civic addresses are being evacuated, names, the number of persons, special needs, pets, and if any persons are refusing to evacuate.
- Use existing evacuation plans for any facilities that are in the evacuation zone.

PERSONAL SAFETY

Do NOT drive on a road that puts your life at risk (with smoke or intense flames).

Do NOT continue to engage with argumentative, threatening residents who do not want to evacuate.

Do NOT attempt to capture pets or livestock that are showing signs of duress.

ALWAYS position your apparatus so it has a clear, direct exit from the residence.

Script for Responders

Due to a threat from a wildfire, your home/business is in an evacuation zone. This evacuation notice has been issued under the authority of section 15 of the Fire Protection and Prevention Act, “Immediate Threat to Life.”

*Time permitting, instruct residents to gather:

- **Infant/Child** supports
- **Pets** (cage, leash, and food)
- **Cell phone, home computer, and chargers**
- **Medicines**
- **Important documents** (passports, birth certificates, and health cards)

Ask the resident if any person in the home has special needs (elderly on oxygen, bedridden, limited mobility, or a newborn) they need assistance with.

Instruct residents to evacuate to family or friends and monitor the municipal website for updates. Provide route and location of an evacuation centre to register at and seek additional information for temporary shelter.

Conducting Door-to-Door Evacuation

- Advise dispatch of arrival on site at each civic address.
- Always work in pairs when engaging the public.
- Wear appropriate high-visibility clothing and use a flashlight in low light or dark conditions.
- Identify yourselves (including name, position, and organization).
- Read the script explaining the situation.
- Confirm residents understand and will comply with the evacuation order.
- Document information as per Evacuation Record.
- Provide the time that the residents must be evacuated by.
- Provide the route to take and where the closest evacuation centre is located to register at and seek temporary shelter and food.

PERSONAL CONDUCT

ALWAYS maintain a professional, courteous approach.

Do NOT attempt to physically intimidate residents.

Do NOT promise any assistance without first confirming with Command.

REASSURE residents that everything possible is being done to ensure the safety of the public and reduce the impact of the wildland fire.

Difficult Situations

Refuse to Evacuate: Respect that it is their right to refuse, explain the effects of smoke inhalation (even with a filtration mask), damage to eyes and the severity of burns to skin and lungs from exposure to intense heat.

Children at Risk: Explain hazards as above. Identify the likelihood of panic attacks. Offer to arrange transportation and a safe place for them to evacuate to. Report any instances of children at risk to Command. Command can engage the police for this situation. Adults refusing to evacuate family members under 18 can be deemed in violation of the Mental Health Act, Section 17, which empowers a police officer to take action to evacuate children.

Pets/Farm Animals: Animals sense danger and may attempt to run away or hide. Do not engage in searching for lost animals. Explain to the resident that animals often survive wildfires and are found days later once the threat has passed.

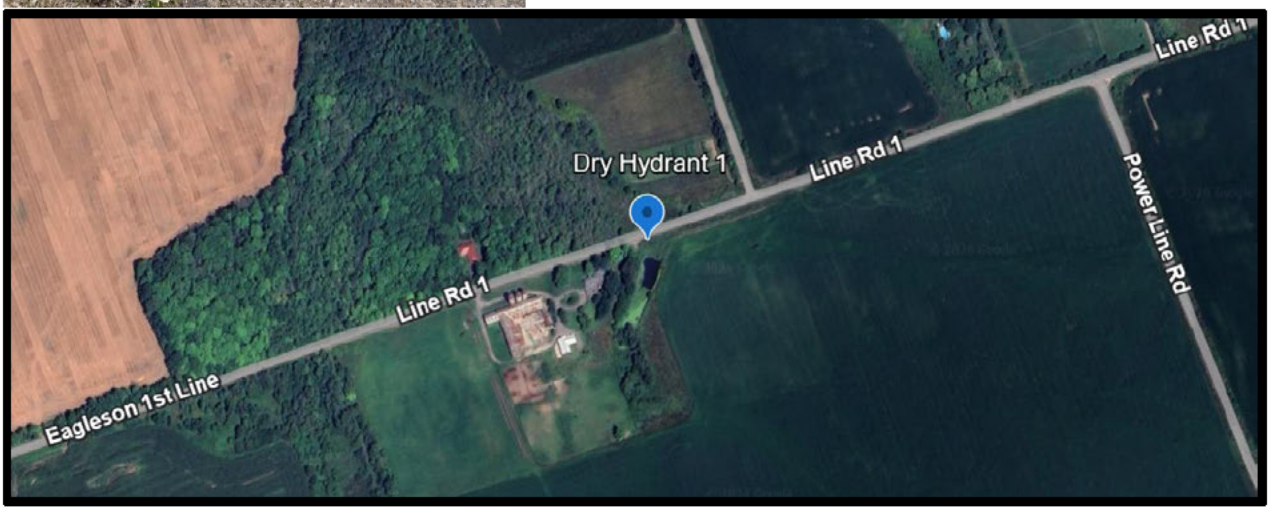
Civic Address	Family Surname(s)	Cell Phone or Email Contact	Number of Occupants			
			Seniors 60+	Adults 18 - 59	Children 2 - 17	Infants < 2

Occupant(s) Special Needs	Type of Evac Assistance Required (Paramedics, Animal Welfare, Personal Transport)	Place Evacuating To	Refuse Evacuation

Appendix D: Rural Water Sources for Refilling Pumpers

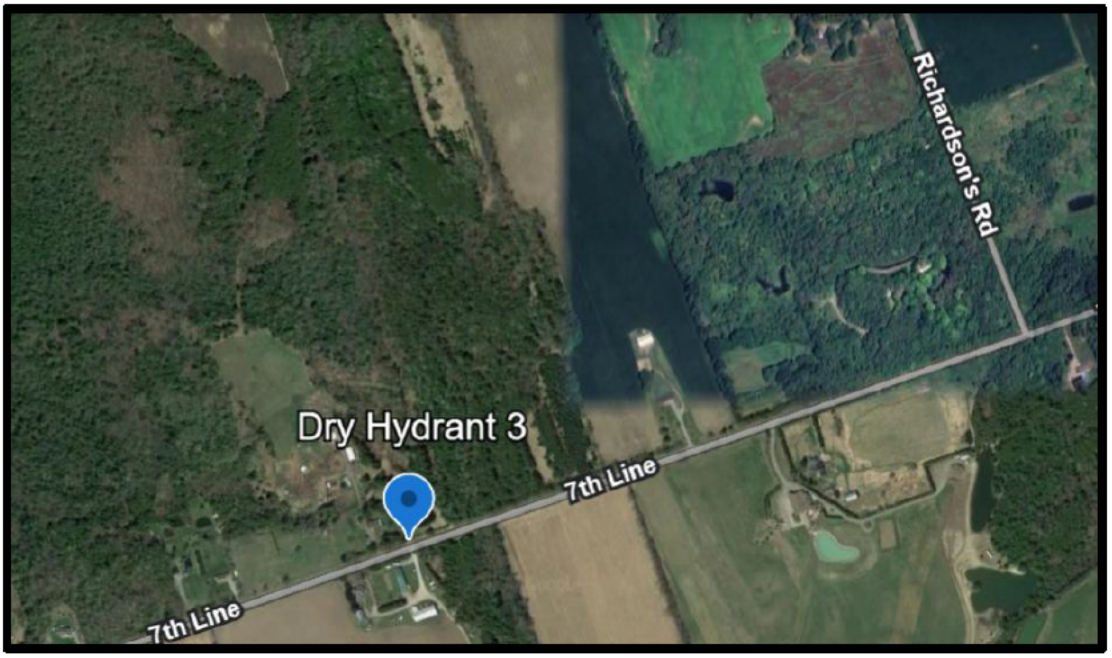
Dry Hydrant Sites (North to South)

Dry Hydrant 1 – 5511 Eagleson Line

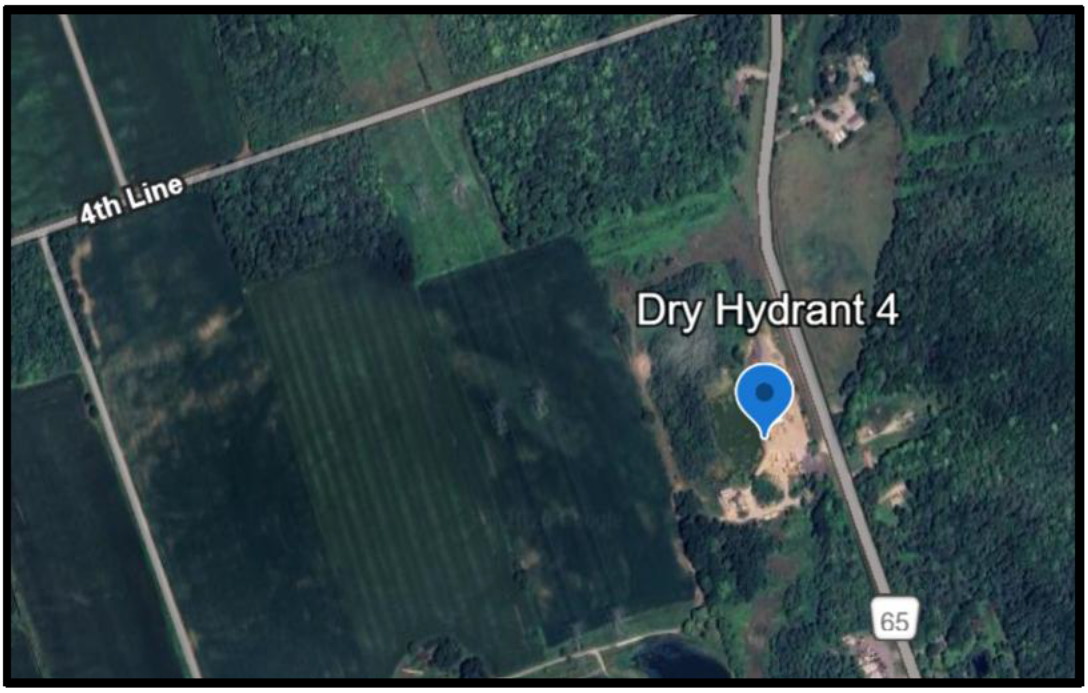


Dry Hydrant 2 – 8109 Mill Street

Dry Hydrant 3 – 2110 7Th Line



Dry Hydrant 4 – 3720 City Road 65



Additional Water Sources Providing Portable Pump Access

Dry Hydrant Ganaraska Forest Center – 10585 Cold Springs Camp Road

Water Source – 1385 County Road 9

Water Source – North and South Ponds, Mill Street and 7th Line

Appendix E: AFFES Interagency Wildland Fire Response Operating Guidelines

Forward

This guide, which falls under the directive FM 3-13 will be applied when Ministry of Natural Resources (MNR) firefighters and/or aircraft and community fire agencies both respond to the same wildland fire. The purpose of this guide is to ensure safe and effective cooperation between fire response agencies.

Definitions

Incident Commander: the person in charge at the scene of the incident. This person is assigned by the agency responsible for the fire.

Agency Representative: the lead person for MNR (i.e., Fire Ranger Crew Leader, Fire Operations Technician, Fire Management Technician, Fire Operations Supervisor) and the lead person for the Community Fire Agency (usually the Fire Chief, Deputy Fire Chief or Fire Officer). One of the Agency Representatives is usually the Incident Commander responsible for the fire and the other is the lead representative for the agency supporting the fire response.

Responsibility for Fires

Municipalities

Inside the fire region where no municipal agreement with the MNR is in place, municipalities are responsible at their expense to extinguish grass, brush or forest fires within their municipal boundaries under Section 21 (1) of the Forest Fires Prevention Act (FFPA).

- Where a fire starts on Crown land within a municipal jurisdiction, the MNR will reimburse the municipality for its suppression costs.

When a municipality has a municipal forest fire management agreement with the MNR, the response areas will be broken down into Municipal Protection Areas (MPA) and Crown Protection Areas (CPA).

- Municipal Fire Departments are responsible for fires within the MPA
- MNR is delegated responsibility for fires within the CPA

Unincorporated Territories

Fire suppression services for wildland fires in Unincorporated Territories (UTs) located within the Fire Region is the responsibility of the MNR. The MNR may enter into

northern fire protection program (NFPP) forest fire management agreements with local services boards and their Community Fire Agencies located within these areas (in partnership with the Office of the Fire Marshal who oversees these departments/agencies). Areas of response are identified on the agreement map where the local Community Fire Agency will provide a first response to wildland fires within the fire protection area (FPA).

Fires that occur within the Fire Agency's area of response (FPA) may be turned over to the MNR at any time as described by the agreement in place.

First Nations Communities

The MNR is contracted by Indigenous Services Canada under the DIAND agreement,1991, and subsequent Memorandum of Understanding (MOU), to provide forest fire suppression services on Indigenous Lands located in the Fire Region of Ontario.

When a community has a fire response service/agency and wishes to enter into a forest fire management agreement with the MNR, Community Protection Zones (CPZ) are established. The community fire service/agency agrees to provide a first response to any wildland fires that occur within the CPZ identified in the agreement. The community can request any time that the MNR take over or assist with wildland fire suppression operations as required for fires that occur within the CPZ.

Terms for Turnover to MNR

Community Fire Agencies, while still responsible for extinguishing fires within their agreement areas, may turn over the management of a fire to the MNR, or other fire suppression organization (where they meet the prescribed standards/training), under the following circumstances:

1. The Community Fire Agency determines the fire has grown in size and/or complexity beyond their capabilities.
2. A structural fire situation or higher community emergency has developed that requires all the community resources.
3. Under rare circumstances where the MNR determines that the actions taken by a Community Fire Agency are inadequate, the MNR may exercise its powers under Section 21 (1) of the FFPA and assume suppression operations of the fire until such a time that fire suppression operations may be returned to the community.

Within the forest fire management agreement, the terms and conditions identify costing processes when one agency supports the other in fire suppression efforts.

Authority Over Resources

- A Community Fire Agency will continue to direct its resources and retain all authority for the co-ordination of police, ambulance and other agency involvement.
- MNR will retain authority for MNR aviation resources and all MNR personnel.
- Where heavy equipment is required in a municipality, the municipality will use its authority to procure and direct it during a joint fire response.
- Where heavy equipment is required in Unincorporated (unorganized) Territories or Indigenous communities, the MNR will be responsible for their operation.

Initial Arrival at a Fire

Irrespective of responsibility, the first organization arriving at a fire scene will commence fire suppression and is in charge of the fire until the appropriate lead agency arrives and assumes the command function. When an MNR Agency Representative arrives at a fire that appears to be the responsibility of a community:

1. The MNR Agency Representative will immediately seek out the person in charge on behalf of the Community Fire Agency (usually a Fire Captain, the Fire Chief or Deputy Fire Chief). If the MNR is first to the fire site, the MNR Agency Representative will focus on suppression operations until a community fire official arrives.
2. The MNR official will identify themselves as the Agency Representative for the MNR and will ask if the Community Fire Agency requires continued assistance from the MNR.
3. If the Community Agency Representative says they do not require MNR assistance, the MNR Agency Representative will document the conversation (including the name of the Community Agency Representative who has authorized this) and contact the Sector Response Officer (SRO). If the SRO and MNR Agency Representative agree that the Community Fire Agency can control the fire, MNR resources can depart the scene. If the MNR Agency Representative, through personal observation of the fire, fire behaviour, and values at risk, believes that the situation is beyond the capability of the Community Fire Agency resources at the scene, they will discuss further support with the SRO.
4. If the Community Fire Agency Representative says that they require MNR assistance, the MNR Agency Representative will document the conversation (including the name of the representative who has authorized this) and update the SRO.
5. The MNR Agency Representative will update the local SRO with all information discussed in the field. The SRO will document this information in the SRO logbook as a permanent record.

6. To avoid confusion, the MNR Agency Representative will document the location of the fire using a GPS device. This is very important if the fire is located near protection zone boundaries identified within the agreement.

All communication with the Community Fire Agency Representative will be through the MNR Agency Representative. The SRO will be contacted immediately if there is uncertainty about the responsibility for the fire, the status of the fire, or whether there are agreements in place.

Incident Command

The representative of the agency responsible for the fire will be the Incident Commander unless the other Agency takes responsibility for the fire, as described above. Each agency will retain authority over its own resources, as described above.

Agency Representatives for both the MNR and Community Fire Agencies will wear a vest or other visible and clear identification indicating that they are in charge on behalf of their agency.

The style of joint operations will be at one of two levels, depending on fire conditions.

Table 10. Factors used to determine the level of operation.

Factor	Level 1 Operations	Level 2 Operations
Fire Behaviour	Intensity Class 1 or 2	Intensity Class 3 or higher
Fire Complexity	Low to moderate	High to extreme
Risk to Values	Low to moderate	High to extreme
MNR Resource Commitment	1 or 2 crews Air attack uncommon	3 or more crews Air attack common
Incident Commander	MNR incident commander, level 4 or 5 Fire captain or lieutenant	MNR incident commander, level 1, 2, or 3 Fire chief or deputy chief
Operations	Agency reps meet, discuss the situation, and agree on a suppression plan. Both reps will work with their respective resources, as well as work apart from one another.	Set up a command post. Agency reps remain together to ensure communication between agencies and to coordinate suppression actions.

Factor	Level 1 Operations	Level 2 Operations
Communication	Contact between agency reps as required. The MNR rep should provide an MNR radio to the community fire agency rep. If there is no radio, agency reps will meet at regular times to discuss operations and adjust suppression operations.	Agency reps remain together and communicate to firefighters using their respective communication systems. The MNR will provide an MNR radio to the community agency rep to maintain a communication link if the reps must be apart for an extended period.

Every effort should be made to provide radio contact between Agency Representatives. All MNR Radios will be retrieved when the MNR operation leaves.

Air Operations

Water bombing in conjunction with ground attack can present a hazard to ground crews. This hazard can be minimized with diligent air/ground co-ordination.

When a community hires aircraft for fire suppression operations, and MNR water bombers are working on the fire, the MNR Air Attack Officer will control airspace and all aircraft activities. Only aircraft with direct radio communication with the Air Attack Officer can operate on the fire. Where the community has hired aircraft that are under the direction of a Community Incident Commander and no MNR aircraft are involved in fire suppression, the MNR Agency Representative should work closely with the community Incident Commander to maximize the efficiency and safety of any aircraft operations on the fire.

Air Attack

If an MNR Agency Representative is on the ground, air attack will communicate directly with the MNR Agency Representative using the assigned MNR radio frequency. This would include identifying any aircraft hired by the community.

If air attack arrives before MNR personnel are on site, air attack will make contact with the Community Incident Commander prior to commencing bombing operations. All initial air-to- ground communications with the Community Incident Commander will be done on the VHF/FM frequency 154.070 MHZ (Provincial Office of the Fire Marshal frequency).

When the MNR is not at a fire, requests for air attack may be made by a Community Incident Commander directly to the appropriate MNR Sector Response Officer (SRO).

This request is then relayed by the SRO to the MNR Regional Duty Officer. If air attack is approved, the SRO will then notify the Community Incident Commander and advise them to immediately monitor 154.070 MHZ at the fire. The SRO will also advise the Community Incident Commander of the type, number of aircraft, the Bird Dog number and the Air Attack Officer's name, being dispatched to the incident along with an estimated time of arrival.

Lone Wolf Operations

Because of the general complexity of interagency fire responses, every effort will be made to have an Air Attack Officer on-site. When this is not possible, lone wolf operations (where the bombing operation is not under the control of an Air Attack Officer) will be permitted when air/ground communications can be established between the pilot and the Incident Commander or MNR Agency Representative. Bombing operations can only occur once the pilot is assured that it is safe to do so. As community incident commanders may be unfamiliar with air attack and firefighters may be less visible than Fire Rangers, extreme caution must be used on lone wolf operations. Guidelines for these operations are included in the MNR Air Attack Manual.

General Direction for Air Attack Operations on Interagency Fires

> The Air Attack Officer (AAO) and agency representatives share the responsibility for the safety of ground crews. The AAO is responsible for determining the presence of ground crews before commencing air attack. The AAO must be aware of each ground crew's exact location.
>
> The drop zone includes a safety area of 120 by 350 metres around the target that must be clear of all personnel. Air/ground communications must be maintained between the Bird Dog aircraft or AAO and the ground crew(s). Unless otherwise directed, this communication link will be through the MNR Agency Representative, if present, or the Community Incident Commander. Bird Dog aircraft, CL-415's and Twin Otters are equipped with high band (VHF/FM) radios. High band radios are required for air/ground communications (154.070 MHZ) with the Community Incident Commander when MNR ground personnel are not at the fire. All Out of Province (OOP) water bombers are accompanied by a Bird Dog aircraft. During their operational briefing, OOP Bird Dogs are advised of the importance of Interagency Operating Procedures and the OFM radio frequency.
>
> Air attack will be discontinued if the safety of ground crews might be jeopardized. Any near miss, or direct hit of ground personnel by a drop, is an "incident" and must be reported immediately to the MNR Agency Representative who will take prompt, corrective action; as well as informing the local SRO. The local SRO will inform the Regional Duty Officer. An Incident Report must be completed.

Remote Piloted Aircraft System (RPAS)/Municipal Aerial Drones

AFFES does not share airspace with any outside agency RPAS/Drone operations. No AFFES aircraft will be dispatched to incidents with confirmed or suspected RPAS/Drone operations taking place. If an RPAS/Drone incursion is reported during aerial operations over incident, all aviation assets will communicate and depart airspace until the threat is confirmed to be grounded.

- Communication between Municipal Fire Departments and local AFFES Fire Management Headquarters, Sector Response Officers is imperative for safe operations.
- Annual discussions between the Fire Department and AFFES should include RPAS/Drone operations and operational use plans.
- RPAS/Drone status should be included in response notification call from either party as occurs as part of the Municipal Forest Fire Management Agreement
- RPAS/Drone must be confirmed to be grounded or not operational when requesting AFFES aerial operations assistance.

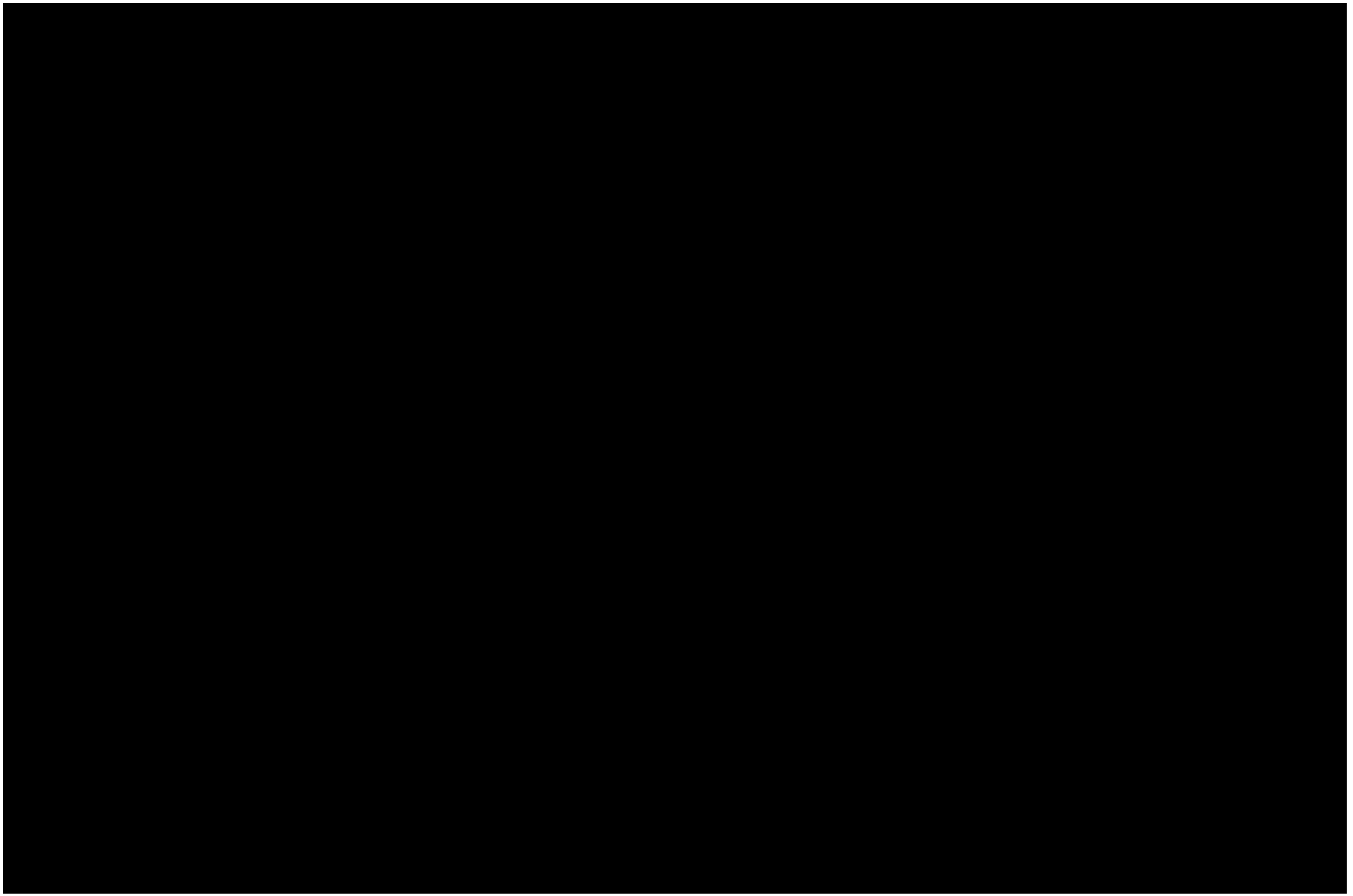
Training

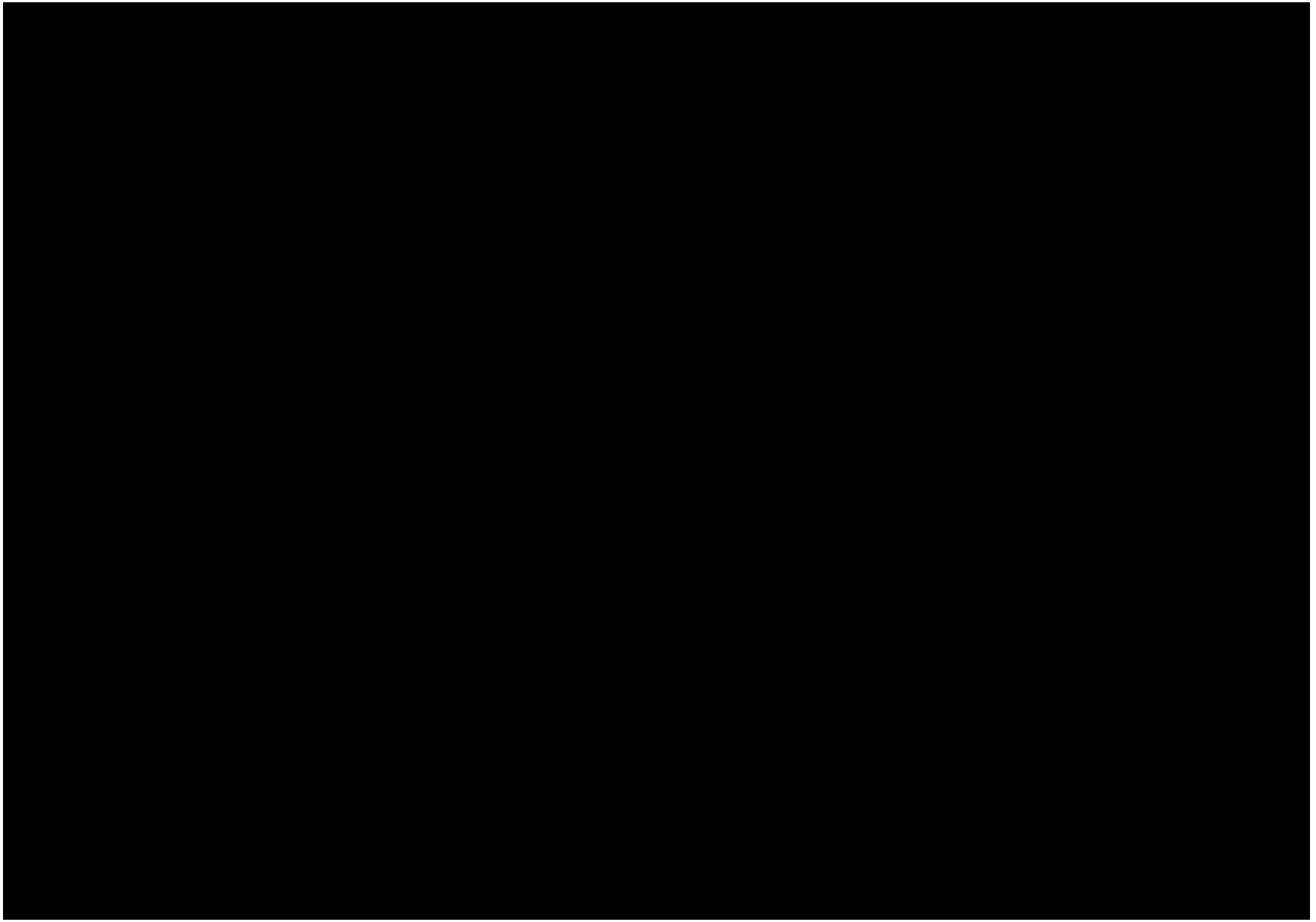
SP103 “Wildland Fire Fighter Training for Fire Agencies” is recommended for community firefighters that engage in fighting grass, brush, or forest fires (wildland fires). Under a forest fire management agreement, this training is mandatory. The SP103 is a pre-requisite for the SP-230.

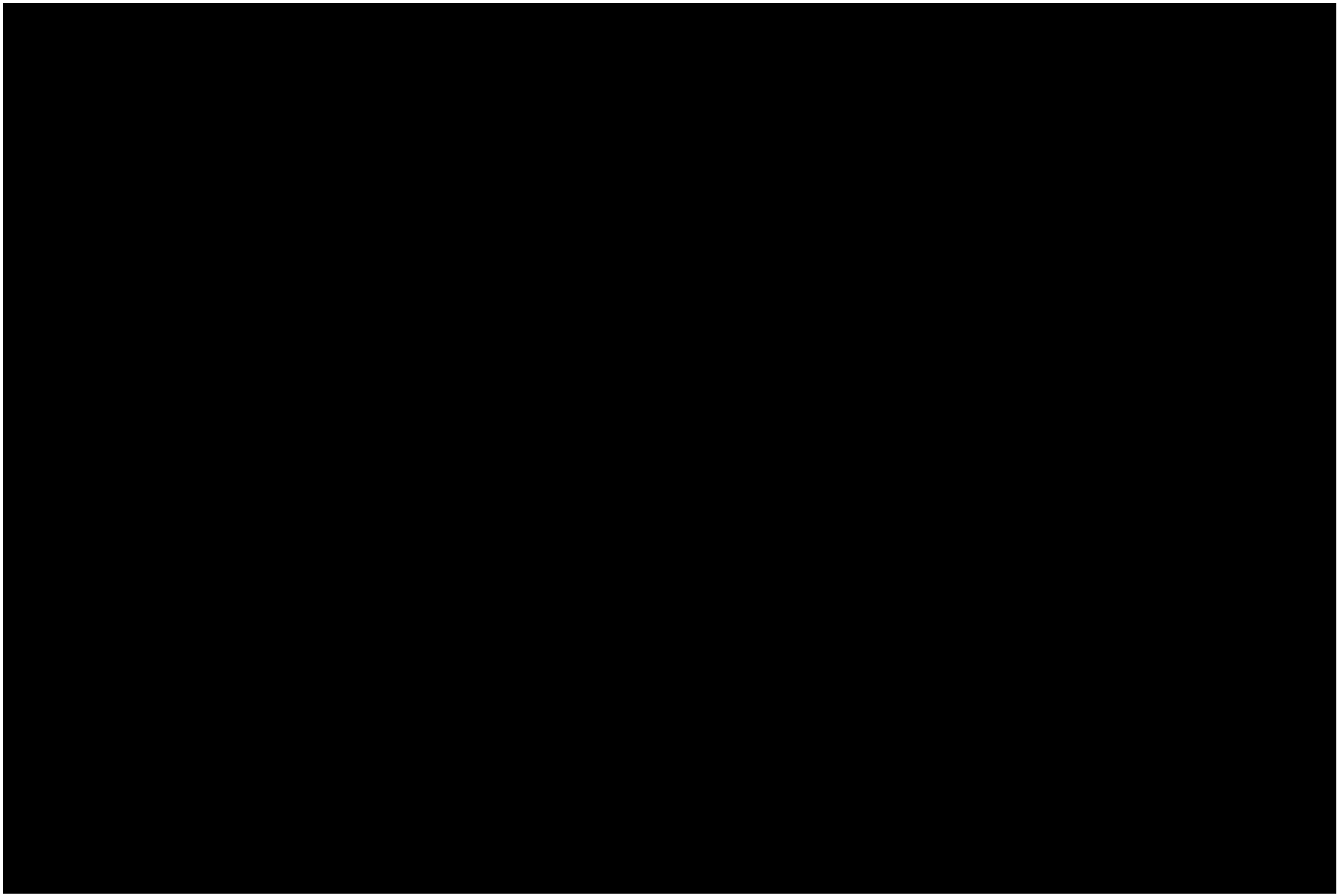
SP-230 “Wildland Fire Strategies and Tactics” provides training suitable for Incident Commanders of community fire agencies/departments.

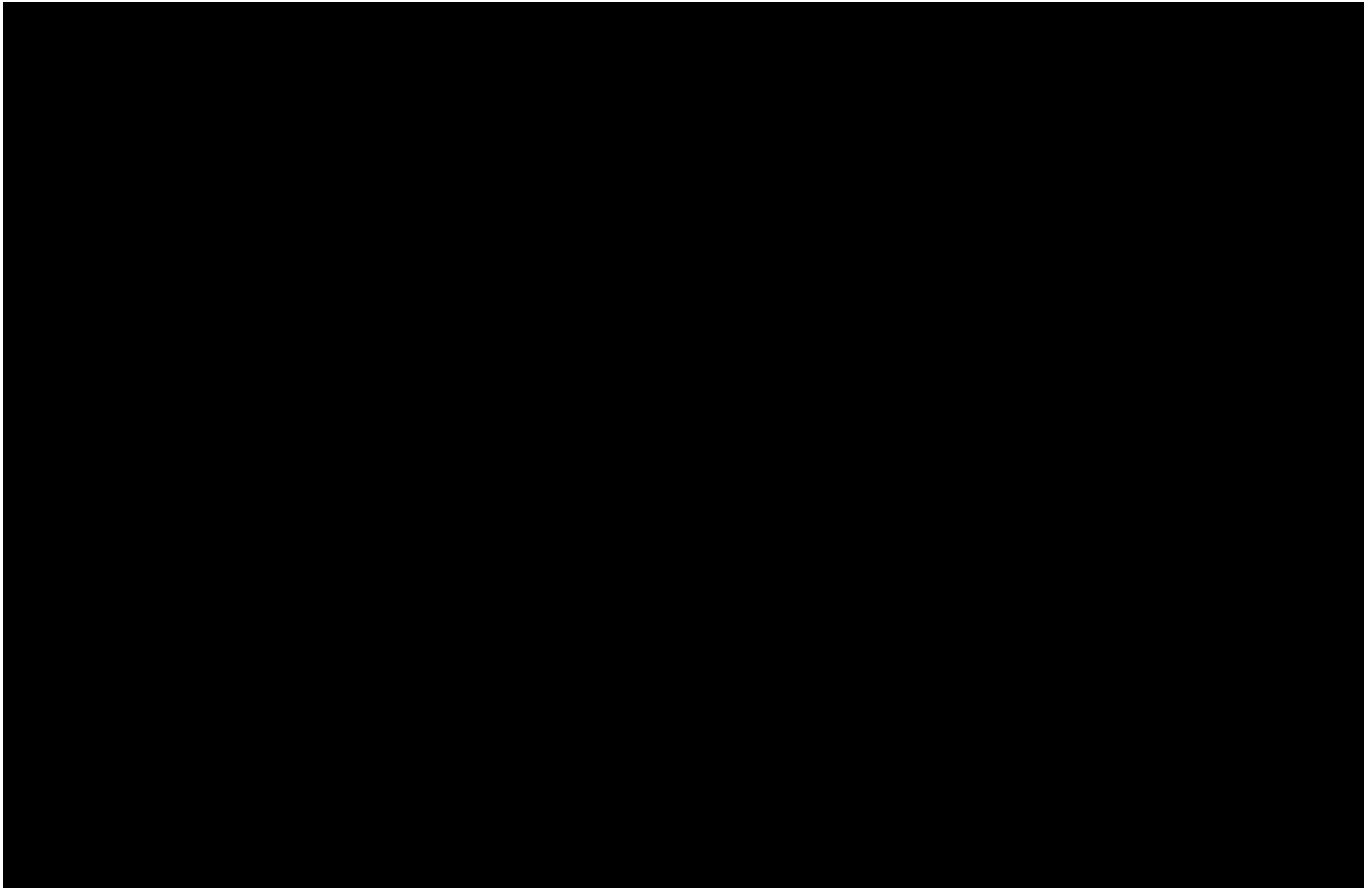
Appendix F: Ganaraska Forest Committee Contacts

Note: The information in this appendix is confidential.









Appendix G: Home Ignition Zone Self-Assessment

How resilient to wildland fire is your home and property? Walk around your home and answer the questions below. Then consider implementing the recommended actions as you perform maintenance and renovations in each of the three Home Ignition Zones.

IMMEDIATE ZONE
0 m to 1.5 m

The Immediate Zone should be a non-combustible area that starts at the house and extends to a 1.5 metre perimeter around the home and any attachments. Treat outbuildings to the same standards as your home.

1. Does the structure have acceptable fire-rated roofing material?

YES ☐
NO ⇨ A Class-A fire-rated roof assembly offers the best protection. Metal, asphalt, clay, and composite rubber tiles are all options. Untreated wood shakes create a dangerous combination of combustible material and crevices for embers or sparks to accumulate and enter. Refer to manufacturers' guidelines to maintain the fire resistance of your roof.

2. Are the roof and gutters non-combustible and clean of debris?

YES ☐
NO ⇨ Every inside-corner of your roof is a place where debris and embers can collect. Regularly check and clean combustible debris, like needles and leaves, from the roof and gutters. Consider installing commercial screens or covers over gutters to reduce debris accumulation.

3. Are the eaves enclosed?

YES ☐
NO ⇨ Open eaves create a surface for embers and radiant heat. Consider enclosing eaves with properly fitted soffits and fascia to reduce the risk of embers and heat from reaching the wooden rafters of your home.

4. Are the vents non-combustible and screened?

YES ☐
NO ⇨ Unscreened vents can allow embers to enter a building. With the exception of dryer vents, install non-combustible vents with 3 mm metal screening in order to limit embers from accessing your home. Ensure dryer vents are clean and operational.

5. Is exterior siding non-combustible or ignition-resistant?

YES ☐
NO ⇨ Some types of construction material, like vinyl siding, can melt when exposed to high temperatures allowing the fire to reach the underlying wall components and penetrate the interior of the building. Stucco, metal, brick, concrete, and fibre cement siding offer superior fire resistance.

6. Is exterior siding free of gaps, holes, or other areas where embers can accumulate?

YES ☐
NO ⇨ Examine your siding for locations where embers could accumulate or lodge. Be sure to fix any holes and gaps in exterior siding in order to prevent embers from igniting your home.

7. Are windows multi-pane or tempered glass?

YES ☐
NO ⇨ Single pane glass windows are highly vulnerable to breakage from radiant heat exposures that can occur during wildland fires. Multi-pane windows are less vulnerable and tempered glass windows are least vulnerable.

8. Are exterior doors non-combustible, or fire-rated?

YES ☐
NO ⇨ All doors into your home should be fire-rated, or non-combustible and have a good seal. This is also true for garage doors.

9. Are exterior walls protected with a minimum 15 cm vertical non-combustible ground-to-siding clearance?

YES ☐
NO ⇨ Creating a non-combustible vertical ground-to-siding clearance can be achieved by lowering the level of the ground to expose the foundation walls. It can also be achieved by replacing the first 15 cm of combustible siding with non-combustible siding material or flashing. This will limit the risk of siding igniting as a result of ember accumulation at the base of the building.

10. Is the deck/porch enclosed?

YES ☐
NO ⇨ Consider enclosing the underside of the deck or porch with non-combustible sheathing, as this will act as a shield against embers. Moving combustible materials stored underneath the deck to the Extended Zone, or storing inside a FireSmart-mitigated building, will limit potential for those materials to ignite.

11. Is the deck/porch made with fire-rated materials?

YES ☐
NO ⇨ Non-combustible, or fire-rated deck or porch materials are ideal when it comes to reducing your wildland fire risk. A non-combustible surface should be under the deck and extend for 1.5 metres out from its perimeter.

12. Are there combustible materials and landscaping products immediately surrounding your home?

YES ☐
NO ⇨ Reduce the chance of wind-blown embers igniting materials near your home. A non-combustible surface should extend around the structure and any attachments such as decks. Creating a non-combustible surface can be as easy as clearing flammable materials and vegetation. No grass or plants of any type should be present in this zone.

INTERMEDIATE ZONE
1.5 m to 10 m

Elements in the Intermediate Zone are managed so they don't transmit fire to your home.

1. Is the lawn cut to a length of 10 cm or less?

YES ☐
NO ⇨ Mowing and maintaining the lawn to a height of 10 cm or less will limit flame intensity and/or spread.

2. Is the yard free of combustible debris?

YES ☐
NO ⇨ Regularly remove accumulations of combustible debris like needles, leaves, and branches. Ensure that all combustible materials, like woodpiles, building materials, patio furniture, recreation vehicles etc., are moved into the Extended Zone, or a FireSmart-mitigated building.

3. Are garden beds lined with crushed rock/decorative gravel?

YES ☐
NO ⇨ Organic mulch like bark or pine needles are highly combustible. Crushed rock or decorative gravel significantly reduce the risk of damage from wildland fire.

4. Does landscaping include fire-resistant plants?

YES ☐
NO ⇨ Create a landscape that will not easily transmit fire to your home. Selecting fire-resistant plants can increase the likelihood of your home surviving a wildland fire.

5. Are coniferous trees pruned to a height of 2 metres?

YES ☐
NO ⇨ A surface fire can climb trees quickly. Removing all coniferous branches within 2 metres from the ground will help stop surface fires from moving into the treetops.

6. Are coniferous trees spaced at least 3 metres apart?

YES ☐
NO ⇨ Spacing coniferous trees at least 3 metres apart from crown-to-crown will reduce the risk of tree-to-tree fire transmission.

EXTENDED ZONE
10 m to 30 m

The focus in the Extended Zone is not to eliminate fire, but to reduce its intensity.

1. Are all firewood piles and other combustible materials located within the Extended Zone?

YES ☐
NO ⇨

Firewood and combustibles are major fire hazards. Moving all combustible material into the Extended Zone, or into a FireSmart-mitigated building, is critical to reducing wildland fire risk.

2. Are coniferous trees pruned to a height of 2 metres?

YES ☐
NO ⇨

A surface fire can climb trees quickly. Removing all coniferous branches within 2 metres from the ground will help stop surface fires from moving into the treetops.

3. Are coniferous trees spaced at least 3 metres apart?

YES ☐
NO ⇨

Spacing coniferous trees at least 3 metres apart from crown-to-crown will reduce the risk of tree-to-tree fire transmission.

4. Have accumulations of fallen branches, dry grass, and needles on the ground been removed?

YES ☐
NO ⇨

Cleaning up accumulations of fallen branches, dry grass, and needles will reduce potential surface fuels.

WHAT'S NEXT?

The Home Ignition Zone Self-Assessment is a great step to help you on the path to wildland fire resiliency, but there are many factors that can influence your level of preparedness! So, what else can you do to be prepared?

- Take FireSmart 101, our free online course, for a deeper dive into FireSmart and how homes ignite.
- Create an evacuation plan. Find the Last-Minute Checklist on our website.
- Contact your FireSmart Liaison or Local Program Coordinator for a professional assessment of your home or neighbourhood.
- Reach out to **general@firesmartcanada.ca** with any questions.

WWW.FIRESMARTCANADA.CA

2307-02

Appendix H: Urban Interface Structure Defence Firefighter Safety Assessment

Check the box if the answer is yes. (If a box is not checked, the Incident Commander should consider the risk and determine whether the means to mitigate the risk exists.)

□ **Situational Awareness**

- Is there a means to maintain situational awareness of this progression and behaviour?
- Visibility of the column?
- Communications with a lookout?

□ **Fire Behaviour**

- Surrounding wildland fuel types – expected intensity of wildland fire within ground suppression limits? (Less than rank 3)
- No chance of fire flanking you and compromising the escape route?

□ **Safety Zones**

- Presence of a non-flammable area four times the expected flame height, free from overhead and ground hazards?
- Availability of SCBA or filtration masks to mitigate the effect of expected smoke levels?

□ **Escape Routes**

- Is the driveway and/or access road easy to navigate in the event of smoky conditions (width, hills, sharp turns)
- Can apparatuses be positioned to drive forward out of location?

□ **Terrain**

- Is the slope on-site less than 20 per cent? (Rate of spread doubles at 20 per cent)
- Is the site not upslope from the approach of the fire?

□ **Weather**

- Temperature and relative humidity not predicted to cross over? (Humidity drops below temperature)
- Will the wind remain under 20 km per hour?
- No forecast for thunderstorms or wind shifts?

□ **On-site Hazards**

- Fuel tanks in non-flammable locations?
- No power lines overhead?
- No tall dead trees within falling distance?
- Area free from vehicles, RVs, and boats that are at risk to burning?

□ **Terrain**

- Is the slope on-site less than 20 per cent? (Rate of spread doubles at 20 per cent)
- Site not upslope from approach of fire?

□ **Occupants**

- Are the occupants off site or capable / willing to depart?
- Domestic or farm animals transportation arranged or already removed from site?

□ **Incident Plan Success**

- Are resources and water sufficient to defend structure?
- Is there enough time to carry out the incident action plan?
- Are the chances of success greater than 80 per cent?

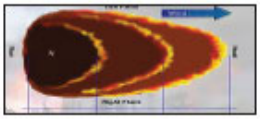
Appendix I: Wildland Fire Briefing Topics

Wildland Fire:
Nine Factors To Assess On Arrival

1 Location: Street address, civic address (911), highway mileage, intersection, GPS coordinates.

Hazards: 2 Threats from vehicles along highway, potential for wind shifts which will cause spot fires and flanking.

3 Size: Current size at arrival and predicted size for the next 1-4 hours.



Fuel Type: 4 Current fuel type and fuel types in areas of spread.

5 Weather: Past, present and predicted weather over the next 1-4 hours, Current temperature, relative humidity (RH), wind direction, cloud conditions and time of day.

Fire Behaviour: 6 Past present and future. Intensity classes: 1. Smouldering, 2. Open flame, 3. Intense surface fire, 4. Continuous torching, 5. Explosive flames above trees.

7 Water Source: Are pumper trucks the only source of water? Turnaround time to refill truck(s)? Viable sources within 1 km for a fire pump.

Access: 8 Suitable roads? Distance from road to fire? Fuel types to lay hose through? Need to cut escape routes? Egress?

9 Values: Locations with respect to fire, description of access, special concerns (ie. traversing through flammable fuel types).

Appendix J: Letter of Recognition for Fire Insurance Grading

Fire Underwriters Survey
A SERVICE TO INSURERS AND MUNICIPALITIES

c/o Opta Information Intelligence

October 25, 2023

RECOGNITION FOR FIRE INSURANCE GRADING RECEIVED

Municipality of Port Hope Fire and Emergency Services

Superior Tanker Shuttle Service - Accredited

I am pleased to advise you that the above-mentioned fire protection district within the province of Ontario was recently registered in the fire insurance grading index as being accredited for the delivery of Superior Tanker Shuttle Service.

The requirements for this accreditation are stringent and verify that the fire protection district is capable of delivering the minimum accepted fire flows to detached dwellings throughout the fire protection district and within 8 kilometres by road of the responding fire station. This accreditation is an equivalency to the minimum requirements for hydrant protection as set out by the insurance industry and the Fire Underwriters Survey.

Fire Underwriters Survey has provided information on fire protection and risk levels to the insurance industry in Canada since 1883. Fire Underwriters Survey was previously operated under the auspices of the Insurers Advisory Organization, CGI; however, is now operated by Opta Information Intelligence.

Should you have any questions or concerns related to the Fire Underwriters Survey, the Superior Tanker Shuttle Service Accreditation process or any other related area, please contact the offices of Fire Underwriters Survey for further information.

Please note that this accreditation expires on October 24, 2028 and is valid for the following fire stations:

- Fire Station 1 - (245 Ontario Street, Port Hope)
- Fire Station 2 - (4366 County Road 2, Port Hope)
- Fire Station 3 - (3585 Ganaraska Road, Port Hope)

Mark Radejewsky
Fire Protection Specialist
Fire Underwriters Survey

fire underwriters survey

British Columbia: 800 665 5861
Ontario: 877 642 4468
Québec: 877 640 8352
Atlantic Canada: 877 634 8564

POWERED BY opta
optaintel.ca
fireunderwriters.ca

Appendix K: Ministry of Natural Resources Cost Recovery Charges

Ministry of Natural Resources and Forestry
Aviation, Forest Fire and Emergency Services
70 Foster Drive, Suite 400
Sault Ste. Marie, ON P6A 6V5

2021 Cost Recovery Charges

(Invoicing will be issued at 75% of total cost)

Aircraft

MNRF and Long-Term Contract Aircraft	$/hour
EC 130 /AS350 B2 – dry rate	$977.00
AS350 B2 – fuel L/hr (H11)	$172.01
EC 130 – fuel L/hr (H1, H3, H7, H9, H15, H19, H21)	$184.99
Medium Helicopter (H16) dry rate	$1,864.83
Medium Helicopter (H16) – fuel L/hr	$412.61
Medium Helicopter (H2, H8) dry rate	$1,995.00
Medium Helicopter (H2, H8) – fuel L/hr	$348.26
Medium Helicopter (H4, H6, H10, H12, H14, H18) dry rate	$2,084.38
Medium Helicopter (H4, H6, H10, H12, H14, H18) – fuel L/hr	$340.69
Medium Helicopter foam drop	$43.30
Turbo Commander (birddog 157 & 150)	$2,258.56
Turbo Commander (birddog 155 & 160)	$2,186.03
Turbo Commander – fuel, L/hr	$314.89
Aero Commander (birddog 152, 153, 154, 156, 159)	$809.97
Aero Commander – fuel L/hr	$113.56
CL415 water bomber	$5,000.00
CL415 water bomber – fuel, L/hr	$949.99

MNRF and Long-Term Contract Aircraft	$/hour
CL415 water bomber – foam drop	$146.13
Twin Otter	$1,935.00
Twin Otter – fuel, L/hr	$385.01
Twin Otter – foam drop	$54.12

Costs Recovery Charge = (actual contract Dry rate) + [($/hour) *(# of hours)]

Fuel rate calculations are based on internal statistical analysis and methodologies
Short-Term Aircraft Costs Recovery Charge:

If required, short-term aircraft would be charged back at the current contract rate and fuel cost.

Forest Fire Suppression Equipment (FFSE)

Equipment Rate Table	Daily Rate	Replacement Cost
Vehicle		
Truck, (3/4 Ton) Fire Ranger Crew	$22.81	$46,258.00
Engine, Wildland	$52.91	$185,392.23
All Terrain (ATV)	$8.00	$8,364.00
All Terrain (UTV)	$8.10	$17,340.00
Common Operational FFSE		
Pump, Power, Mark 3	$20.93	$4,244.48
Kit, Pump Tool, Regular	$1.34	$1,240.31
Kit, Chainsaw	$6.62	$914.71
Axe	N/A	$13.00
Shovel	N/A	$27.00
Pulaski	N/A	$25.00
Specialized Operational FFSE		
Hose, 2 ½”	$7.00	$219.00
Kit, Tool, 2 ½” Hose	$1.61	$2,268.53

Equipment Rate Table	Daily Rate	Replacement Cost
Torch, Burnout	$6.00	$222.00
Weather Station, Fire, Automatic	$1.07	$2,300.00
Kit, Sprinkler, 5 Head	$1.61	$1,668.09

Appendix L: Structure Defence Triage Decision Process

STRUCTURE DEFENSE GUIDE CARD

STRUCTURE TRIAGE DECISION PROCESS (S-FACTS)

SURVIVAL

- Initial Assessment: can you survive here? **If not, LEAVE NOW!**
- Is there a Safety Zone nearby? **If not, LEAVE NOW!** (IRPG)
- Do you have a viable Escape Route?
- What is the decision point at which you will leave based on fire behavior and rate of spread?
- Is there a Temporary Refuge Area (TRA) on site? **If not, LEAVE NOW!**
- Preplanned area for immediate, temporary refuge.
- Use of fire shelter should not be necessary
- Is there a viable Escape Route to the TRA and/or Safety Zone?
- Is the "Prep and Go" tactic an option?
- Do you have communication with your supervisor and adjoining forces?
- If safety issues cannot be mitigated, **LEAVE NOW!**

FIRE ENVIRONMENT

- Can you survive based on current and expected fire behavior? **If not, LEAVE NOW!**
- Look Up, Look Down, Look Around Indicators:
  - Fuels (characteristics, moisture, temperature)
    - What will be the intensity of the fire when it arrives?
    - How long will it take to consume the fuels?
  - Wind
    - Current speed/direction
    - Expected changing winds
  - Terrain
    - Are you in a chute, chimney, or saddle? If yes, LEAVE NOW!
    - Is the wind in alignment with topography?
    - What is your position relative to topography?
    - Are you mid slope or at the top of a ridge?
  - Atmospheric Stability
  - Fire Behavior (requires constant monitoring)
    - Spotting, crowning, sheeting, rate of spread?
    - Flame length and height?
- Other weather considerations:
  - What is the current relative humidity?
    - Is there an expected change?
  - Are thunderstorms forecasted?

ACCESS

- Is access compatible with time and distance factors necessary to utilize an Escape Route to a Safety Zone?
  - Road surface adequate for speed necessary?
  - Adequate width?
  - Turnarounds/turnouts?
  - Bridges within limits for fire apparatus?
  - Drainage ditches and culverts?
  - Steep grades?
  - Is there a place to spot apparatus?

Construction/Clearance

- Does the construction have adequate defensible space, based on topography, fuels, and current and expected fire behavior?
- Can defensible space problems be mitigated quickly?
- Will building materials and yard clutter compromise safety?
- Is the construction wood siding or shake shingle roof?
- Are there vent openings, open eaves, large glass windows facing the fire front, decks with vegetation below?
    - ➢ Will ember intrusion through attic or foundation vents be a problem?
- What are the contents in the garage and outbuildings?
- Are there hazardous materials present?
- Are there propane tanks, fuel tanks, or power lines?
- Is there adequate water supply nearby?
- Are additional resources needed to mitigate issues?
- Consider "Prep and Go" and "Prep and Defend" tactics?

Time Constraints

- Is there time for an adequate size-up of the structure defense problems?
- Is there time to mitigate safety concerns?
- Is there time and adequate resources to properly prepare and defend the structure?
- Is there time to escape, utilizing Escape Routes, to a Safety Zone? **If not, LEAVE NOW!**

Stay or Go

Tactical decisions based on the S-FACTS:

- Is it safe to stay? If not, utilize "Check and Go" tactic
- Is there time to prepare the structure for defense and what will the fire behavior be when the fire gets here?
- "Prep and Go" and "Fire Front Following" tactics should be used when it is not safe to "Prep and Defend"

CONSIDER PRIOR TO ENGAGEMENT

- Are you adhering to the **10 Standard Firefighting Orders?** (IRPG)
- Have you considered the **18 Situations that Shout Watch Out?** (IRPG)
- Have you established **LCES?**
- Emphasize "Look Up, Look Down, Look Around" throughout the incident
- Have Decision Points ("Trigger Points") been established?
- Conduct Risk Management Assessment (IRPG)

Situational Awareness - Hazard Assessment - Hazard Control - Decision Point - Evaluate

STRUCTURE TRIAGE CATEGORIES

Not-Threatened

- Safety Zone nearby and TRA present at structure
- Construction features/defensible space make structure unlikely to ignite
- Residents may/may not have evacuated

Threatened Defensible

- Safety Zone nearby and TRA present at structure
- Construction features/defensible space require structure defense tactics during fire front impact
- Residents may/may not have evacuated

Threatened Non-Defensible

- Lack of adequate Safety Zone nearby
- Structure cannot be safely defended
- Residents must be evacuated

STRUCTURE DEFENSE TACTICAL ACTIONS

- **Check & Go** – Most appropriate action when no Safety Zone/TRA is present and the fire front impact is imminent. Conduct rapid evaluation to check for occupants and evaluate for follow up action. **LEAVE promptly.**
- **Prep & Go** – Structure preparation can be safely completed prior to fire front impact. Potential fire activity is too dangerous to remain and/or there is no Safety Zone/TRA present. **LEAVE before Escape Routes are compromised.**
- **Prep & Defend** – Appropriate when a Safety Zone is nearby and a TRA is present. Adequate time exists to prepare the structure for defense prior to fire front impact. Escape Routes must be maintained.
- **Evacuation** – Utilize either as an "Immediate Need" or as a "Planned Action" well before the fire front hits. Immediate Need evacuations will require the rapid removal or escort of civilians from an area by all resources in an effected area. **Planned** evacuations are coordinated efforts with the local law enforcement agency to ensure they are thorough and efficient with minimal duplication of effort.
- **Fire Front Following** – Follow-up tactic after passage of the fire front. Involves searching for victims, perimeter control, hot spotting, and ember control.
- **Bump & Run** – Resources move ahead of the fire front extinguishing spot fires and defending structures. Utilize extreme caution.
- **Anchor & Hold** – Resources use large-volume water streams to extinguish structure fires, stop structure-to-structure ignitions, protect exposures, and control embers.
- **Tactical Patrol** – Resources remain mobile and continuously monitor assigned area after fire front passage. Involves aggressive mop-up around structures.

Structure defense tactics are a vital part of perimeter control operations.

- Stopping fire spread significantly eliminates the fire's threat to structures.
- Connect contained points along the fire's edge to strengthen perimeter control. Typically used near the values at risk.
- Perimeter control and structure defense should be done concurrently.

TACTICAL PLANNING

Utilize PACE

- **P**rimary Plan (Offensive)
  - Focused on fire fighter safety and objectives
- **A**lternate Plan (Offensive)
  - Fallback plan that closely resembles primary plan
- **C**ontingency Plan (Defensive)
  - Focused on fire fighter safety, move to a Safety Zone or Temporary Refuge
- **E**mergency Plan (Defensive)
  - Fire fighter survival
    - Deployment Zones/Refuge Areas
    - Fire Shelters

IMMEDIATE NEED EVACUATION CHECKLIST

- Co-locate with law enforcement at ICP
- Identify evacuation area utilizing local maps. Include area of incident potential when determining evacuation area
- Identify traffic control points for entry and exit of resources and civilians
- Identify areas that must be immediately evacuated and label as "evacuation order" area
- Identify areas that are potentially threatened and label as "evacuation warning" areas
- Identify community safe refuge areas inside evacuation areas
- Determine and publish evacuation routes
- Identify and clearly communicate the decision points for implementing additional evacuation areas
- Identify areas of special-needs populations and large animals
- Consider public information system for evacuations

IMMEDIATE NEED EVACUATION CHECKLIST

- Back equipment in for tactical mobility
- Shield apparatus from radiant heat - be aware of structure ignition potential
- Park in cleared area (watch for hazards overhead such as power lines and trees)
- Have an engine/crew protection line identified
- Determine if residents are home. Determine best course of action - evacuate if safe to do so or shelter in place at a safe location
- Maintain communication with all crew members
- Maintain at least 100 gallons of water reserve in your tank
- Top off your tank at every opportunity (use garden hose if possible)
- For roof access, place owner's ladder at a corner of the structure on the side with the least fire threat and away from the structure's power drop
- Keep out of heavier fuels (suppress lighter fuels)
- Clear around and shut off above-ground fuel tanks
- Close windows and doors, including garage, leaving doors unlocked
- Place combustable outside furniture inside the structure
- Change and place garden hoses strategically around structure for immediate use if needed
- Move wood piles away from structure
- Consider applying foam/gel to the structure (roof and siding) and/or fuels
- **REMEMBER** to follow up with **TACTICAL PATROL!**

Appendix M: Equipment Used by Ministry of Natural Resources

Minimum FFSE and Other Equipment Onboard the Engine

The following table lists the minimum standard equipment required on all engines. Headquarters can include additional equipment to suit its needs, but the equipment listed must be onboard. Doing so ensures a level of provincial standardization.

Quantity	Equipment	Comments
1	Drip torch	Empty
1	Container of fuses	Must be in locked container (pump tool kit) and appropriately labeled. Key for lock on engine key ring.
1	5-gallon container (25 L) drip torch fuel	3 parts diesel, 1 part gasoline
2	5-gallon (25 L) pump gas	24 parts gasoline, 1 part oil
1	5-gallon (25 L) straight gasoline	Used for onboard 4 stroke pump
2	5-lb. ABC fire extinguishers	1 mounted in compartment D2, 1 not mounted (for use with drip torch)
3	Shovels	May need handles cut down to fit in cabinet
3	Soft backpack pumps	None
1	Axe	None
1	Pulaski	None
24	(2400') 1 ½" fire hose	Bagged hose, amount of Part 1 and 2 at FMH discretion
3	(300') Forest QC 2 ½" fire hose	Bagged hose
7	Hose bags	For 1 ½" and 2 ½" fire hose
2	50' lengths of double jacketed 2 ½" hose (CSA thread)	Municipal fire hose
1	Mark III Pump	

Quantity	Equipment	Comments
1	Mark III Pump with B2 Head	Required to fill engine from remote water source • B2 pump end intake side to have a 2 ½" CSA female X 2 – 2" NPSH male adaptor (to accept two intake hoses) Discharge side of pump end to have a 2 ½" QC adaptor attached
1	Mark III Pump Tool Kit	None
1	Volume and Onboard Pump Tool Kit	See contents list
1	Foam Concentrate Handling Kit	Contains: • 1 – 250 ml saline solution eye wash station • 1 – SBS medicated skin cream • 4 – pair of NITRILE gloves • 1 – MSDS for foam concentrate • 1 – anti-splash safety goggles • 1 –container • 1 – contents list
1	5-gallon cruise-a-day of straight gas	For operating onboard 4-stroke pump
2	Sprinkler Kits	None
1	15' length of ¾" hose	Rolled and attached to ¾" outlet on manifold for filling pack pumps
4	Intake hose	None
1	soft wall 1,500-gallon port-a-tank	Complete with 2 ball valve assemblies
2	30' Tow straps	35,000 lbs breaking strength
1	Air hose kit	Complete with 50' of coiled air hose, nozzles, compressed air fitted 1 ½" QC blanking cap, etc.

Quantity	Equipment	Comments
2	Fog nozzles	Located on nozzle holder in P4
1	Foam nozzle	Located on nozzle holder in P4
1	Barrel nozzle	Located on nozzle holder in P4
2	Sets of tire chocks	None
2	Milk crates	For storing items
1	Socket set	None
1	Assorted fluids: large can of Silicone spray for door lubrication, 1 litre of motor oil (vehicle), 1 gallon of antifreeze (vehicle), 1 gallon of wiper fluid, 1 box of Kim wipes, and spray can of windshield cleaner, 1 litre of Castrol Super 2 Stroke oil, 1 litre of 4 stroke engine oil “SF” or “SG” rated.	Stored in crate
4	CSA approved safety vests that meet OHSA requirements	None
16	Reflective cones	Minimum of 70 cm in height
4	Collapsible sign stands	None
1	Set of reflective signs (roll-up versions) • 1 – yield to oncoming traffic sign (Rb-91) • 1 – lane closure sign (TC-4) Arrow sign • 2 – road work signs (TC-2B or TC-2A – older style men at work sign)	None
1	15-person first aid kit	Located in cab of engine
1	2-gallon jug of diesel exhaust fluid (D.E.F.)	Not required for Engine 1 or Engine 8

Quantity	Equipment	Comments
1	Set of roadside emergency equipment 2 MTO-certified retro-reflective triangles	Stored in cab (MTO requirement)

Volume and Onboard Pump Tool Kit

Kit Components

1 ea. box, metal, 2 ½" hose tool kit (IMIS #946) complete with contents list taped to inside of lid

1 ea. bag, freezer, sealable, large, 26.8 cm x 27.9 cm (IMIS #486) complete with the following items:

Quantity	Item and IMIS Description	IMIS ID #
2 ea.	Rags, clean, generous size	N/A
6 ea.	Tag, defective	806
6 ea.	Tie, cable, white, 10.1 cm	1801
2 sets	Plug, ear, foam type	762
1 ea.	Tape, electrical, black, 7 mil, 1.9 cm x 18.2 m	813
1 ea.	Pencil	N/A
1 ea.	Part, fuel container, cap, screw	1013
1 ea.	Part, fuel container, cap, vent	1014
2 ea.	Part, fuel container, stopper	1018
4 ea.	Gasket, face, 2 1/2"	950
2 ea.	Plug, spark, power pump, Bosch M4AC	737
2 ea.	Container, sparkplug, plastic	565
2 ea.	Part, WE, plug, spark, wildland engine pump, BPR6ES	3161

1 ea. roll, tool, chainsaw kit/pump tool kit (IMIS # 1052) complete with the following items:

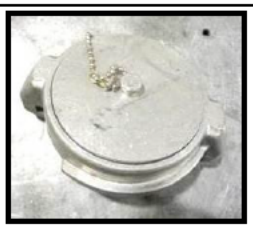
Quantity	Item & IMIS Description	IMIS ID #
1 ea.	Wrench, adjustable, 8” (crescent wrench)	848
1 ea.	Wrench, combination, 13 mm (box end / open end)	851
1 ea.	Pliers, slip joint, 15.2 cm	760
1 ea.	Wrench, combination, 10 mm, bent to 45 degrees at open end	560
1 ea.	Screwdriver, common, 20.3 cm overall length	781
1 ea.	Wrench, open 1/2” by 9/16”	1068
1 ea.	Bar, steel, pump spark plug wrench, 3/8” by 10”	2333
1 ea.	Wrench, combination, 7/16”	852
1 ea.	Wrench, spark plug, power pump, R-904L	1073
8 ea.	Nail, common, 3”	1970

Fittings

Note: Items marked with an asterisk may not be in the kit but instead be put on fittings/adapters with the engine.

Quantity	Item & IMIS Description and Use	IMIS ID #	Photo Depiction
3 ea.	Wrench, hose, 2 ½” used on 2 ½” IN threaded fittings which are wrench tightened	3162	
2 ea.	Wrench, hose, 1 ½”	958	None
1 ea.	Cord, sash, #6, (Length of 20’/6.1 m)	569	None
1 ea.	Gun, grease, pump (Mark III pump grease gun) (Roll grease gun in wiping rag and place in plastic bag)	648	None

Quantity	Item & IMIS Description and Use	IMIS ID #	Photo Depiction
2 ea.*	Adaptor, 2 ½" CSA threaded male X 2 ½" QC: threads into female CSA fitting to adapt fitting to 2 ½" QC: i.e. inlet on Engine tank, 2 ½" CSA municipal hose female coupling	2404	
4 ea.*	Adaptor, 2 ½" swivel CSA threaded female X 2 ½" QC: threads into male CSA fitting to adapt fitting to 2 ½" QC: i.e. 2 ½" CSA municipal hose male coupling	2406	
1 ea.	Valve, gate 2 ½" hydrant: attaches to fire hydrant outlet to ensure water can be shut off if hydrant valve breaks.	3165	
2 ea.	Hydrant wrenches: opens and closes hydrants	N/A	
2 ea.*	Valve, foot, B-2561: for Mark III with B2 pump end (requires two intake hoses)	1062	None
1 ea.	Nipple, double male, 2 ½" converts female CSA fitting to male CSA fitting	3167	

Quantity	Item & IMIS Description and Use	IMIS ID #	Photo Depiction
1 ea.	Valve, one way, CSA, 2 ½": attaches to hydrant valve to prevent water flowing back into hydrant	3166	
1 ea.	Line, fuel, single; fuel line for Mark III with B2 pump end.	960	None
1 ea.	Adaptor, 1 ½" quick connect X 1 ½" female NPSH, FA-4N: to convert threaded fitting to QC.	854	
1 ea.	2 ½" QC X 1 ½" QC adaptor. When combined with 2 ½" swivel CSA threaded female x 2 ½" QC allows you to adapt municipal hose to 1 ½" QC hose	N/A	
1 ea.*	Cap, blanking, 2 ½" quick connect: used on engine inlet if adapted to QC	3164	

Engine Load Configuration

The following is a recommended load configuration for the minimum equipment requirements for engines. Headquarters can adjust this configuration to better suit their preferences depending on what if any additional equipment they decide to carry.

Recommended Load Configuration

P1 (Passenger Side Front Cabinet)

Top shelf:

- Three 1 ½” hose boxes in packs

Bottom shelf:

- One 4-stroke onboard pump
- One 15’ length of ¾” hose (rolled up and attached to the ¾” discharge on the manifold)

P2 (Passenger Side Middle Cabinet)

Top shelf:

- Three soft backpack pumps[75]
- One box of Kimwipes

Middle shelf:

- One chainsaw and kit

Bottom of cabinet:

- One 5-gal cruise-a-day straight gas[76]
- Crate containing:
  - One Silicone spray lubricant
  - One litre of motor oil
  - One litre of 4-stroke oil for onboard pump (“SF” or “SG” rated)
  - One spray windshield cleaner
  - One litre 2-stroke oil

[75] If full rigid backpack cans are carried, their location should be switched to middle shelf due to their weight (for ease of loading).

[76] Do not use the space in front of the cruise-a-day for a 5-gallon fuel container due to the proximity to the onboard pump’s muffler.

P3 (Passenger Side Rear Wheel Cabinet)

Top shelf:

- Two cases of water
- One Mark III pump tool kit

Bottom of cabinet:

- One toolbox for volume/onboard pump
- One socket set
- One 5-gallon drip torch fuel

P4 (Passenger side rear body cabinet)

Top shelf:

- Two 30’ tow straps

Middle shelf:

- One 5-gallon straight gasoline

Bottom of cabinet:

- Two 5-gallon 24:1 pump gas
- One set of wheel chocks

Middle shelf back compartment:

- Two fog nozzles
- One barrel nozzle
- One foam nozzle

D1 (Engine Operator's Side Front Cabinet)

Top shelf:

- Personal packs
- One foam concentrate handling kit
- Two sprinkler kits

Middle shelf/base:

- One 1,500-gal port-a-tank
- One 1 ½" hose box in a pack
- Personal packs

Bottom of cabinet:

- Two 1 ½" hose boxes in packs
- One 2-gallon container of D.E.F.

Note: The cabinet contains cargo netting to prevent the load from shifting onto the door during travel.

D2 (Engine Operator's Side Middle Cabinet)

- Four CSA-approved safety vests (in pouch)
- 16 reflective cones: minimum of 70 cm in height.
- Reflective signs (roll-up versions) and collapsible sign stands:
  - one "Yield to Oncoming Traffic" sign (Rb-91)
  - one "Lane Closure" sign (TC-4) arrow sign
  - two "Road Work" signs (TC-2B or TC-2A) (this sign is the old "Men at Work" sign)
- One 5-lb. ABC fire extinguisher (hard-mounted on front of cabinet)

D3 (Engine Operator's Side Rear Wheel Cabinet)

Top shelf:

- Three shovels
- One axe
- Two Pulaskis

Bottom of cabinet:

- One Mark III pump
- One Mark III pump with the B2 pump head with double intake adapter and 2 ½" QC on discharge

D4* (Engine Operator's side rear body cabinet)

Top shelf:

- Two 50' lengths of municipal 2 ½" hose
- One locked container of fuses

Middle shelf:

- One 2 ½" hose box (300') in pack

Bottom of cabinet:

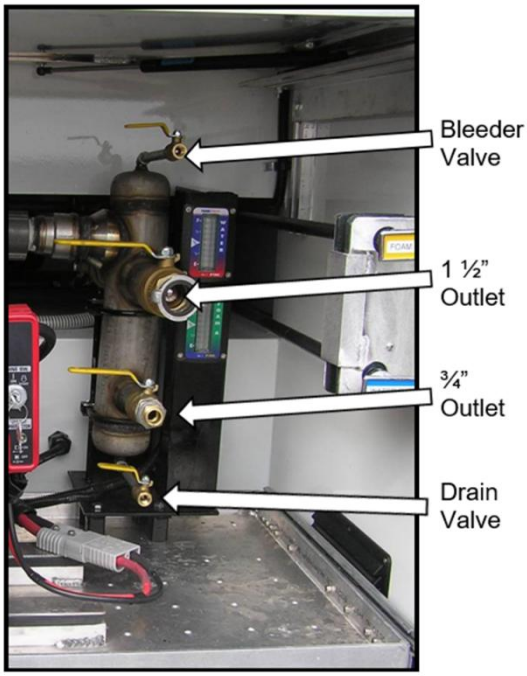
- Crate containing:
  - One 5 lb fire extinguisher
  - One drip torch (empty)
  - One set of wheel chocks

Intake Hose Storage

Two intake hose storage tubes run through the tops of the cabinets on both sides of the Engine body. Access to the intake storage tubes is through the pan doors on the rear of the truck. Four intake hoses are stored on the truck. Intake tubes are long enough to allow for the foot valve to be left on the intake hose (except Engine 8).

Onboard Pump Operations

The onboard pump on the MNR's engines is a 13 HP Honda 4-cycle pump with a 4-stage pump head. **The pump runs on straight gasoline.** The pump has similar pump head and performance characteristics to that of the Mark III Power Pump.



Pump Tool Kit

- 3 ea. Strangler hose clamp
- 3 ea. holster, Strangler hose clamp
- 1 ea. valve, foot

- 2 ea. nozzle, barrel (1 1/2 in. (38 mm) quick connect, complete with combination 3/8-in. (10-mm) and 1/4-in. (6-mm) tips.)
- 2 ea. wye with 1 1/2 in. quick connect
- 1 ea. line, fuel, single
- 1 ea. tool, fuel line priming/draining
- 1 ea. thief, water, w/ 1 1/2 in. quick connect x 3/4 in. with shut off valve
- 1 ea. adaptor, tandem (tandem coupling)
- 2 ea. wrench, hose, 1 1/2 in.
- 4 ea. patch, hose, metal
- 1 ea. gun, grease, pump, filled with Unirex EP 2 grease (roll grease gun in wiping rag and place in a plastic bag)
- 1 ea. cord, sash, #6, (length of 6.1 m +/- 30 cm)
- 1 ea. tool roll containing:
  - 8 ea. nail, common, 8 cm (+/- 1 cm)
  - 1 ea. bar, steel, pump spark plug wrench
  - 1 ea. wrench, spark plug, power pump, 1 in. x 13/16 in.
  - 1 ea. wrench, combination, 10 mm, bent to 45 degrees at open end
  - 1 ea. wrench, combination, 13 mm (box end/open end), 851
  - 1 ea. wrench, adjustable, 20 cm (+/- 2.5 cm)
  - 1 ea. screwdriver, common, 20 cm overall length (+/- 2.5 cm)
  - 1 ea. pliers, slip joint, 15 cm (+/- 2 cm)
  - 1 ea. wrench, hex, T-handle, 4 mm
  - 1 ea. wrench, hex, T-handle, 6 mm
- 1 ea. freezer bag containing:
  - 2 ea. container, spark plug, plastic
  - 1 ea. part, PP, plug, spark, power pump, (Bosch – M4AC, NGK – AB-8, Champion – K7) (gap .020 in. (0.51 mm)
  - 1 ea. part, PP, plug, spark, BPR7HIX (Watson) (gap .020 in (0.51 mm)
  - 1 ea. adaptor, 1 1/2 in. quick connect x 1 1/2 in. female NPSH ULC (complete with face washer & inside washer)
  - 1 ea. pencil N/A
  - 4 ea. washer, face, grooved (for 1 1/2 in. quick connect adaptors)

- 2 ea. washer, 1 1/2 in.
- 1 ea. washer, hum bung adaptor
- 2 ea. washer, 1/2 in. x 13/16 in. (inside nozzle tips)
- 1 ea. washer, suction hose, 2 in. (2.6 in. O.D. x 2.0 in I.D.) (for smooth suction hoses)
- 1 ea. washer, nitrile, white, 2.5 in. (for ribbed suction hose, foot valve, and tandem couplings)
- 2 ea. O-ring, barrel nozzle
- 10 ea. tag, defective
- 10 ea. tie, cable (approx. 178 mm (7 in.); ladder type preferred) 819
- 1 ea. union, barbed
- 2 ea. rags, clean, generous size (can be cloth or shop towel), N/A
- 2 sets plug, ear (disposable type)
- 1 ea. tape, electrical (> 3/4 full roll)
- 3 ea. part, Strangler hose clamp, insert, rubber
- 1 ea. part, fuel container, cap, screw
- 1 ea. part, fuel container, cap, vent
- 2 ea. part, fuel container, stopper

Values Protection Kit

- 5 ea. part, SK, sprinkler, head assembly, w/ base
- 1 ea. case, carry, sprinkler head assembly
- 5 ea. thief, water, with 1 1/2-in. quick connect (one with blanking cap attached with retainer)
- 15 ea. hose, 3/4 in., 25 ft.
- 1 ea. line, fuel, double
- 1 ea. roll, tool, sprinkler kit, containing:
  - 1ea. cap, blanking, with 1 1/2-in. quick connect
  - 1 ea. retainer, priming port or blanking cap (attached to above)
  - 1 ea. ring, key, blanking cap (attached to above)
  - 1 ea. hammer, claw, steel handle, 16 oz.
  - 24 ea. nail, double, headed, 2 3/4 in. 2875

- 5 ea. rope, sideline, 3.1 mm to 2.5 m lengths (+/- 0.5 m)
- 1 ea. pliers, side cutter, 7 in.
- 1 ea. tool, fuel line priming/draining
- 1 ea. wrench, adjustable, 8 in.
- 1 ea. tape, electrical (> 3/4 full roll)
- 3 ea. washer, humm bung adaptor
- 3 ea. washer, rubber, garden hose, 3/4 in.

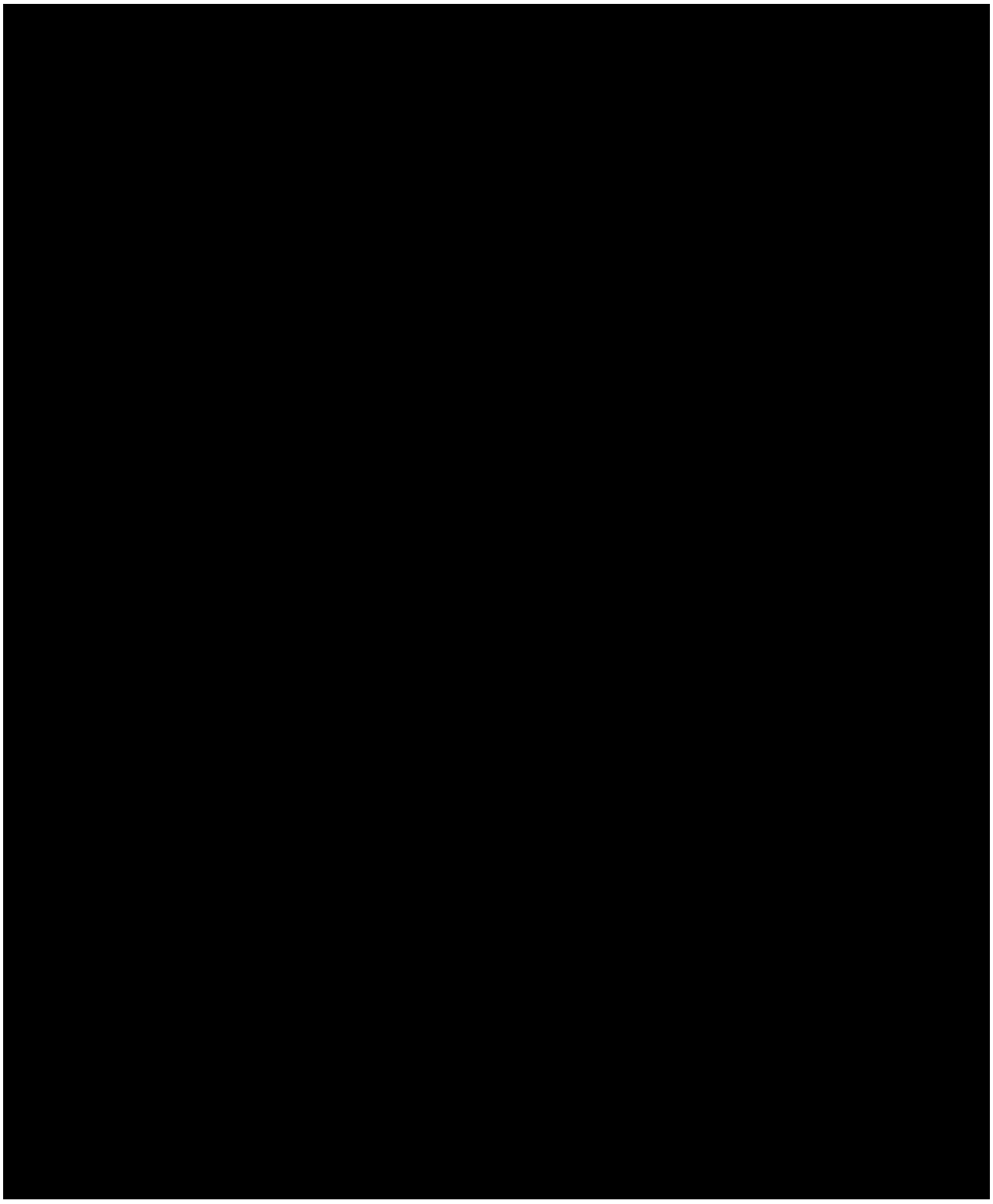
Appendix N: Port Hope Fire and Emergency Services Equipment Listing

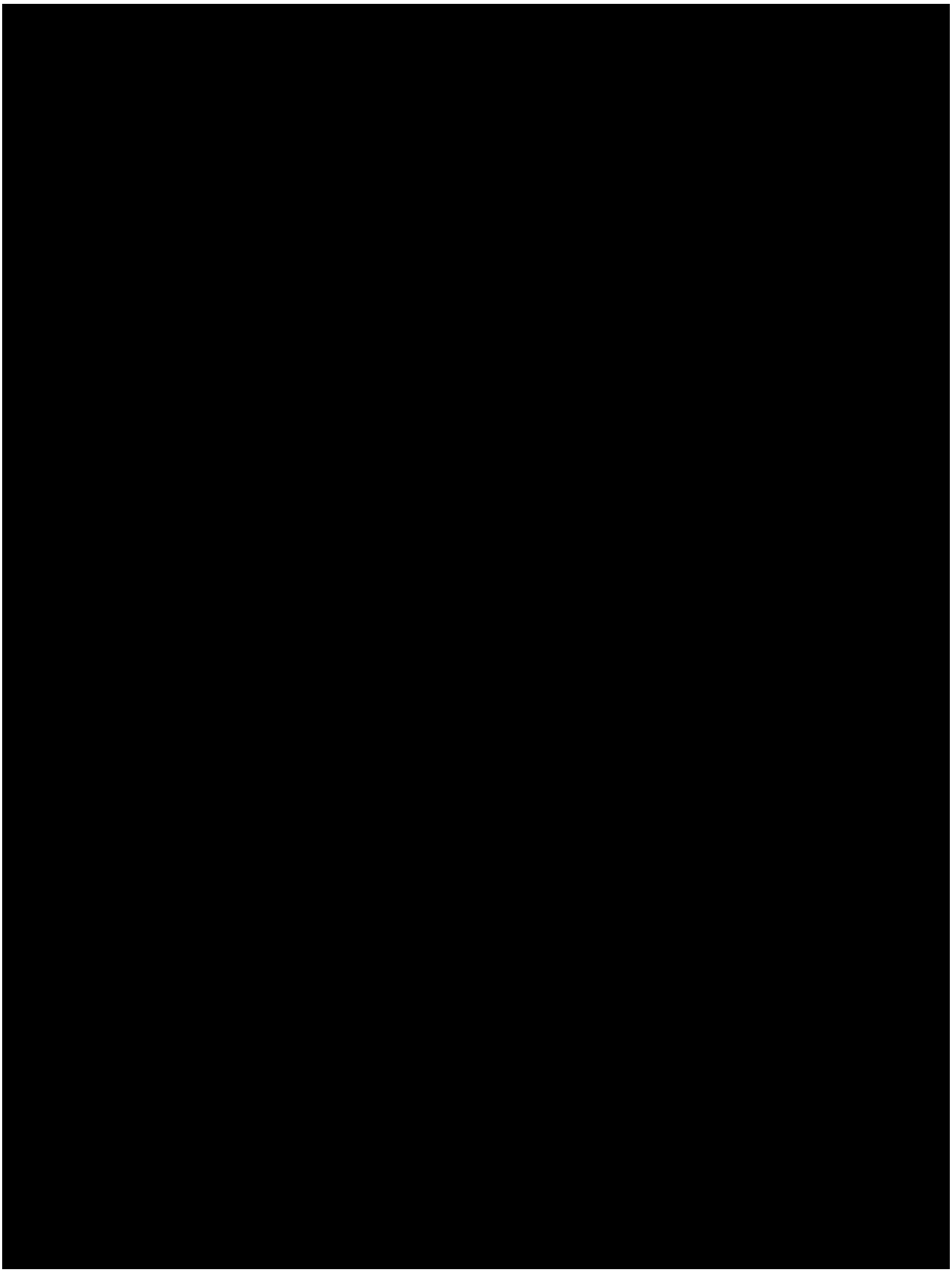
Item	Count
Nomax coveralls	75
Compasses	10
GPS	2
Pumper trucks	4
Tanker trucks	0
Tanker pumper (2800 Gal)	1
Tanker pumper (1700 Gal)	2
Grass fire trucks (4x4)	1
Foam trucks	2
4x4 trucks	3
ATV/UTV	1
Wajax pump sets	3
Portable pumps	3
Portable tanks	5
Forestry hose	500
100mm hose (high volume)	3,000

Item	Count
38mm hose	35,000
65mm hose	3,000
Logging axes	12
Pulaski axes	5
Firefighting rakes	12
Shovels	12
Chainsaws	5
Firefighting brooms	15
Grass fire water packs	15
Class "A" foam barrels	65
Class "B" foam barrels	0
Portable generators	5
Lights (Generators)	4
Cords (Generator)	4
Flashlights	30

Appendix O: Confidential Contact List

Note: The information in this appendix is confidential.





Appendix P: Port Hope Radio Channels

Channel	Identifier
Chief's Radio	
1	Port Hope OPS
2	Port Hope TAC
3	Northumberland Mutual Aid
4	Hamilton Fire OPS A
5	Hamilton Fire TAC
6	Cobourg Fire OPS
7	Cobourg Fire TAC
8	Alnwick-Haldimand OPS A
9	Alnwick-Haldimand TAC
10	Cramahe Fire OPS
11	Cramahe Fire TAC
12	Trent Hills Fire OPS
13	Trent Hills Fire TAC
14	Brighton Fire OPS
15	Brighton Fire TAC
16	Cavan Monaghan Fire OPS
17	Cameco ERT
18	HBM Fire OPS (Havelock)
19	PCNTY Wide A (Prince Edward County)
20	OSM Fire OPS (Otanbee - South Monaghan
21	Quinte West
22	AMB Paging
23	ANFR Ops (Asphodel Norwood)

Channel	Identifier
24	Helicopter
25	OFM
	Firefighter Radio
1	Port Hope OPS
2	Port Hope TAC
3	Northumberland Mutual Aid
4	Hamilton Fire OPS A
5	Hamilton Fire TAC
6	Cobourg Fire OPS
7	Cobourg Fire TAC
8	Alnwick-Haldimand OPS A
9	Alnwick-Haldimand TAC
10	Cramahe Fire OPS
11	Cramahe Fire TAC
12	Trent Hills Fire OPS
13	Trent Hills Fire TAC
14	Brighton Fire OPS
15	Brighton Fire TAC

Appendix Q: Wildland Fire Understory Behaviour

Wildland Fire Photo	Description
	• Grass moss • Rear of fire • Smoldering • Rank 1 • Photo credit: MNR AFFES Communications Unit
	• Pine forest • Needles understory • Post-burn, smoldering in root systems • Rank 1 • Photo credit: Michael Bruce (Research Gate)

Wildland Fire Photo	Description
	• Hardwoods • Leaf understory • Burning on slope • Rank 2 • Photo credit: MNR AFFES Communication Unit
	• White pine • Logging slash understory • Rear of fire • Rank 2 • Photo credit: MNR AFFES Communications Unit

Wildland Fire Photo	Description
	• Hardwoods, cedar • Leaves and shrubs understory • Slope next to lake • Rank 2 • Photo credit: MNR AFFES Communications Unit
	• Grass and cat tails • Flame beginning to develop rotation • Rank 2 to 3 • Photo credit: MNR AFFES Communications Unit

Wildland Fire Photo	Description
	• Cut straw, agricultural field in spring • Solid continuous flame front • Rank 3 to 4 • Photo credit: Denver 7 News Video – Broomfield
	• Grass-treeline interface • Solid continuous flame front • Torching in white spruce • Rank 3 • Photo credit: MNR AFFES Communications Unit

Wildland Fire Photo	Description
	• Red pine • Understory of dead, dried needles and branches • Solid continuous flame front • Candling up bark • Rank 3 • Photo credit: Anderw Orlemann (Britannica)
	• Mixed wood (aspen, spruce) • Understory of immature spruce and balsam • Solid continuous flame front, slope influence • Rank 4 • Photo credit: Sarah Noelle (Rangelands Gateway Newsletter)

Wildland Fire Photo	Description
	• White pine, spruce • Solid continuous flame front • Insect-killed spruce and balsam (black smoke) • Rank 4 • Photo credit: MNR AFFES Communications Unit

U.S. Wildfire Ranking System

The following graphic was created by the U.S. Bureau of Land Management – Predictive Services.

Fire Observation/Description

Rank 1 Smoldering	Rank 2 Creeping	Rank 3 Running	Rank 4 Torch/Spot	Rank 5 Crowning	Rank 6 Erratic
					
• No open flame in surface fuels • **White smoke** • Smoldering ground fire	• Visible open flame, **1-4 ft.** in surface fuels • Surface fire only • Unorganized flame front • Little or no spread	• Organized surface flame front, **4-8 ft.** in surface fuels • Moderate rate of spread • Vigorous surface fire • May see some candling or torching along the perimeter and/or within the fire	• Organized surface flame front, **8-12 ft.** in surface fuels • Moderate to fast ROS on the ground • **Grey to black smoke** • Torching/Short range spotting • Disorganized crown involvement	• Organized crown fire front • Moderate to long range spotting • Independent spot fire growth • **Black to copper smoke** • **12-18 ft** flames in open and slash fuels	• Organized crown fire front • Moderate to long range spotting • Independent spot fire growth • Presence of fire balls and whirls • Violent fire behavior

Appendix R: Port Hope Agricultural and Grass Fuel Type Images

Wildland Fire Agricultural and Grass Fuel Type Photo	Description
	• Corn, cut stocks • Overwintered • Spring view • Potential for fast moving, moderate-to-high-intensity ground fire • Photo credit: Grant Murphy, The Loomex Group

Wildland Fire Agricultural and Grass Fuel Type Photo	Description
	• Corn, uncut • Overwintered • Spring view • Potential for high-intensity fire and spotting • Photo credit: Grant Murphy, The Loomex Group

Wildland Fire Agricultural and Grass Fuel Type Photo	Description
	• Marsh grass • Spring view • Fully cured • Potential for moderate-intensity, fast-moving fire and limited spotting • Photo credit: Grant Murphy, The Loomex Group

Wildland Fire Agricultural and Grass Fuel Type Photo	Description
	• Phragmites • Spring view • Native and non-native species exist • Non-native species are invasive species • Potential for fast-moving, high-intensity fire with some spotting • Photo credit: Grant Murphy, The Loomex Group

Wildland Fire Agricultural and Grass Fuel Type Photo	Description
	• Wheat, cut • Overwintered • Spring view • Potential for moderate fire intensity, moderate spread rates, and limited spotting • Photo credit: Grant Murphy, The Loomex Group

Wildland Fire Agricultural and Grass Fuel Type Photo	Description
	• Field grasses • Overwintered • Spring view • Potential for fast-moving, moderate-intensity fire with limited spotting • Photo credit: Grant Murphy, The Loomex Group