



Industrial Operations Protocol



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Introduction

The Ministry of Natural Resources and Forestry (MNRF), in consultation with our industry partners, has established the Industrial Operations portion of Ontario Regulation 207/96 “Outdoor Fires”. This regulation identifies the responsibilities of industrial operators in regard to our mutual objectives of preventing and mitigating the effects of wildland fire in the forest areas of Ontario.

This Industrial Operations Protocol was prepared to provide direction and supplemental information in support of this regulation. This protocol provides direction on how to prevent industrial caused wildfires and expedite the suppression of any fires occurring on or near industrial worksites in forested areas. The protocol is a supplement to the regulation and in all matters requiring interpretation, the regulation should be consulted.

The regulation provides guidance to industrial operations within the Ontario Fire Region during the fire season, normally April 1 – October 31.

The objectives of the protocol are:

- industrial operations are conducted in a manner that prevents wildland fires from starting;
- wildland fires are detected and reported to Ministry of Natural Resources and Forestry (MNRF) so that they receive a timely response;
- industrial operators are able to continue to work safely as long as possible, as the risk of fire increases; and
- employees are adequately trained to use available equipment to take safe action that will reduce the negative impact or damage from a fire, should one occur.

The regulation and protocol provide a consistent methodology for modifying industrial activities by:

- utilizing the most current knowledge of wildland fire;
- incorporating measures in daily operations that will help reduce the risk of a fire escaping within the operating area (e.g., fire suppression training, detection, and communications); and
- determining when and where industrial operations should be modified depending on the fire danger (a general term used to describe the potential for wildland fires to start and spread) and the risk of the operations starting a wildland fire.

The protocol consists of three main sections that may apply to industrial operations within forest areas:

- **Development of a Fire Prevention and Preparedness Plan** (Section 1.0) which includes information about company operations, fire prevention programs and initiatives and fire preparedness including company and MNRF contacts. It may also include annual updates for long term activities.
- **Preparedness activities** (Section 2.0) including having wildfire suppression equipment and trained staff on hand to take immediate action on small fires that

are ignited by the industrial operation or that may occur near the industrial operation to reduce their spread.

- **Modifications and/or mitigation actions** (Section 3.0) that will be required as the risk of wildland fire ignition and spread increases.

All industrial operations ongoing during the fire season, within the fire region, should have the capability and the knowledge to immediately report any fire that they discover to the MNRF, whether started by their operation or not.

1.0 Fire Prevention and Preparedness Plans

Fire Prevention and Preparedness Plans are required for all industrial operations that are conducted in forest areas within the fire region of Ontario that are not categorized as low risk operations (see sections 3.1 and 3.2). The fire region of Ontario encompasses the area shown in green (figure 1) and is described in the Schedule referred to in Section 14 of Ontario Regulation 207/96. The fire season is typically April 1 to October 31 but this can be changed by the Minister of Natural Resources and Forestry if a wildland fire hazard materializes before or after that time period.



Figure 1 – Legislated Fire Region of Ontario

Companies that are required to prepare these plans must make them available to MNRF if requested. Annual updates may be required for some sections if long term plans are developed.

The plan lays out the wildland fire prevention activities that the company will undertake to ensure that their operation will not pose an undue fire risk to forest areas. The four key sections of the plan are: operations information, fire prevention, fire preparedness and communications.

Operations information:

- Identification of the company
- The main focus of its operations in forest areas
- The general location(s) of its operations
- Identification of operations by fire risk category

Fire prevention:

- Fire prevention programs and initiatives
 - steps the company will take to ensure that onsite operators will classify forest vegetation, obtain and review fire intensity codes and modify operations in accordance with sections 20, 22 and 23 of the Outdoor Fires Regulation
 - what actions may be taken to lower the fire risk category of operations as per subsection 19 of the Outdoor Fires Regulation
- Fire prevention monitoring

Fire preparedness:

- Fire suppression training
 - how staff will be trained to attack fire safely and efficiently
 - the number of staff that will be trained, and to what levels
- Suppression equipment available
 - the amount and type of equipment and location
- Actions to be taken when a fire is detected

Communications:

- Company and MNRF contacts
 - identification of key personnel from the company who MNRF should contact with fire or fire hazard information
 - list of key MNRF personnel who should be contacted for information or questions
- Emergency wildland fire reporting procedures
- Information concerning fire hazard, current restrictions, the process of the protocol, general inquiries
- The methods of communicating with staff to ensure that they understand the required fire prevention measures

Annual plan updates will contain:

- Operating areas for that year
- Contacts and phone numbers
- Any changes being undertaken to other sections

Appendix A contains an example of a completed plan. A template that can be used for developing a plan is available from the local Fire Management Headquarters.

2.0 Fire Preparedness Activities

Essential to industrial partners being allowed to continue to operate during periods of increasing wildland fire hazard is their ability to respond quickly to fires that their operations may start or that may be started by other causes in close proximity to their operations. These preparations must be in place for the period of the fire season that the worksite is snow free.

2.1 Fire Suppression Equipment

If mechanical equipment is operating on the site, a serviceable fire extinguisher must be located on each piece of equipment or within 5 metres of it. The purpose of the fire extinguisher is to put out fires starting on the equipment itself.

Wildland fire suppression equipment may also be required on an operation. Unless deemed low risk, a backpack pump is required on or within 30 m of every piece of heavy machinery and at the location of any hot work. A serviceable pressurized water delivery system located on a machine can replace the requirement for a backpack pump. A backpack pump consists of a flexible or rigid container containing at least 18 litres of water with a short rubber hose and a single action hand pump to disperse the water. They must be immediately available to take quick action on a small fire while they can still be effective. Table 1 identifies the number of backpack pumps that are required depending on the industrial operation or activity.

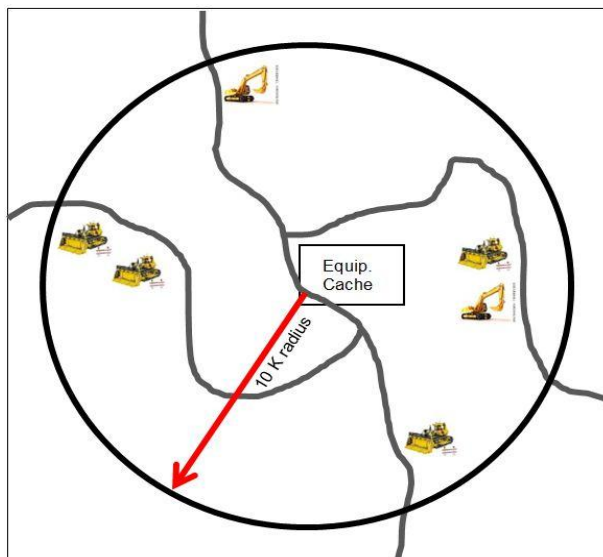


Figure 2 – Locating an Equipment Cache

As the number of pieces of heavy machinery increases in the operation, additional fire suppression equipment may be required. Equipment caches, or units of fire equipment, must be stored in a central location within a 10 km radius of the operation(s) and available to be transported quickly to any worksite when a fire is detected. These equipment caches must consist of a minimum of a pumping unit (which includes intake and output hose, tools and gas) and at least 3 shovels and other fire suppression equipment that the industry may have in place. Table 1 describes the fire suppression equipment required according to the operation. Staff must know how and where to access the equipment and how to use the equipment once at the worksite. The equipment must be checked on a regular basis to ensure that it is in working order. The schedule for this inspection should be included in the fire plan.

Table 1: Suppression Equipment Required by Operation

Operation Type	Backpack Pump Requirements	Additional Suppression Equipment Requirements
10 or more pieces of heavy machinery being operated within a 10 km radius if no more than 5 are equipped with tire chains, metal tracks or skids.	1 per machine located on or within 30 metres of where the machine is being used, or 1 pressurized water delivery system per machine	1 fire equipment cache containing at least one pumping unit and 3 shovels
6 or more pieces of heavy machinery being operated within a 10 km radius equipped with tire chains, metal tracks or skids.	1 per machine located on or within 30 metres of where the machine is being used, or 1 pressurized water delivery system per machine	1 fire equipment cache containing at least one pumping unit and 3 shovels
Hot work	1 per hot work operation, located within 3 metres of the operation	None required
Rail cutting, welding or grinding, thermite welding, switch crossing grinding	1 per operation located within 3 metres of the operation	If fire intensity code is A, B or C, a water delivery system with a minimum of 90 gallons of water onsite
Rail production grinding	4 per grinding operation	A water delivery system with a minimum of 1000 gallons of water onsite

2.2 Fire Suppression Capabilities

Anyone working in a forest area that is expected to use fire suppression equipment must be trained to use that equipment. Operations that meet the “trained and capable” standard outlined below may qualify to work longer during higher fire danger periods and not have to modify their operations as often or as significantly, as they should be trained and capable to respond to any fires that start.

"Trained and Capable" operations must meet each of the following criteria:

1. **Prevention:** Implementation of an effective prevention program for the type of operation, as outlined in the fire plan.
2. **Suppression:** Fire suppression equipment onsite to meet the minimum requirements laid out in Table 1.
3. **Communication:** The ability to communicate and report fires immediately and to obtain updated information on the fire danger.
4. Immediately means two-way radio or telephone capabilities from the site to the company or local MNR Fire Management Headquarters.
5. **Training:** A minimum 25% of all staff involved in industrial operations on the worksite must be trained and proficient to the MNR SP105 standard if an equipment cache is not required or to the SP106 standard if an equipment cache is required.
 - Industry will implement refresher training to ensure that their staff are proficient with the material covered within the SP105 and SP106 course.

Operations that do not meet all of the above criteria will be considered to be not trained and capable operations and their operations may be restricted more frequently as the fire danger increases.

2.3 Communications

Communication capabilities are essential to ensure an appropriate response to a wildfire, and to obtain the most current information for determining the requirement for operational modifications or mitigation efforts.

The company operation will need to ensure communications with the MNR. Industry staff must be able to contact MNR to report fires. This communications link must also function in both directions as MNR staff may need to provide industry personnel with updated hazard information or contact them to obtain additional information. While a direct link is preferred, in some cases, company field operations will have to communicate with MNR through a company office and vice versa. The fire plan must clearly lay out the procedure along with pertinent phone numbers and contact names. The author of the fire plan should contact the local Fire Management Headquarters to obtain the pertinent MNR contact information for their area.

Companies should communicate fire prevention and suppression procedures to all staff and operators.

3.0 Determining Modifications and Mitigations to Industrial Operations

When the worksites are snow free, industrial operations must be modified or mitigation steps taken as fire danger increases to reduce the risk of igniting a wildland fire. The steps in determining when and how operations should be modified or mitigated by considering the fire hazard and risk of ignition from the operations include:

1. **Determine the Fire Risk Category** (Section 3.1) of the operations being conducted.
2. **Consider Mitigation of Operations to Lower the Fire Risk Category** (Section 3.2).
3. **Determine the Forest Fire Fuel Group** (Section 3.3) at the worksite.
4. **Determine the Fire Intensity Code** (Section 3.4) for the next day.
5. **Determine the Operational Modifications** (Section 3.5) for the next day.

The following sections provide details and background information regarding each of these steps.

A field guide to the industrial operations protocol is available at the Fire Management Headquarters that contains the tables and charts required for daily interpretation and application of the protocol in the field.

3.1 Determine the Fire Risk Category of the Operation

Certain industrial operations are more likely to create a source of ignition (e.g., spark) and therefore are categorized into four levels of operational risk:

- Very High Fire Risk Operations
- High Fire Risk Operations
- Moderate Fire Risk Operations
- Low Fire Risk Operations

The fire risk categories are based on the potential for the operation to create a spark (e.g., presence of stones or bedrock when using heavy machinery equipped with metal parts that may come in contact with the stones), or other sources of ignition (e.g., hot work).

Operational modifications (i.e., restrictions on hours of work) are not required for low fire risk operations unless extreme fire danger or a wildland fire event requires forest closure or an Emergency Area Order restricting access to some areas of the forest.

Tables 2a and 2b outline the fire risk for common industrial operations on sites with surface stoniness of <15% and >15% respectively. If the operation in question is not included in Tables 2a or 2b, the operator should contact the local Fire Management Supervisor (FMS) for advice in determining the fire risk category of that operation. Appendix B provides additional information on assessing the stoniness of a worksite.

Any operation working exclusively on mineral soil, clay or gravel (e.g., on roads and landings, where there is no continuous fuel component) is classified as low risk.

However, in the case of hot work, there must be no forest fuel or other continuous flammable material within eleven metres of the hot work operation.

Table 2a: Fire Risk Categories / Surface Stoniness Less Than 15%

Operation	Risk Category
<ul style="list-style-type: none"> • Hot work: welding, torch or saw cutting of metal and grinding, operations involving open flame • Thermite welding • Rail production grinding • Switch crossing grinding • Operation that uses heavy machinery equipped with metal parts that may come into contact with rocks or similar material in the normal course of operation and cause a spark, e.g., equipment with tire chains or metal tracks or skids such as rubber-tired skidders with chains, bulldozers or drill rigs; machines with rotary cutting heads; mechanized site preparation; mechanical tending with chain flails and mowers; hydro-axe • Geophysical surveys using a power generator (e.g., induced polarization) 	High Fire Risk Operations
<ul style="list-style-type: none"> • Blasting without mats • Delimiting, slashing felled trees with heavy machinery • Slash piling • Using a portable saw mill • Stripping of the forest floor and surface vegetation with heavy machinery • Any drilling operation that does not use water as a coolant/flushing agent and where the area has not been cleared of the forest floor and surface vegetation. 	Moderate Fire Risk Operations
<ul style="list-style-type: none"> • Building, spreading and shaping sub-grade with a back hoe or excavator • Graveling/grading roads • Bulldozer flattening of sub grade (mineral soil) • Stream work: water crossing installation/ repairs, bridge work, stream rehabilitation • Portable chipping • Loading wood or gravel and hauling • Using chainsaws or brush saws • Blasting with mats • Using all-terrain vehicles (wheels or rubber tracked) • Using heavy machinery with rubber tires (no chains) • Manual industrial operations (e.g., tree planting and tending, claim staking, line locating, surveying and manual stripping) • Pitting and trenching with mechanical equipment, including the use of a channel saw, where the forest floor and surface vegetation has been 	Low Fire Risk Operations

Operation	Risk Category
<p>removed for at least 3 metres from the site.</p> <ul style="list-style-type: none"> • Any drilling operation that uses water as a coolant/flushing agent or is carried out where the area has been cleared of the forest floor and surface vegetation <p>The following railway operations:</p> <ul style="list-style-type: none"> • Surfacing, tie installation, under-cutting, gauging, spiking, gophering 	

Table 2b: Fire Risk Categories / Surface Stoniness Greater than 15%

Operation	Risk Category
<ul style="list-style-type: none"> • Operation that uses heavy machinery equipped with metal parts that may come into contact with rocks or similar material in the normal course of operation and cause a spark, e.g., equipment with tire chains or metal tracks or skids such as rubber-tired skidders with chains, bulldozers or drill rigs; machines with rotary cutting heads; mechanized site preparation; mechanical tending with chain flails and mowers; hydro-axe • Stripping of the forest floor and surface vegetation with heavy machinery 	Very High Fire Risk Operations
<ul style="list-style-type: none"> • Hot work: welding, torch or saw cutting of metal and grinding, operations involving open flame • Thermite welding • Rail production grinding • Switch crossing grinding • Blasting without mats • Operations using a channel saw where the forest floor and surface vegetation has not been removed to a distance of at least 3 metres. • Geophysical surveys using a power generator (e.g., induced polarization) 	High Fire Risk Operations
<ul style="list-style-type: none"> • Delimiting or slashing with heavy machinery • Portable saw mills • Slash piling • Building, spreading and shaping sub-grade with back hoe/excavator • Operations using 3 or more brush saws • Using heavy machinery with rubber tires (no chains) (e.g., forwarders, skidders) • Drilling operations that do not use water as a coolant / flushing agent and where the area has not been cleared of the forest floor and surface vegetation 	Moderate Fire Risk Operations
<ul style="list-style-type: none"> • Graveling/grading roads • Bulldozer flattening of sub grade (mineral soil) • Stream work: water crossing installation/ repairs, bridge work, stream rehabilitation • Portable chipping • Loading wood or gravel and hauling • Operation using chain saws and/or no more than 2 brush saws • Blasting with mats • Using all-terrain vehicles (wheels or rubber tracked) • Manual industrial operations (e.g., tree planting, claim staking, line locating, surveying, manual stripping) • Pitting and trenching with mechanical equipment, including the use of a channel saw, where the forest floor and surface vegetation has been removed for at least 3 metres from the site. • Any drilling operation that uses water as a coolant/flushing agent or where the area has been cleared of the forest floor and surface vegetation <p>The following railway operations:</p> <ul style="list-style-type: none"> • Surfacing, tie installation, under-cutting, gauging, spiking, gophering 	Low Fire Risk Operations

3.2 Mitigation of Operations to Lower Fire Risk Category

Certain measures can be taken to lower the fire risk of some operations. These will typically only be taken on operations where the worksite is very small as presoaking large areas is likely not cost effective.

During periods of elevated fire danger, some high or very high risk operations, which occur on localized areas, can be conducted safely by mitigating the immediate worksite/work area to minimize the chance of causing a wildland fire. Mitigating the worksite can be done in a number of ways including removing flammable material in the area, modifying the flammable material so that it is no longer flammable (e.g., soaking with water/foam) or shielding the flammable material from sparks and other potential ignition sources. Another key part of mitigation is the organized patrolling of the area after the operation is complete while having immediate access to suppression equipment and a means of reporting any fires that are discovered.

The following mitigation activities will allow the fire risk category of operations other than hot work, rail production grinding and switch crossing grinding to be rated two fire risk categories lower (e.g., very high risk becomes moderate risk, high and moderate risk becomes low) before operational modifications are applied:

- Soak the operational area with water or a fire suppression foam mixture using back pack pumps or another water delivery system prior to commencing the operation.
- Keep the operational area in a wet condition during the operation.
- Assign at least one person to monitor the area during the operation to watch for possible fire ignitions and to take action on any fires that do ignite.
- After operations are complete, soak the operational area with water or a fire suppression foam mixture using back pack pumps or another water delivery system.
- Actively patrol the area for at least one hour after the operation has concluded. If a fire is discovered, notify MNRF and, if it safe to do so, extinguish any fires that are found.
- Ensure individuals monitoring the area or conducting patrols have the ability to immediately report a fire to MNRF and do so.

In addition to the measures described above, hot work, rail production grinding and switch crossing grinding also require the use of non-combustible shields designed to catch any and all material capable of igniting a fire. Taking all of these precautions will result in hot work, rail production grinding and switch crossing grinding being considered a moderate fire risk category operation.

It may be beneficial to plan to mitigate some operations because industrial operations that are categorized as, or mitigated to, low risk do not require a fire prevention and preparedness plan, are not required to modify hours of work and do not require any additional fire suppression equipment. However, operators must ensure that operations that require mitigation to categorize them as low risk fire operations must be mitigated

or the requirements for a fire prevention and preparedness plan, fire suppression equipment and operational modifications apply.

3.3 Determine the Forest Fire Fuel Group

Fire danger is a general term used to describe the potential for wildland fires to start and spread. It is in part determined by the physical characteristics of the wildland fuels. The classification of wildland areas into general "forest fire fuel groups" is based on site characteristics and provides an initial indication of the potential fire behaviour, should a fire ignite.

Five forest fuel groups (Table 3) have been developed using information from the 16 benchmark fuel types defined within the Canadian Forest Fire Behaviour Prediction (CFFBP) System. These fuel groups are used to classify the work area that will be operated on each day/shift at the forest stand or site level. The fuel group is determined by observing the nature of the stand/site, such as the amount and condition of conifer/deciduous vegetation, presence of understory vegetation, ladder fuels, etc.

Table 3: Forest Fire Fuel Group Descriptions

Fuel Group	Hazard Level	Description of Vegetation
1	Very Low	Deciduous species and live grass-dominated stands
2	Low	Deciduous dominated mixedwoods (<35% conifer), spruce-lichen woodlands, mature red and white pine, conifer on peat/organic soils
3	Moderate	Mixedwoods (35-64% conifer), mature jack pine and self-thinned and pruned spruce
4	High	Mature upland boreal spruce without conifer understory, conifer plantations and mixedwood stands with >64% conifer
5	Very High	Mature upland boreal spruce with conifer understory, natural immature conifer stands, mixedwood stands with dead balsam fir, cured grass and slash-dominated sites

Site-specific forest fire fuel groups are determined using the forest fire fuel group decision keys found in Appendix C.

If the work area is made up of more than one fuel group, use the highest fuel group that represents at least 20% of the work area. (e.g., work area is made up of 25% fuel group 2, 50% fuel group 3 and 25% fuel group 4 – use forest fire fuel group 4 to determine modifications). Alternatively, the modifications can be determined for each fuel group and applied to each fuel group area as the operation progresses through them.

Seasonal Conditions Adjustment to Fuel Group

Seasonal conditions, spring (leaf-off) and summer (leaf-on), also play a role in determining the appropriate fuel group to use (e.g. determining the fuel group to be a higher or lower hazard). Use the latest MNRF "[Industrial Fire Intensity Code Report](http://www.ontario.ca/environment-and-energy/fire-intensity-codes)" available on the Ontario government internet at <http://www.ontario.ca/environment-and-energy/fire-intensity-codes>, to determine if the weather station representing the worksite area is in leaf off (spring) or leaf on (summer) conditions, or contact the local Fire Management Headquarters.

Appendix C provides a number of decision keys to determine the appropriate forest fire fuel group to use. They provide for applicable adjustments (+1/-1) to raise or lower the forest fire fuel group based on seasonal conditions and understory plants to determine the final fuel group.

3.4 Determine the Fire Intensity Code

Another important factor in determining fire danger is weather, which in combination with wildland fuel type determines the ease of ignition, rate of spread, and difficulty of control of a wildland fire. This protocol uses the Fire Intensity Code (FIC) as the key indicator of rate of spread and difficulty of control and therefore overall danger if a wildland fire should start. Fire intensity is directly related to suppression difficulty and the need to prevent and extinguish fires as soon as possible.

The fire intensity codes range from A (highest), through to E (lowest). Table 4 relates the intensity code to the potential head fire intensity and type of wildland fire, as well as the type of action wildland fire management agencies might take at each level. Fire agencies consider 2000 kW/m as the upper limit of fire intensity for the safe action by ground crews. Beyond 4000 kW/m, continuous crowning and fire spotting is likely.

Table 4: Fire Intensity Code Relation to Potential Head Fire Intensity and Suppression Capability

Fire Intensity Code	Level of Fire Danger	Fire Type (fire characteristics) <ul style="list-style-type: none">• Typical suppression tools and tactics
A	Extreme Fire Danger	Continuous crown fire, medium to long range spotting, major fire runs possible <ul style="list-style-type: none">• Indirect attack and burn-out operations
B	Very High Fire Danger	Intermittent and continuous crowning <ul style="list-style-type: none">• Indirect attack and burn-out operations
C	High Fire Danger	Intermittent crown fire with spotting <ul style="list-style-type: none">• Pumps on flanks, air tankers/ bucketing on head
D	Moderate Fire Danger	Surface fire with torching <ul style="list-style-type: none">• Pumps and hose with air support (bucketing or tankers)
E	Low Fire Danger	Smouldering and creeping <ul style="list-style-type: none">• Hand tools and backpack pumps

The fire intensity code is determined using the previously identified forest fire fuel group and two fire weather index parameters: the Build-Up Index (BUI), an indicator of fuel availability for combustion; and the Initial Spread Index (ISI), an indicator of how fast a fire will spread. The Canadian Forest Fire Weather Index (CFFWI) System establishes the process for calculating them.

A related component of the CFFWI System is the Fine Fuel Moisture Code (FFMC) which provides an indication of the moisture content in the fine fuels and is an indicator of how easily a fire can start. The fire intensity code may be adjusted based on the value of the FFMC.

A map of the MNRF weather station locations is provided on the internet on the fire intensity codes page to be used to determine the closest MNRF weather station. Staff at the local Fire Management Headquarters can also assist in these determinations.

The fire intensity codes provided for the MNRF weather stations will automatically contain any FFMC modifications that are in effect.

For the forest area represented by an MNRF weather station, a fire intensity code is available for the next burning period, every afternoon during the fire season. The available report shows each MNRF weather station, whether the area is considered in leaf on or leaf off conditions and the calculated fire intensity code for each fuel group. The MNRF will normally publish the [Fire Intensity Code reports](#) by 4 pm EDT or 3 pm CDT by the following methods:

- **Internet:** <http://www.ontario.ca/environment-and-energy/fire-intensity-codes>
- **Telephone:** Fire Management Headquarters in each MNRF district will provide a recorded telephone message containing the Fire Intensity Codes by fuel group and weather station. The following link will provide contact information for the [Fire Management Headquarters](#) across the fire region.
<http://www.ontario.ca/page/fire-management-offices>

It is the responsibility of industry staff to know the fire intensity codes for the weather stations used by each worksite daily (the closest MNRF weather station to the operation). If the fire intensity code report is not available in a timely manner (e.g., due to technical or other difficulties), industry representatives are responsible for contacting their local Fire Management Headquarters to obtain the fire intensity codes.

Appendix D contains the fire intensity code charts for each of the 5 forest fire fuel groups. Appendix E outlines the procedures to follow if an industrial operator decides to establish their own weather station for the purposes of determining worksite fire intensity codes.

3.5 Determining Operational Modifications

Table 5 lists the operational modifications required for industrial operations based on the risk of the operation, the daily reported fire intensity code for the forest fire fuel group at the worksite and the classification as “trained and capable” or “not trained and capable” operation.

Table 5: Operational Modifications

Fire Risk Category	Fire Intensity Code	Work Modifications Not Trained & Capable	Work Modifications Trained & Capable
Very High Risk Operation	A	SD	SD
	B	SD	RS
	C	SD	SS
	D	P	P
	E	P	P
High Risk Operation	A	SD	RS
	B	SD	SS
	C	SS	P
	D	P	P
	E	P	P
Moderate Risk Operation	A	SD	SS
	B	SS	SS
	C	P	P
	D	P	P
	E	P	P
Low Risk Operation	A, B, C, D & E	P	P

P = Prevention (Normal Operations)

Wildfire prevention is a part of normal operations and at a minimum, the requirements identified in the *Forest Fires Prevention Act* and *Outdoor Fires Regulation* must be followed. These should be identified in the operation’s fire plan if one is required.

SS = Short Shift

Operations are **not** permitted between 1200 and 1900 hrs local daylight savings time. Prevention measures still apply and a dedicated patrol* of the area must be carried out for one hour after operations shut down. Workers conducting the dedicated patrol must immediately report fires that are detected.

RS = Restricted Shift

Operations are **not** permitted between 0800 and 2200 hrs local daylight savings time. Prevention measures still apply and a dedicated patrol* of the area must be carried out for one hour after operations shut down. Workers conducting the dedicated patrol must

immediately report fires that are detected. Water sources close to operations should be identified prior to commencing any operations.

SD = Shutdown

Operations are **not** permitted starting at 0600 hrs local daylight savings time on the first day of shutdown. Operations will remain suspended until conditions change and Prevention, Short Shift or Restricted Shift is indicated. Prevention measures still apply and a dedicated patrol* of the area must be carried out for one hour after operations cease. Workers conducting the dedicated patrol must immediately report fires that are detected. Once this initial patrol is complete, lower risk operations working in the vicinity can offer dedicated fire patrols during the shutdown period.

*Personnel assigned to patrol a worksite are expected to move as much as required to continually assess the entire worksite for fires. If a fire is discovered, they are required to first notify MNRF of the fire and its location and then, if it is safe to do so, try to extinguish the fire.

Appendix A

FIRE PREVENTION AND PREPAREDNESS PLAN EXAMPLE

INDUSTRIAL OPERATIONS FIRE PREVENTION AND PREPAREDNESS PLAN

April 1, 2016 – October 31, 2017

Smith Exploration

This plan has been prepared in accordance with the requirement under section 24 of the Outdoor Fires Regulation.

Company Representative: Fred Smith Date: March 15, 2016

FIRE PREVENTION AND PREPAREDNESS PLAN

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1.0 General

Company: Smith Exploration

Main focus of operations: Mining exploration

General location of operations: Ring of Fire

Operations by risk category:

Very high fire risk

- Stripping of the forest floor and surface vegetation with bulldozers.
- Moving metal skid equipped drill rigs on the site.

High fire risk

- Channel sawing of exposed bedrock areas.

Moderate fire risk

- Pulling the rubber tired fuel trailer with a skidder to the rigs.

Low fire risk

- All other operations on the site were determined to be low risk.

2.0 Fire Prevention Planning

The following measures will be undertaken to ensure compliance with the *Forest Fires Prevention Act*:

- all camps, mines, mills and dumps will have the area surrounding the camp, mine, mill or dump cleared of flammable debris for a distance of at least 30 metres
- all brush, debris, non-merchantable timber and other flammable material resulting from land clearing will be safely disposed of through chipping and dispersal
- any fires started by the operation that are not kept under control will be reported to the MNRF without undue delay
- staff will be instructed on rules around smoking during the fire season and the proper disposal of smoking materials
- all burners, chimneys, engines, incinerators and other spark-emitting outlets will be equipped with an adequate device for arresting sparks

The following measures will be undertaken to ensure compliance with the Outdoor Fires Regulation:

- burning will cease when fire permits are suspended or during restricted fire zone periods
- equipment or machinery being operated within forest areas will be equipped with a serviceable fire extinguisher rated at least 6A80BC
- staff operating chainsaws or brush saws will do so in accordance with section 10 of the regulation
- staff operating equipment or machinery in a forest area during the fire season will do so in accordance with section 11 of the regulation

- any fires detected by the operation during operations that are being mitigated or when patrols are being conducted will be reported to the MNRF without undue delay
- filled back pack pumps will be carried on or be located within 30 metres of every piece of heavy equipment, hot work operation and wherever else required by Section 26 of the regulation
- our operations require additional fire suppression equipment
- the appropriate fuel group will be determined for worksites where very high, high and moderate risk operations are occurring as per section 18 of the regulation
- the fire intensity code for every operating period will be determined by contacting the recorded phone message at the Greenstone FMH as per section 22 of the regulation
- modifications of hours of operation will be made based on section 23 of the regulation

The following are additional measures that will be taken to prevent wildland fires:

If drill rig moves are required during periods of high hazard, mitigation efforts will follow the steps laid out in Section 19.(2) of the regulation to lower the hazard before the rig is moved.

3.0 Fire Preparedness

Our operations are to be considered to be trained and capable.

30 percent of our field staff are trained and proficient to the SP106 level.

Training is delivered by contractors. A record of the trained staff and the dates of training are available at our head office.

Refresher training is done on a 3 year cycle. A tailgate session will be held with staff each spring to ensure that staff onsite know their roles and responsibilities.

In addition to the backpack pumps and equipment cache identified in section 26 of the regulation, we have the following equipment available for fire suppression:

Type of Fire Suppression Equipment

- Every drill rig is connected to a water pump that is operating and under pressure whenever the rig is being operated. An additional 200 feet of hose is available at every drill rig that can be connected to the water supply for fire suppression purposes.
- The skidder used to move the fuel tank and drill rigs is equipped with an on-board 200 gallon water tank with a self-contained pump. The tank will be filled when the fire hazard is high or extreme.

The equipment cache will be checked on a monthly basis to ensure that all equipment is in place and operational. If the equipment cache is used, it will be restored to an operational status prior to the next operational shift.

The wildland fire hazard will be monitored on a daily basis by accessing forecasted weather conditions, fire weather indices and fire intensity codes from the MNRF website. Intensity codes representing the operational areas will be determined and modifications/mitigation will be made as required by the Outdoor Fires Regulation.

If a fire is detected within or near the worksite, MNRF will be notified using satellite phone. Staff will report to MNRF at that time whether they think that they will be successful in putting the fire out. MNRF will be updated on the progress on any fires that are actioned by company staff at 30 minute intervals. The fire will be assessed by the most experienced staff member onsite and suppression will commence using backpack pumps and any other equipment close at hand. If required, the equipment in the fire cache and the skidder with the on-board tank will be brought to the site.

4.0 Communications

The process for field operations to communicate with MNRF staff will be by satellite phone. The process for MNRF to contact field operations will be by calling the satellite phone or by contacting the company office in Thunder Bay and asking them to relay the message.

The company will ensure that all employees working in field operations are aware of the standard fire prevention measures as well as the fire hazard and specific fire prevention processes that may be required. The company will do this by delivering an initial briefing to staff on April 1st. Any new staff assigned to the operation after that date will be provided with a briefing as well. Additionally, as the fire hazard increases, daily tailgate sessions will address any fire prevention concerns.

5.0 Annual Fire Prevention and Preparedness Plan Update

5.1 Annual Operations

This update applies to the 2016 fire season for Smith Exploration in their Ring of Fire operations. The following shows the operations being undertaken by area this season:

Operation	Location	Timeframe	Weather Station Code
Stripping of the site	Basemap 55584, Block 73	Snow melt for 4 weeks	ROF
Drilling	Basemap 55584, Block 73	June 1 – August 15	ROF
Stripping of the site	Basemap 55584, Block 76	July 15 – August 15	ROF
Drilling	Basemap 55584, Block 76	August 15 – October 31	ROF
Rehabilitation	Basemap 55584, Block 73	September 15 to October 31	ROF

5.2 Wildland Fire Reporting

Smith Exploration will suppress wildland fires originating from company operations if it is safe for them to do so. All fires will be reported immediately to the MNRF using the fire reporting number.

Northwest Region – (807) 937-5261 (in place of 310-FIRE)

5.3 Company and MNRF Contacts

The following lists the local MNRF/AFFES contacts:

Name	Position	Location	Phone number
Sam Brown	Fire Management Supervisor	Greenstone	807-854-1600
Catherine White	Fire Operations Supervisor	Greenstone	807-854-1600
	Sector Response Officer*	Greenstone	807-854-1705*
Fire Intensity Code Recording		Greenstone	1-800-339-9938

* designates the main emergency contact in the AFFES program for this company.

The following lists the company contacts:

Name	Position	Location	Phone number
Fred Smith	Owner/operator	Thunder Bay	807-555-1234
Steve Smith*	Foreman – drilling operations	Thunder Bay	807-555-1235
Bob Smith	Alternate foreman – drilling operations	Thunder Bay	807-555-1236
Onsite satellite phone			613-555-1234

* designates the main emergency contact in the company for AFFES.

The following changes should be considered as amendments to the Fire Prevention and Preparedness Plan:

No changes for 2016.

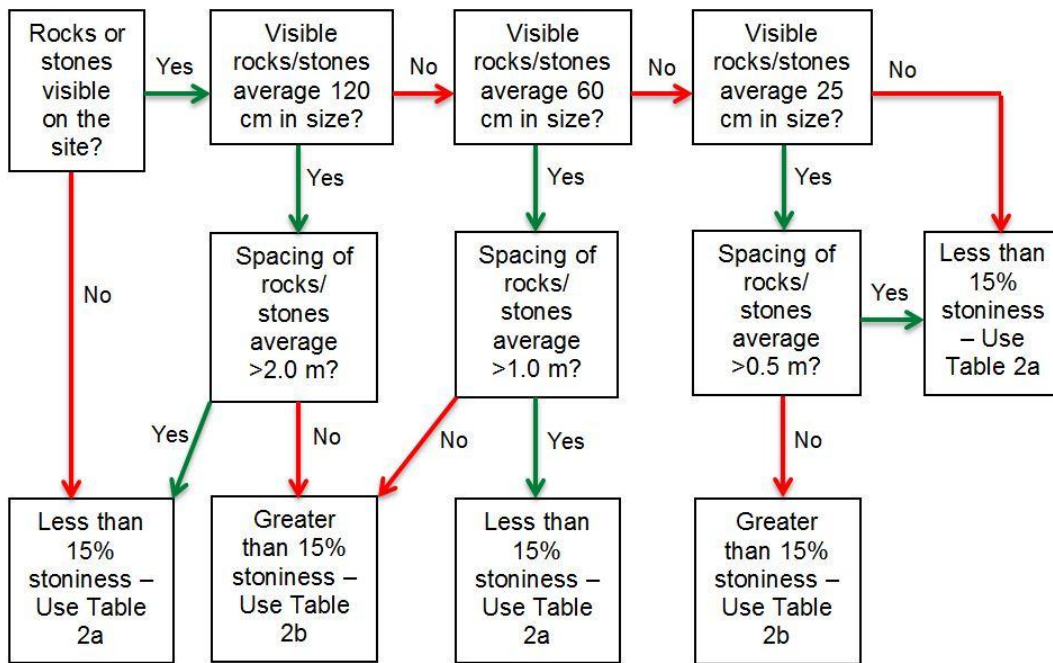
Appendix B

Assessing Stoniness

Within the Industrial Operations Protocol and the regulation, stoniness has been defined as “the presence of stones and boulders, 25 cm or greater, at or just below the surface of the soil.

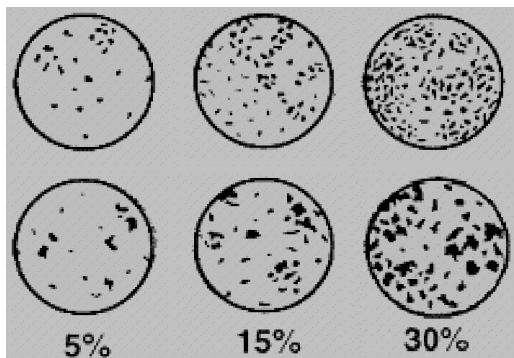
The percentage of stoniness that has been determined to increase the operational risk of industrial activities that bring metal in contact with rocks has been set at 15%.

The following key and visual aids will assist the user in determining site stoniness.



If more than one bedrock outcrops are visible on the site, it should be treated as >15% stoniness.

The diagram provides some additional detail that can be used to help determine the percent stoniness.



Appendix C

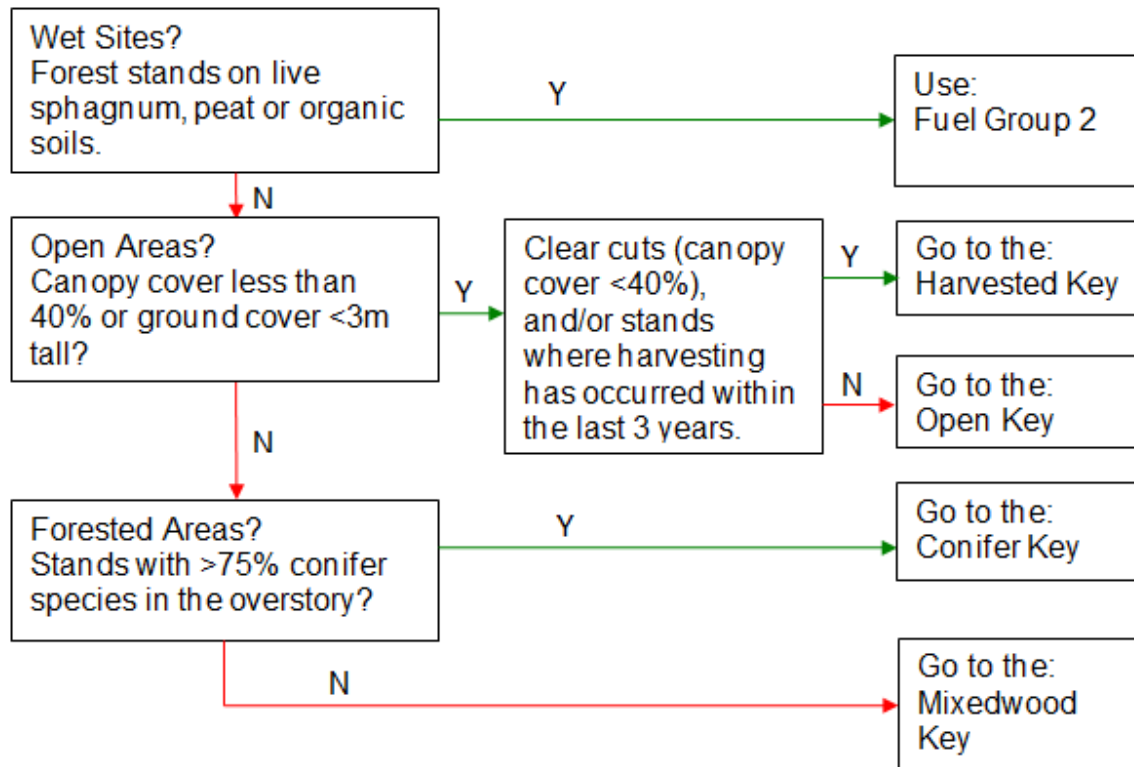
Forest Fire Fuel Group Decision Keys

The overview key directs the user to the proper key for a given type of forest area; open, harvested, conifer or mixedwood.

Following through the decision key, an initial fuel group is identified (numbered 1 – 5). Stand adjustments (+1/ -1) are then applied. Stand adjustments account for local site factors that may increase or decrease the fire hazard of the site. Some depend on summer conditions or "leaf-on", determined annually by the local MNR fire management supervisor in consultation with the regional duty officer.

When determining the fuel group, the amount of forest area or "stand" to be assessed will be representative of the work area to be covered on one day/shift of operation.

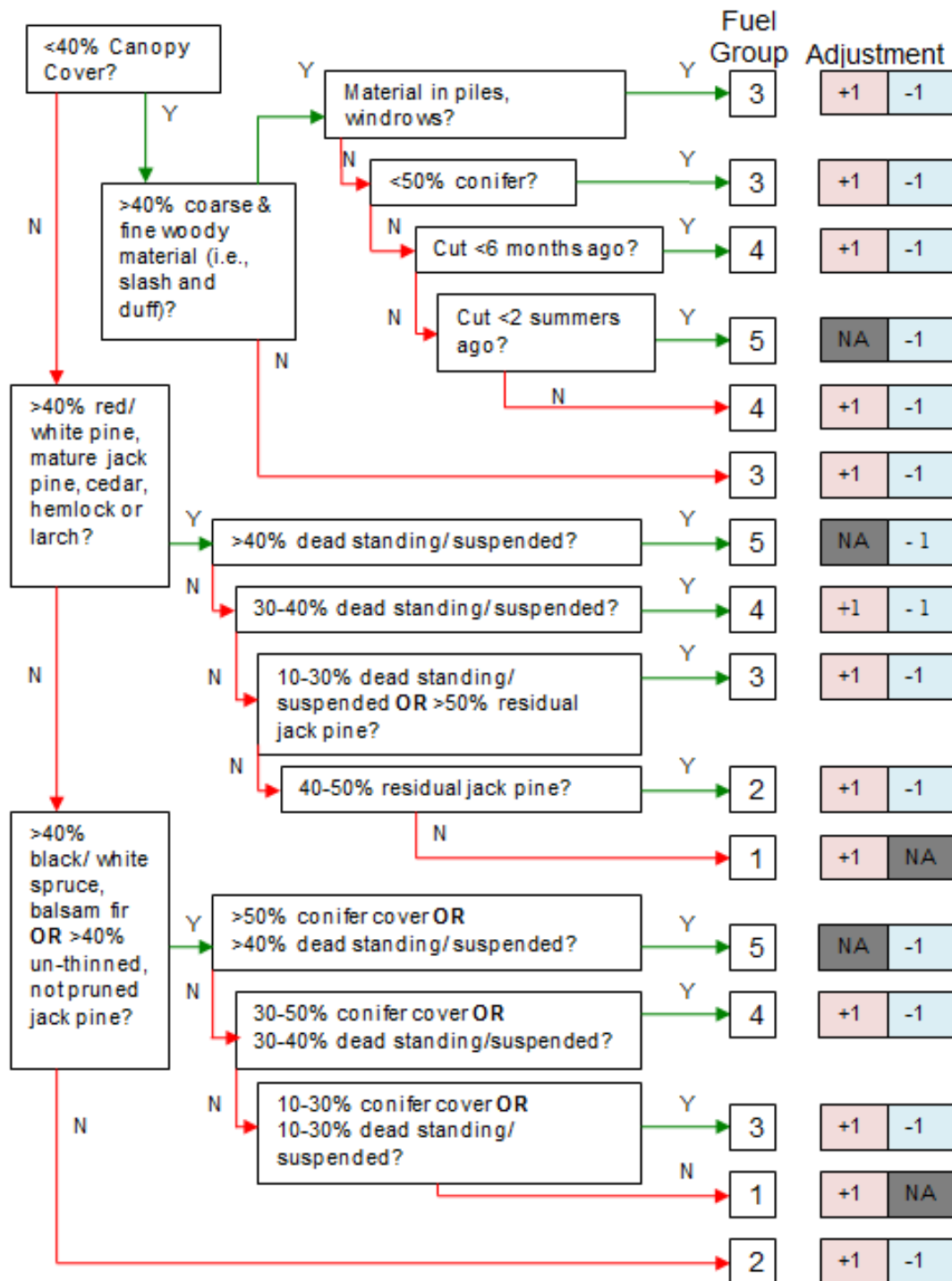
Overview Key



Harvested Key

>40% cover of deciduous herb or shrub layer in leaf-on (-1)

>40% cover live or dead immature conifer (+1)

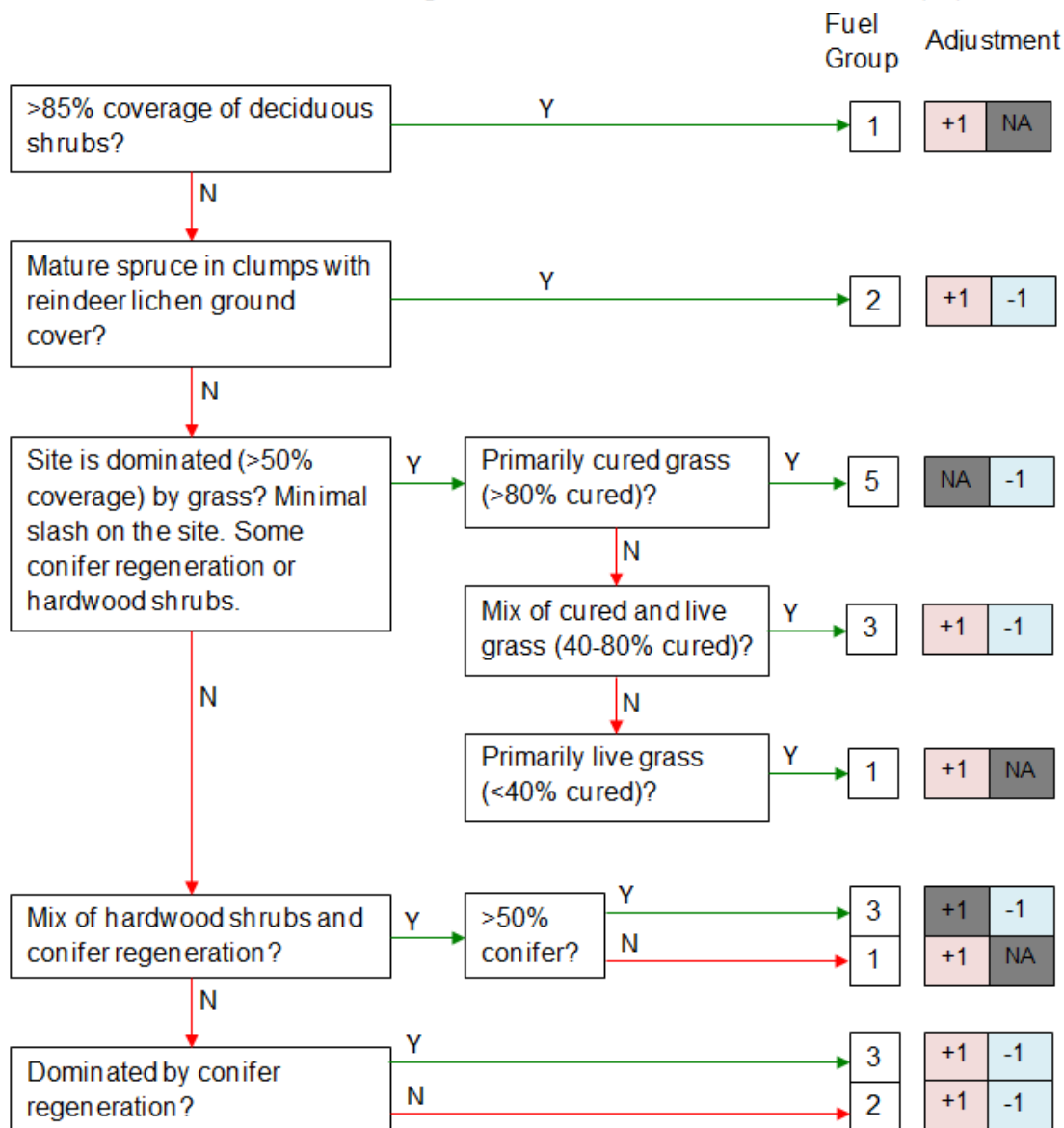


Note: "suspended" means slash (or dead material) not in direct contact with the ground

Open Key

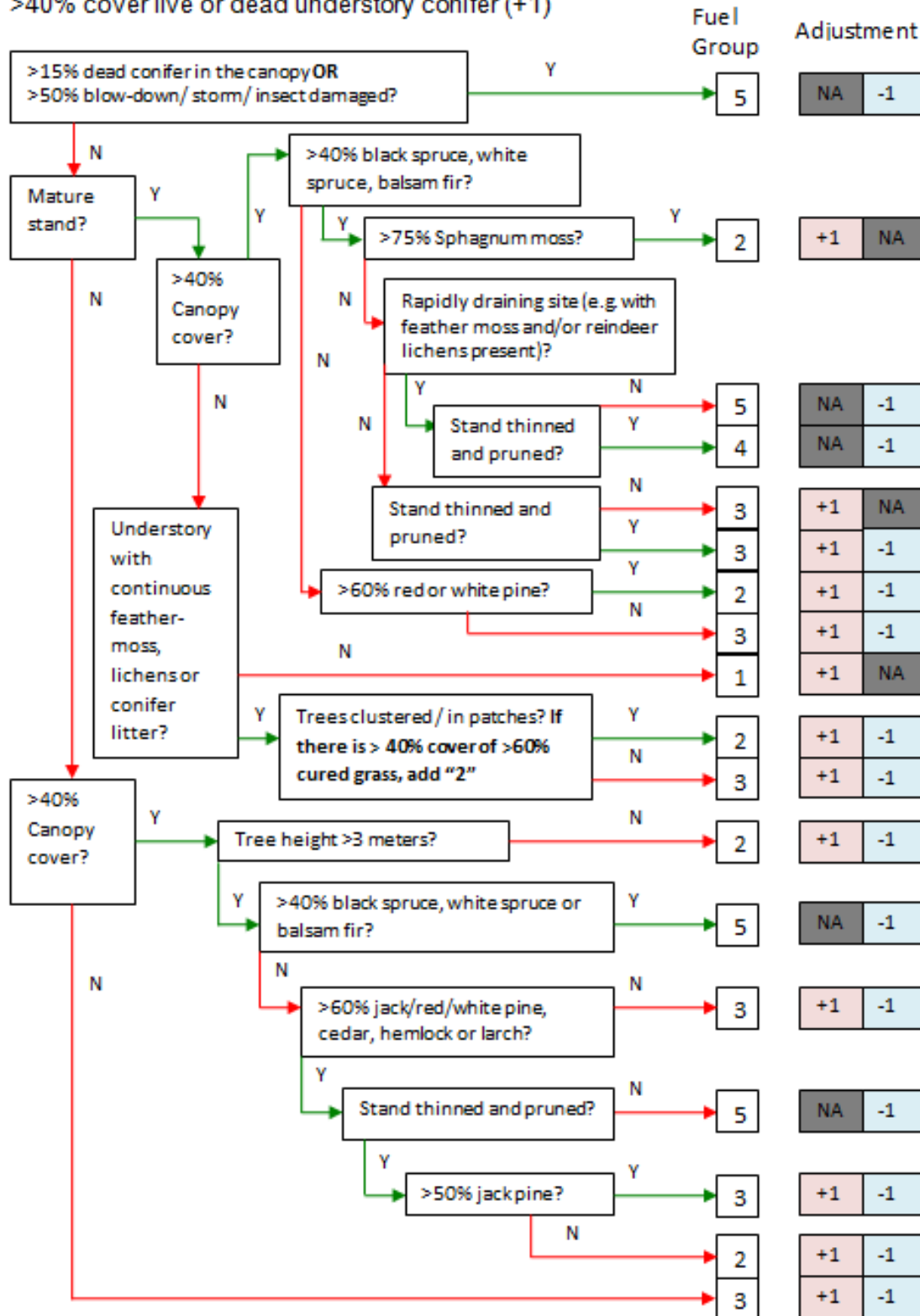
>40% cover of deciduous herb or shrub in leaf-on (-1)

>40% cover of live or dead conifer regeneration **OR** herbicide killed deciduous (+1)



Conifer Key

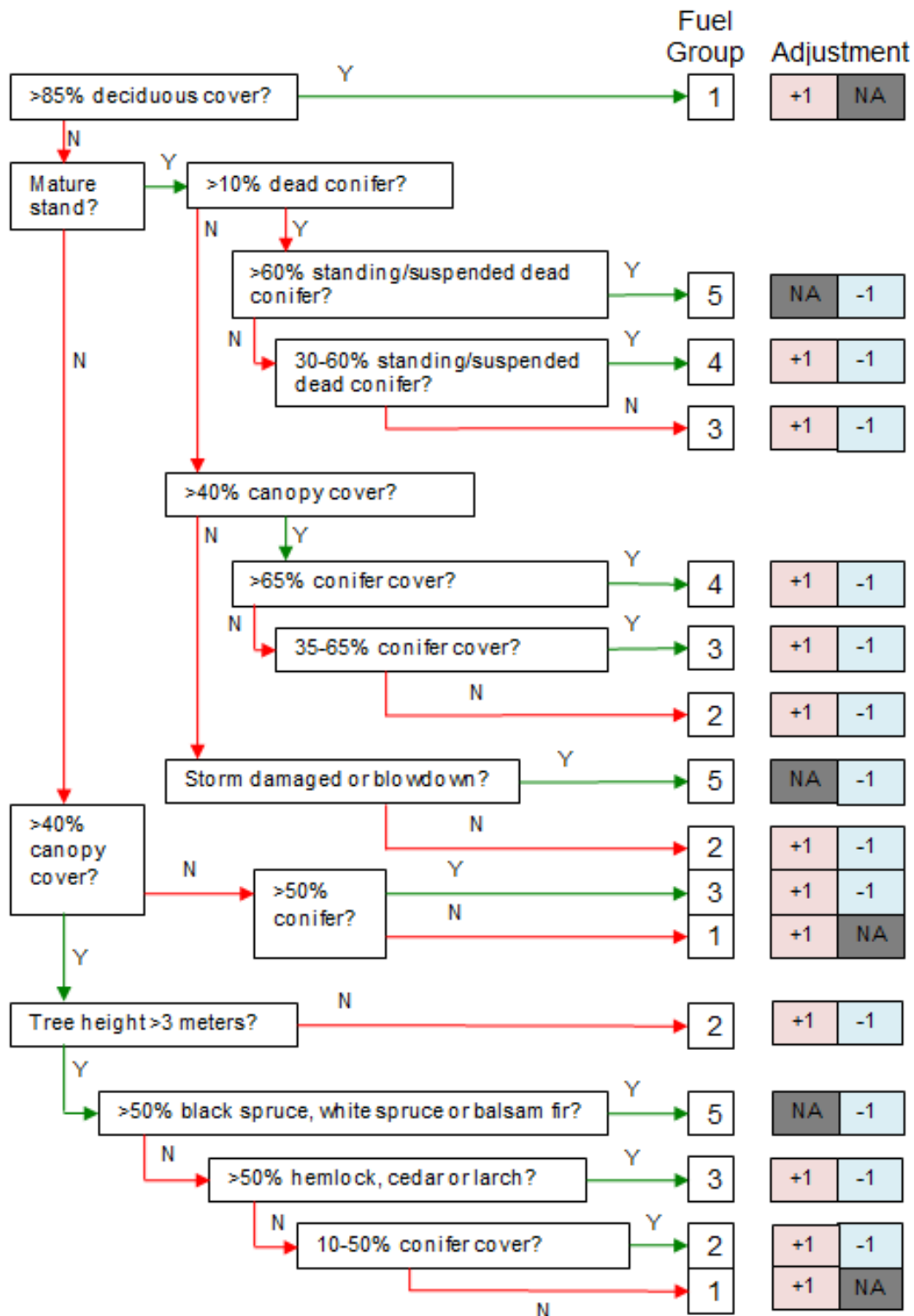
- >40% black spruce overstory in leaf-on OR >40% balsam fir understory in leaf-on OR
- >40% cover of deciduous herb or shrub layer in leaf-on (-1)
- >40% cover live or dead understory conifer (+1)



Mixedwood Key

>40% cover of deciduous herb or shrub layer in leaf-on (-1)

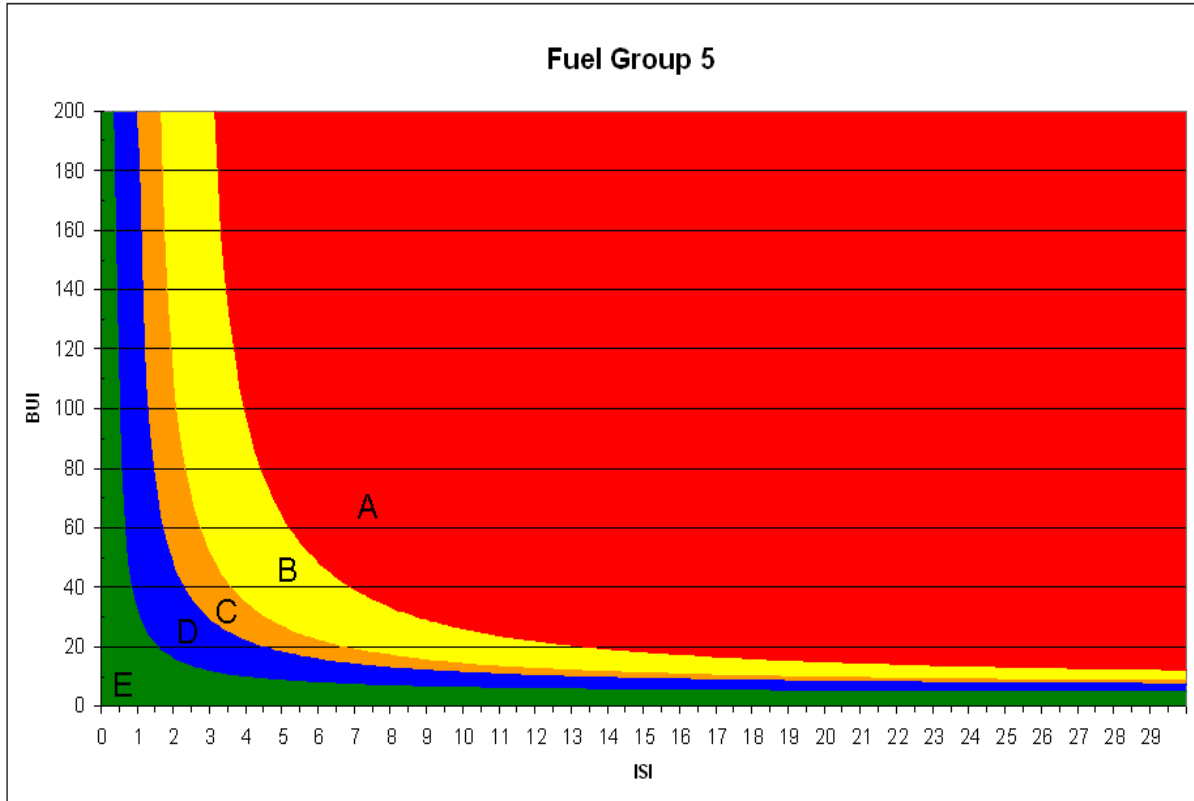
>40% cover live or dead understory conifer (+1)

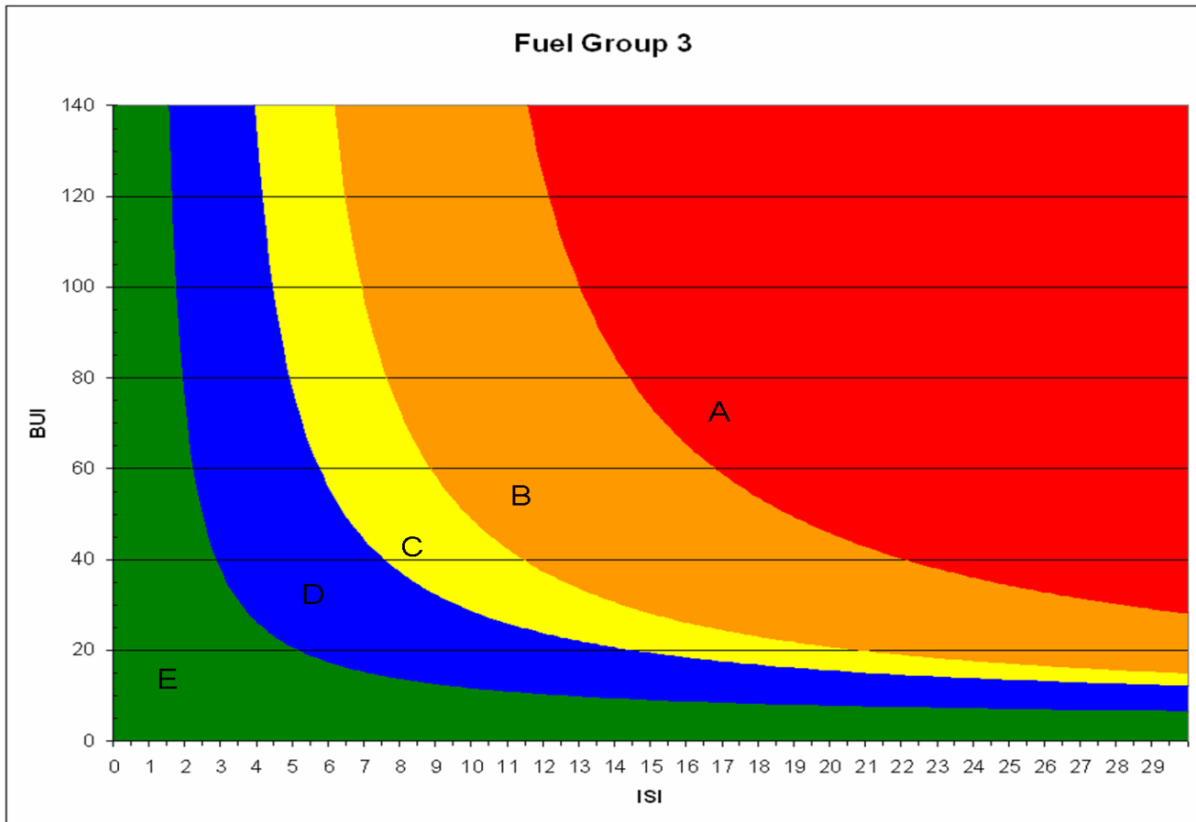
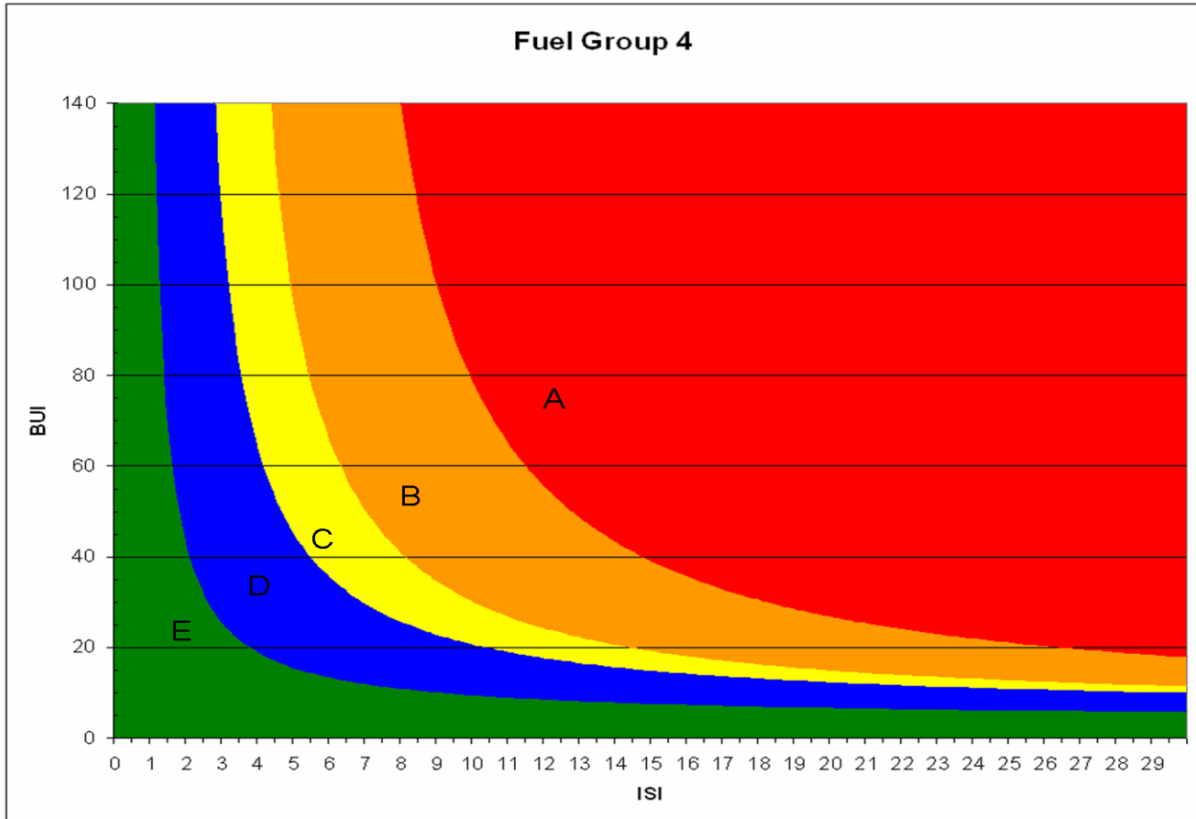


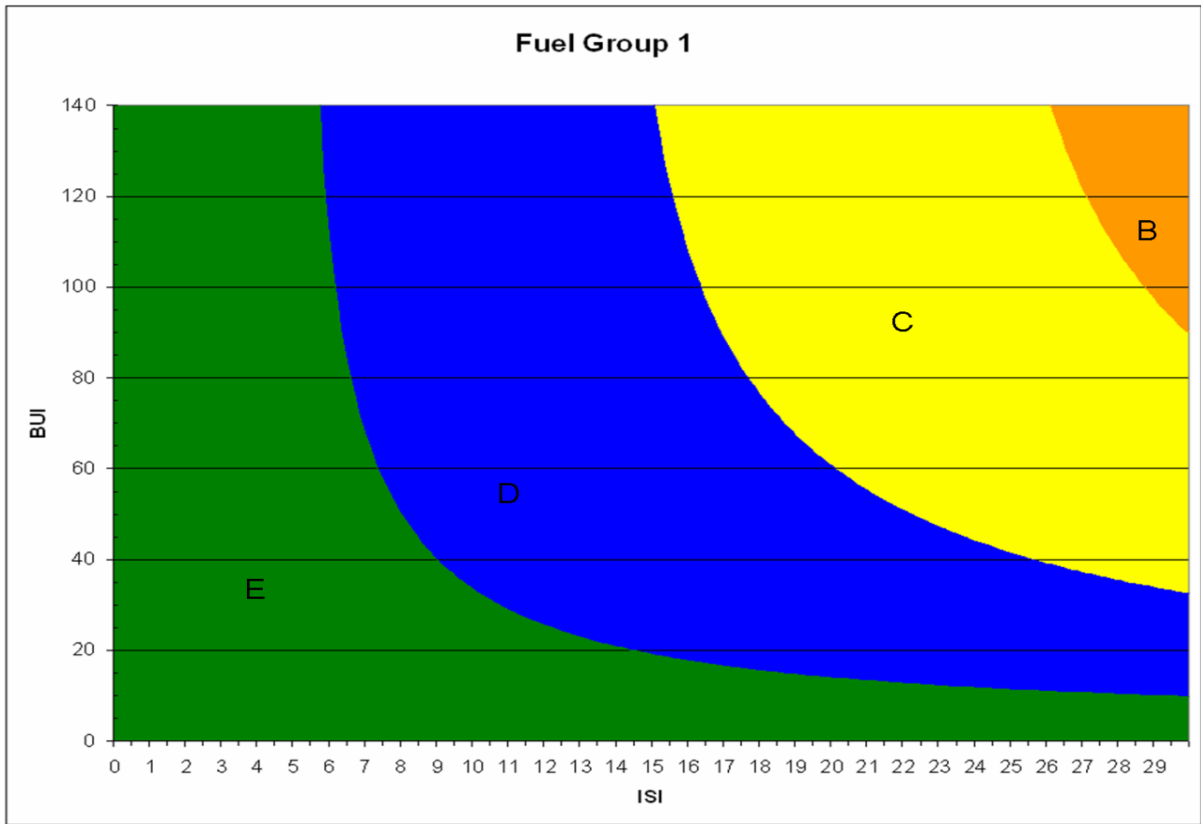
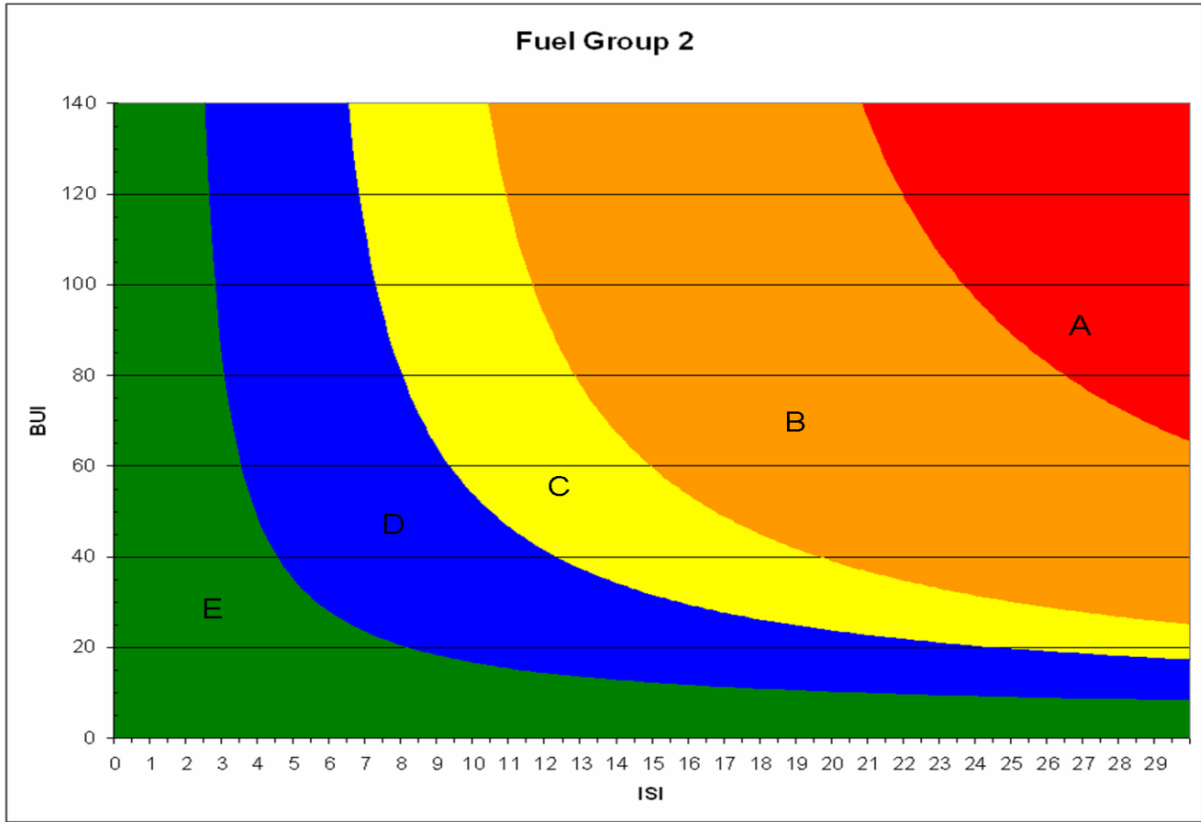
Note: "suspended" means slash (or dead material) not in direct contact with the ground

Appendix D

Fire Intensity Code Charts by Forest Fire Fuel Group







Appendix E

Operating a Weather Station to Support Industrial Fire Prevention

If a company or operator desires weather data and fire intensity codes more specific to their geographic area of operation, they may install a weather station of their own. The station must meet the fire weather station standards as established in "[Weather Guide for the Canadian Forest Fire Danger Rating System](#)", available on the Natural Resources Canada website. Such a weather station can be used to determine the fire weather indices for that area. For administrative purposes, annual records of daily weather observations and fire weather index system calculations must;

- Commence on the 3rd day after the area has become snow free
- Be continuous through the fire season
- Terminate when the operations in the area are concluded or at the end of the fire season
- Be retained for a 5 year period from the date of collection either in electronic or paper format.

The process for determining fire weather indices is found in the "[Tables for the Canadian Forest Fire Weather System](#)", available on the Natural Resources Canada website.

On a daily basis, the user will have to determine the current day's fire weather indices using the weather observations from the weather station taken at 1300 hrs local time. Then, using the Fire Weather Forecast Map produced by MNRF for the following day, the user will have to generate forecast fire weather indices. This map is commonly referred to as the Day 2, P.M. map.

The following outlines the procedure for interpreting the Fire Weather Forecast Map.

Fire Weather Forecast maps are produced every morning and afternoon for most of the fire season. The morning maps include a forecast for that afternoon and the following day while the afternoon maps include maps for the following day and at least 3 days past that. All of the maps are created to provide similar information. This guideline provides information on properly interpreting the data to get the most accurate weather parameters.

Information on the maps includes the 1300 hrs temperature, relative humidity, wind speed and direction and precipitation for the forecast period. Also included on the maps are the positions of high and low pressure systems, the position of high pressure ridges and low pressure troughs and trowals, expected cloud cover or other atmospheric conditions at a given time, the type of precipitation expected, the valid date of the forecast and the date and time the forecast was issued.

For the purposes of determining forecast fire weather indices, the user must first determine their location of interest on the map. They can then follow the sections below to determine the best forecast weather parameters for that location.

Temperature

Temperature is shown on the maps as burgundy dashed lines in 5°C increments. Find the closest temperature line to the point of interest. Make note of the temperature represented by that line. Find the next temperature line and use its represented temperature to determine if the temperature at the point of interest is higher or lower than the temperature of the highest lines. If the point of interest is between two lines representing two different temperatures, estimate the temperature at the point based on its position between the two lines (e.g., a point half way between the 20° and 25° lines should be estimated as 22.5°C). If the point of interest is in an area that is surrounded by one line, use the value that that line represents.

Relative humidity

Relative humidity is shown on the maps as areas of colour, primarily in 10% increments. Determine the colour which represents the relative humidity range at the point of interest. Interpolate the relative humidity value based on the point of interest's position relative to the point of transition to the next humidity range (e.g., if the point of interest is in an area that represents 40-50% humidity but is close to the transition to the area that represents 30-40%, a value close to 40% is warranted. However if it is in a position that is equal distance from the 30-40% range and 50-60%, then a value of 45% is more applicable.

Wind speed

Wind is shown on the map using a number of wind barbs. Wind barbs are arrow like symbols with "flags" at one end. The wind direction at the location of the barb is indicated by the direction the barb points with the wind coming from the flag end. Wind speed is denoted by the flags. Each flag (line) represents 10 kph of wind speed. A half flag represents 5 kph of wind speed. Therefore, a wind barb with 2 ½ flags represents a wind speed of 25 kph. A pennant (triangle) on a wind barb represents a wind speed of 50 kph. Estimate the wind speed at the point of interest based on the wind speeds shown by the wind barbs that surround the point of interest.

Precipitation

Precipitation is shown on the maps as green, dashed lines. The lines outline the areas where precipitation is expected to occur with the amount shown by the green numbers located somewhere on the line. The standard values shown on the maps are 2mm, 5mm, 10mm, and then increasing by 5 mm increments. Determine whether the point of

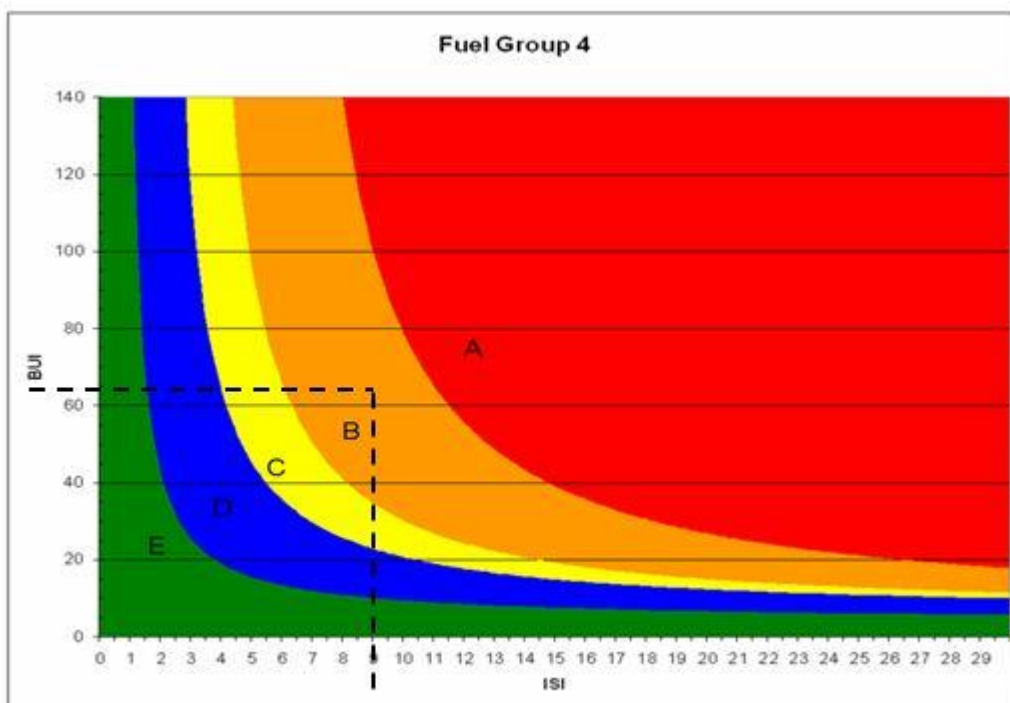
interest is within an area that is expecting precipitation (inside the 2 mm line). Then, use the interpolation principles outlined in the temperature section to make the best estimate of the amount of precipitation that is being forecast for the site. Areas outside of the 2 mm line should use no precipitation in their calculations.

Once the forecast weather parameters have been determined, they can be used to calculate the fire weather index values for the next day.

The forecast CFFWI System values determined by the operator are applied to the fire intensity code charts in Appendix D to determine the applicable fire intensity code.

1. Determine the fuel group using onsite observations and the fuel group decision keys found in Appendix C.
2. Obtain or calculate the appropriate fire weather indices (ISI and BUI) from the applicable weather station to determine the fire intensity code.

e.g., Fuel Group 4, ISI is 9, BUI is 65. Fire Intensity Code B



Fine Fuel Moisture Code Adjustment to Fire Intensity Code

Once the fire intensity code has been determined, the FFMC value for the following day should be reviewed as the FFMC adjustment may be applicable. If the FFMC is between 79.5 and 85.5, the fire intensity code can be reduced by one class, e.g., FIC B to FIC C. This new code should be used in the Operational Modifications table to determine any required work modifications. If the FFMC is below 79.5, the fire intensity code for all

forest fire fuel groups defaults to “E” and operators can continue to conduct normal operations with regular prevention considerations.

In this situation, it is the responsibility of industry staff to determine, on a daily basis, the forecast fire weather index values and the fire intensity codes for the weather station used for the worksite. If the fire weather forecast map is not available in a timely manner (e.g., due to technical or other difficulties), industry representatives are responsible for contacting their local Fire Management Headquarters to obtain the fire weather forecast information required to generate forecast fire weather indices and the fire intensity code(s) for the fuel groups they are operating in.

For additional information on setting up and managing a weather station, the local Fire Management Supervisor can be contacted.

Appendix F

Definitions

Backpack Pump: A flexible or rigid container containing a minimum of 18L of water which is equipped with a serviceable single action hand pump to disperse the water.

Buildup Index (BUI): A numerical rating of the total amount of fuel available for combustion

Continuous Crown Fire: A fire that advances with a well-defined wall of flame extending from the ground surface to above the **crown fuel** layer.

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

Cured Grass: Dead grass.

Duff: The layer of partially and fully decomposed organic materials lying below the litter and immediately above the mineral soil. It corresponds to the fermentation (F) and humus (H) layers of the forest floor. When moss is present, the top of the duff is just below the green portion of the moss.

Fine Fuel Moisture Code (FFMC): A numerical rating of the moisture content of litter and other cured fine fuels such as needles, mosses, twigs of less than 6 millimetres in diameter, indicating the relative ease of ignition and flammability of the fine fuels.

Fire Danger: A general term used to express an assessment of both the fixed and variable factors of the fire environment (namely the forces of: fuels, weather and topography) that determine fire behaviour.

Fire Equipment Cache: A supply of standard firefighting tools and equipment in planned quantities located at a strategic point for the exclusive use of fire suppression.

Fire Extinguisher: A minimum 6A 80BC fire extinguisher.

Fire Hazard: A general term used to describe the potential fire behaviour for a given fuel type, based on physical fuel characteristics such as fuel arrangement, fuel load, condition of herbaceous vegetation and the presence of ladder fuels.

Fire Intensity: The rate of heat energy released per unit time per unit length of fire front, and is expressed in kilowatts per metre (kW/m).

Fire Management Supervisor: The lead fire manager at the local MNR Fire Management Headquarters.

Fire Prevention and Preparedness Plan (Fire Plan): A document developed by a company undertaking industrial operations in a forest area that should contain, but is not limited to:

1. Company and MNRF contacts
2. Type of operations by risk category
3. Fire prevention planning
 - Fire prevention programs and initiatives
 - Fire prevention monitoring
4. Fire preparedness planning
 - Fire suppression training
 - Suppression equipment available
 - Actions to be taken when a fire is detected
 - Communications plan(s)

Fire Season: The period from April 1 to October 31 each year as per section 10 of the *Forest Fires Prevention Act (FFPA)* or as set by the Minister as per Sect. 37 of the *Forest Fires Prevention Act (FFPA)*.

Fire Type: General description of fire behaviour, indicating fire is spreading in the ground, on the surface or in the tree crowns.

Forest Area: Means any forest, woodland, prairie, savanna, shrub land, peatland, agricultural land or grassland, but does not include a cultivated garden or lawn.

Forest Floor: The organic surface component of the soil supporting forest vegetation; the combined duff (if present) and litter layers.

Head Fire: A fire spreading, or set to spread, with the wind (upslope in the absence of wind).

Hot Work: Activities that involve devices that could produce a source of ignition, such as a spark or open flame, such as welding, cutting or grinding

Industrial Operation: Any of the following operations that are carried out in a forest area as part of an industrial activity and not for personal purposes:

1. Harvesting trees and processing trees into log lengths, chips, biofuel or lumber.
2. Clearing land of trees or other vegetation.
3. Operation or use, in a forest area, of machinery with metal parts that, in the normal course of operations, may come into contact with rocks or similar material resulting in the creation of a spark or fire.
4. Hot work.
5. Trenching in areas of forest fuels.
6. The use of explosives in or adjacent to forest fuels.
7. Road construction.

Initial Spread Index (ISI): A numerical rating of the expected rate of fire spread in a forest area based solely on the fine fuel moisture code for the area and the wind speed.

Ladder Fuels: Fuels that provide vertical continuity between the surface and crown fuels in a forest stand thus contributing to the ease of torching and crowning (e.g., tall shrubs, small trees, bark flakes and tree lichens).

Not Trained and Capable Operation: An industrial activity or operation which does not meet the standard for trained and capable as defined in this document.

Leaf-off: The period of the year when leaves have not yet fully emerged, usually during the spring months, or, when leaves on deciduous species are absent (e.g., in autumn or due to pests or disease damage) as determined by the local fire management headquarters.

Leaf-on: The period of the year when leaves have fully emerged and vegetation is lush (usually during the summer months) as determined by the local fire management headquarters.

Litter: The uppermost part of the forest floor consisting of freshly cast or slightly decomposed organic materials (i.e. the L layer). Note Duff.

Mature: For the purpose of fuel group classification, a forest stand that is at a stage of development where harvesting could occur, normally at or past, rotation age.

Operational Risk: The potential of a given operation or activity to ignite a wildland fire, based on the presence of a potential source of ignition (e.g., a spark).

Peat/Organic Soil: A site in which there is organic soil that is commonly saturated with water and consists mainly of mosses, sedges, or other hydrophytic vegetation, extending to a depth of at least 40cm.

Percent Cover: The percentage of the area covered by vegetation or by a particular species (e.g., canopy cover is the percent of space taken up by the canopy if you look directly upwards, grass cover would refer to the percent taken up by grass, as you look straight down).

Pumping Unit: A serviceable water pump not affixed to another machine that is capable of maintaining a minimum pressure of 60 psi when used with a nozzle with a 1/2" opening attached directly to the pump and includes:

- A toolbox, containing nozzles with assorted tip sizes, wyes, stranglers, hose, wrenches, spark plugs, and assorted hand tools (e.g., screwdriver, pliers, etc.)
- a minimum of 20 liters of fuel appropriate to operate the pump
- 1 intake hose that is a minimum of 8 feet long with a foot valve

- one and a half inch fire hoses measuring a minimum of 2400 feet in length

Rate of Spread: The speed at which a fire extends its horizontal dimensions, expressed in terms of distance per unit of time.

Risk: A chance or possibility of danger, loss, injury, or other adverse consequences.

Stoniness: The presence of stones and boulders, 25cm or greater, at or just below the surface of the soil or more than one outcropping of bedrock.

Serviceable: A fire extinguisher is considered serviceable if the maintenance of the portable fire extinguisher(s) meets the requirements of the Ontario Fire Code, Section 6.2.7. For other fire suppression equipment, serviceable means equipment that is known to be in a state of working order and is readily available for use.

Thinned and Pruned: The work area can be considered thinned and pruned if branches, needles, and/or vegetation are absent below a crown base height (CBH) of three meters.

Trained and Capable Operation: An industrial activity or operation which meets the standard identified in this document.

Understory Conifer: Mature or immature conifer trees in the understory that are equal to or greater than half the distance from the ground to the bottom of the forest canopy and provide vertical continuity between the surface and crown fuels in a forest stand.

Water Delivery System: A system consisting of a water supply, a water pump or equivalent means of pressurizing water, the hoses, attachments and tools necessary for the operation and maintenance of the system that is mounted on a machine that can deliver water to any place on a worksite.

Worksite: The part of a forest area in which industrial operations are performed on any given day or shift.

Appendix G

Pertinent Websites

[Weather Guide for the Canadian Forest Fire Danger Rating System](#)

- <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/29152.pdf>

[Tables for the Canadian Forest Fire Weather Index System](#)

- <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/31168.pdf>

[MNR Fire Intensity Code reports](#)

- <http://www.ontario.ca/environment-and-energy/fire-intensity-codes>

[Industrial Operations Protocol](#)

- <http://www.ontario.ca/environment-and-energy/fire-intensity-codes>

[Outdoor Fires Regulation](#)

- <http://www.ontario.ca/laws/regulation/960207>

Appendix H

IOP Flow Chart – this chart has been designed to aid the user in following the steps required by the protocol and Outdoor Fires Regulation.

