



Ministry of
Forests, Lands and
Natural Resource Operations

WILDFIRE MANAGEMENT BRANCH

A Guide to Fuel Hazard Assessment and Abatement in British Columbia



April 2012

Disclaimer

This document contains material to assist a person in identifying values at risk, fire risk categories, fuel hazard for dispersed fuels and piled fuels, and finally the table providing the calculations in determining whether abatement is required. This is in accordance with the *Wildfire Act* and regulation. This document does not contain legal advice, it is provided as guidance.

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Glossary

General Abbreviations, Definitions and Acronyms

For the purposes of this Guideline, the following are defined:

Definition / Acronym	Explanation
Guide	A Guide to Fire Hazard Assessment and Abatement in British Columbia (the title of this document)
DHAAS	Defined Hazard Assessment and Abatement Strategy meaning the procedures in Section 2 of this document that meet the requirements for hazard assessment and abatement as required by section 7 of the Wildfire Act.
Fire hazard	means (a) the risk of fire starting, and (b) the hazard associated with an industrial activity; and (c) if a fire were to start, (i) the volatility of the fire's behaviour, (ii) the difficulty of controlling the fire, and (iii) the potential threat to values at risk;
Fuel hazard	Means the potential fire behaviour, without regard to the state of weather or topography, based on the physical fuel characteristics, including fuel arrangement, fuel load, condition of herbaceous vegetation and the presence of ladder fuel; [section 1, Wildfire Regulation]
Forest land	Includes land that previously supported trees and is not in other use, but does not include land excluded from this definition by regulation; [section 1, Wildfire Act]
Forest Professional	Means a professional forester or a registered forest technologist as defined in section 1 of the <i>Foresters Act</i> , S.B.C. 2003, c. 19, and any amendments thereto.
Grass land	Includes land that previously supported grass and is not in other use, or is in use for the production of forage or is lying fallow, having previously been used for the production of forage, but does not include land excluded from this definition by regulation; [section 1, Wildfire Act]
High risk activity	Means activities as defined in section 1 (1) of the Wildfire Regulation.
Industrial activity	Means activities defined in section 1 (3) of the Wildfire Regulation.

Definition / Acronym	Explanation
Interface	<p>An area inside, or within 2 km of, the boundaries of</p> <ul style="list-style-type: none"> (i) a fire protection district in a regional district; (ii) an improvement district; (iii) a water improvement district; or (iv) a prescribed organization. <p>Items (ii) to (iv) are contained in the definition of “local government” under paragraphs (d) to (f) of section 1 of the Wildfire Act.</p> <p>For the purposes of complying with subsection 11(2)(a) of the Regulation, the British Columbia Fire Risk Map as it relates to hazard abatement, updated from time to time, may be used by persons to determine the relative proximity of their industrial activity to the Interface, however, it is the responsibility of industry to determine the exact proximity of their operations to interface in close adjacency situations.</p>
Non-interface	Means the remaining land which is not included in the interface area defined above.
Prescribed activity	Means activities as defined in section 11 of the Wildfire Regulation.
Qualified holder	Meaning is the same as defined in section 1 of the Wildfire Regulation.
Slash Fuel Types	Means fuel types as defined in the <i>Field Guide to Canadian Fire Behaviour Prediction System</i> .
WMB	Wildfire Management Branch, Ministry of Forests, Lands and Natural Resource Operations

About This Guide

Purpose

This Guide has been created to provide a default procedure for determination of the fire hazard created by the carrying out of an industrial or prescribed activity on forest land and the degree of abatement needed to reduce fire hazard if the hazard has been increased by the activity. The objective of legislation is to ensure that fire hazards are identified and abated in an appropriate time and manner and to a level that ensures fuel hazards do not increase the potential fire behaviour and suppression effort associated with a fire start. It is particularly important to ensure that fires do not threaten communities, critical infrastructure or other significant values.

This Guide is not intended to provide legal advice, nor is it intended to fetter the discretion of the minister or delegated decision-makers in making statutory decisions. It does provide a generalized methodology or default procedure that may be used to estimate fuel abatement thresholds. It is important to note that given the variation in conditions across British Columbia it cannot properly represent all areas, thus modifications may be warranted to reflect regional conditions and specific localized circumstances.

This Guide takes into account different thresholds, extent and timing for interface areas and other areas and is to be used by persons required to conduct fire hazard assessments under Wildfire Regulation [s. 11](#) to determine the fire hazard abatement needed. Qualified holders may also follow this Guide, or alternatively may follow a strategy, procedure, or recommendation developed by a forest professional.

Organization and Format

The Guide is designed to be used on-line or printed. References are cited throughout with [underlined hyperlinks](#) to websites where available.

Section 1 provides the context for a defined hazard assessment and abatement system (DHAAS) within the broader policy framework for preventing wildfires and the damage they may cause. Section 2 of this document is provided for those persons conducting an industrial or prescribed activity that wish to follow a simple, default procedure that meets the requirements for hazard assessment and abatement as required by the Wildfire Act. Persons who are qualified holders of a forest tenure agreement have the option of retaining a forest professional to develop an alternative professionally-designed hazard assessment and abatement system.

Supplemental information regarding the derivation of the British Columbia Fire Risk map and the Fuel Hazard charts in Appendix 1 and 2 that may be useful for persons following the DHAAS, or for forest professionals completing a site assessment or designing a modified or alternate hazard assessment and abatement procedure or strategy is provided in the “Links to Other Information Sources” on page 19.

Updates and Feedback

This Guide will be updated as needed to reflect policy changes, new legislation and periodic review. The latest version will be available from the WMB website:

http://bcwildfire.ca/Industry_Stakeholders/industry/Assessment_Abatement.htm

Questions, suggestions for new content, or corrections should be directed to:

Senior Legislation and Policy Analyst

Wildfire Management Branch.

Ministry of Forests, Lands and Natural Resource Operations,

Section 1: Introduction and Explanation

Introduction

Fire hazard assessments and hazard abatement are key activities in reducing the potential threat of wildfires arising from fuels left on the land base following industrial activities. The objective of legislation is to ensure that fire hazards are identified and that fuel hazards are abated in an appropriate time and manner and to a level that they do not increase the potential fire behaviour and suppression effort associated with a fire start. It is particularly important to ensure that fires do not threaten important values associated with: rural-urban interface such as communities and buildings; critical infrastructure such as transmission infrastructure; or other significant values. This guide provides direction that a person may use to assess whether fuel hazard abatement is required or not.

Professionally Prepared Abatement Assessments and Strategies

Amendments to the Wildfire Regulation allow for a qualified holder, on the recommendation of a forest professional, to deviate from the prescribed intervals for conducting hazard assessments, and to vary the timing, extent and fuel thresholds for hazard abatement. This Guide may assist forest professionals in the practice of fuel management, specifically assessing fire hazards associated with industrial or prescribed activities, and creating hazard abatement strategies for a forest licensee or other stakeholders that have obligations to assess and abate.

The Wildfire Regulation requires that a person provide a copy of a fire hazard assessment to an official upon request. Assessments consider the fire hazard in the context of the significance and proximity of values at risk to prescribe recommendations to mitigate the fire hazard through fuel management. As a standard component of professional practice, a rationale is prepared to support a professionally-designed assessment and abatement strategy or other variance from a DHAAS and the rationale may be used in the determination of due diligence in the event of alleged contravention of abatement requirements.

Note that the responsibility lies with the person that carries out the industrial or prescribed activity to ensure that abatement is carried out following the recommendation stemming from: (1) assessment according to Section 2 of this Guide, (2) a professionally-designed procedure or strategy, or (3) the abatement prescription of a forest professional.

This Guide is provided as guidance only. Considering the variability of conditions and circumstances around the Province, it may not represent best practices for all locations. Every site of an industrial or prescribed activity requires analysis of numerous site specific factors, some of which are not fully captured or discussed within this Guide. The fire risk map, threshold table, and fuel hazard charts set out in Section 2 are intended for guidance purposes only, and do not cover all of the factors that a forest professional may consider. The views expressed in this Guide

are those of the WMB and it is the responsibility of the person carrying out the industrial activity or prescribed activity to meet the legislative requirements in specific circumstances.

This Guide is also intended to assist government officials with their assessment of fire hazards associated with industrial or prescribed activities when they are encountered during routine inspections of activities conducted by persons who are not qualified holders.

Qualified holders may retain a forest professional to develop an assessment strategy or operating procedure for assessment of fire hazard at the site(s) of their industrial or prescribed activity within their operating area(s). A localized strategy or procedure would identify and consider the main elements including fuel types and loading, ignition probability, spread potential, and the proximity of interface and other values, as well as those conditions and circumstances specific to the operating area that may increase or decrease risk and the abatement effort undertaken.

WMB staff are committed to working collaboratively with forest professionals, qualified holders, and other stakeholders to provide further guidance or clarification regarding factors that might be considered in a fire hazard assessment and/or abatement recommendation.

The Legislation

It is a legislative requirement that the person carrying out the industrial activity or prescribed activity assesses and abates fire hazards as necessary. When an assessment identifies that a fire hazard is present, abatement must take place within a time frame, and to a level specified by the assessment.

The [Wildfire Act](#) is the governing legislation in British Columbia created specifically for wildfire protection. The Act stipulates that hazard assessments and abatement must be carried out. [Section 7](#) of the *Wildfire Act* requires a person conducting an industrial activity or a prescribed activity on forest or grass land or within one kilometre of forest land or grass land to conduct fire hazard assessments and abate as needed or prescribed.

The [Wildfire Regulation](#) draws its authority from the *Wildfire Act* and implements and interprets the *Wildfire Act*. The *Wildfire Act* and Regulation are intended to be results-based and incorporate the concept of professional reliance.

[Section 11](#) and [section 12](#) of the Wildfire Regulation sets out the prescribed activities and the circumstances where fire hazards created by an industrial or prescribed activity must be abated. These sections also define the time limits and abatement levels that must be followed for both interface and non-interface areas. Interface areas are required to be assessed in shorter time periods than that of the non-interface areas, because of the higher values at risk (see Map on page 13 and interactive map: [British Columbia Fire Risk Map as it relates to hazard abatement](#)). Time limits to abate fire hazards for interface areas are also shorter, to recognize the higher threat to human life, dwellings and infrastructure than in non-interface areas.

Who can carry out this work?

Hazard Assessment

Conducting a fire hazard assessment and the development of a fire hazard abatement strategy falls under the scope of practice of a professional (see definition) as part of fuel management work. A professional can also prepare, review, amend and create hazard abatement strategies in accordance with “professional document” as defined in the [Foresters Act](#). Qualified holders may retain a forest professional to develop an assessment strategy or operating procedure for assessment of fire hazard at the site(s) of their industrial or prescribed activity within their operating area(s) or they may also use this guide.

For persons who are not forest professionals or qualified holders, Section 2 of this Guide provides a default assessment process and identifies when fuel hazard abatement is to be completed. Retaining a forest professional to recommend or oversee hazard abatement would provide further due diligence.

Hazard Abatement

Fuel hazard abatement must be done by the person that carries out an industrial or prescribed activity that creates a fuel hazard. This guide identifies a default process for the determination of when abatement is required.

It is recommended that in areas where it can be anticipated that fuel hazard abatement will be required, that an abatement plan be determined prior to harvest so that post harvesting debris can be managed to accommodate the most efficient disposal option. Disposal options can include burning, but non burning options such as biofibre utilization to maximize carbon offsets, or biofuel utilization to reduce smoke emissions should be considered, where appropriate.

The Benefits to Abating Fire Hazards

Abating the fire hazard helps to protect values at risk. Fuel management can have a positive effect on fuel characteristics and as a result, will mitigate the risks and minimize wildfire suppression costs and losses, both at the site of the industrial or prescribed activity and in the surrounding vicinity.

Further, silvicultural benefits accrue from the removal of piles and accumulations thereby making valuable growing sites available.

The Wildfire Management Branch regards all stakeholders on the land base as responsible partners. When industrial or prescribed activities are undertaken it is expected that due diligence will be applied to ensure that the activity has not increased the fire hazard, and if it has, the hazard is abated to an acceptable level within an identified time period.

Fire Hazard Assessments

Assessing fire hazard is the exercise of analysing the ignition potential and predictable fire behaviour based on fuel hazards (i.e. physical fuel characteristics) and site-specific and probable weather conditions. It includes a consideration of the risk of a fire starting, the difficulty of controlling the fire and the potential impact on identified values.

Fuel hazards are defined as the potential fire behaviour, without regard to the state of weather or topography, based on the physical fuel characteristics including fuel arrangement, fuel load, condition of herbaceous vegetation and the presence of ladder fuel; ([section 1](#), Wildfire Regulation). A person is required to abate the fire hazard created by the carrying out of an industrial or prescribed activity on forest land if the hazard has been created or increased by the activity.

Carry out the hazard assessment considering the factors set out in this Guide or other factors identified by a forest professional. If using Section 2 of this Guide to conduct hazard assessment, follow the steps noted below and calculate whether fuel hazard abatement should be carried out. Although in some cases the table may show that fuel abatement is not a requirement, a person may need to consider other factors such as the proximity to other values at risk, before a decision is made whether or not to abate.

Fire Hazard Abatement

Fire hazard abatement includes activities carried out to reduce the ignition potential or the fire behaviour by reducing the fuel hazard after an industrial activity or prescribed activity has taken place.

A person who conducts an industrial activity must ensure that any industrial or prescribed activity does not increase the risk of a fire starting on the site, and if a fire were to start, would not increase the fire behaviour or the fire suppression requirements associated with the fire. This can often be accomplished through fuel hazard reduction. Qualified holders may rely on a forest professional to incorporate into a strategy, procedure or hazard assessment the levels of fuel abatement or other measures necessary to reduce the fire hazard below critical threshold levels.

WMB recognizes that in some timber harvesting circumstances, it will be impracticable to reduce fuel loads sufficiently so that potential fire behaviour is not increased relative to pre-harvest conditions, and therefore expects that fuel loads will be reduced or minimized either: to the extent practicable; to the fuel thresholds set out in the fire risk table; or, in the case of a qualified holder, to levels specified by a forest professional in consideration of the relevant factors contributing to fire hazard and abatement success. Where abatement measures are not practicable and have not been specified by a forest professional, a person may have to seek an exemption from the local fire centre under [sections 25](#) or [26](#) of the Wildfire Regulation.

SECTION 2:

Determining Whether to Abate

By following the DHAAS process noted below, a person can determine whether or not a fire hazard needs to be abated. A fire hazard that needs to be abated is the result of any industrial or prescribed activity that increases the risk of a fire starting on the site and if a fire were to start, increases the fire behaviour or the fire suppression requirements associated with the fire. It is particularly important to ensure that fuel hazards do not threaten communities, critical infrastructure or other significant values by contributing to volatile fire behaviour and control difficulty. It is not WMB's intention to prescribe all of the elements that a professional must consider during fuel hazard assessments or abatement activities; however this Guide will discuss the three main elements: fire risk; proximity to interface; and, fuel loading and arrangement.

While broad scale mapping provides a general outline of fire risks in relation to urban interface, it does not take local dispersed values into account and these should also be assessed. Assessment of threat to values such as public and private infrastructure, sensitive community watersheds, identified critical wildlife habitat, and developed recreation areas may also be required.

Conversely, local topographic features and their modifying effect on fire spread and direction may also be considered as factors that reduce potential wildfire impacts. Other considerations for non abatement of fuels may include no or highly limited access and/or low ignition probability due to constant wet conditions (e.g. coastal hyper-maritime and other very wet areas).

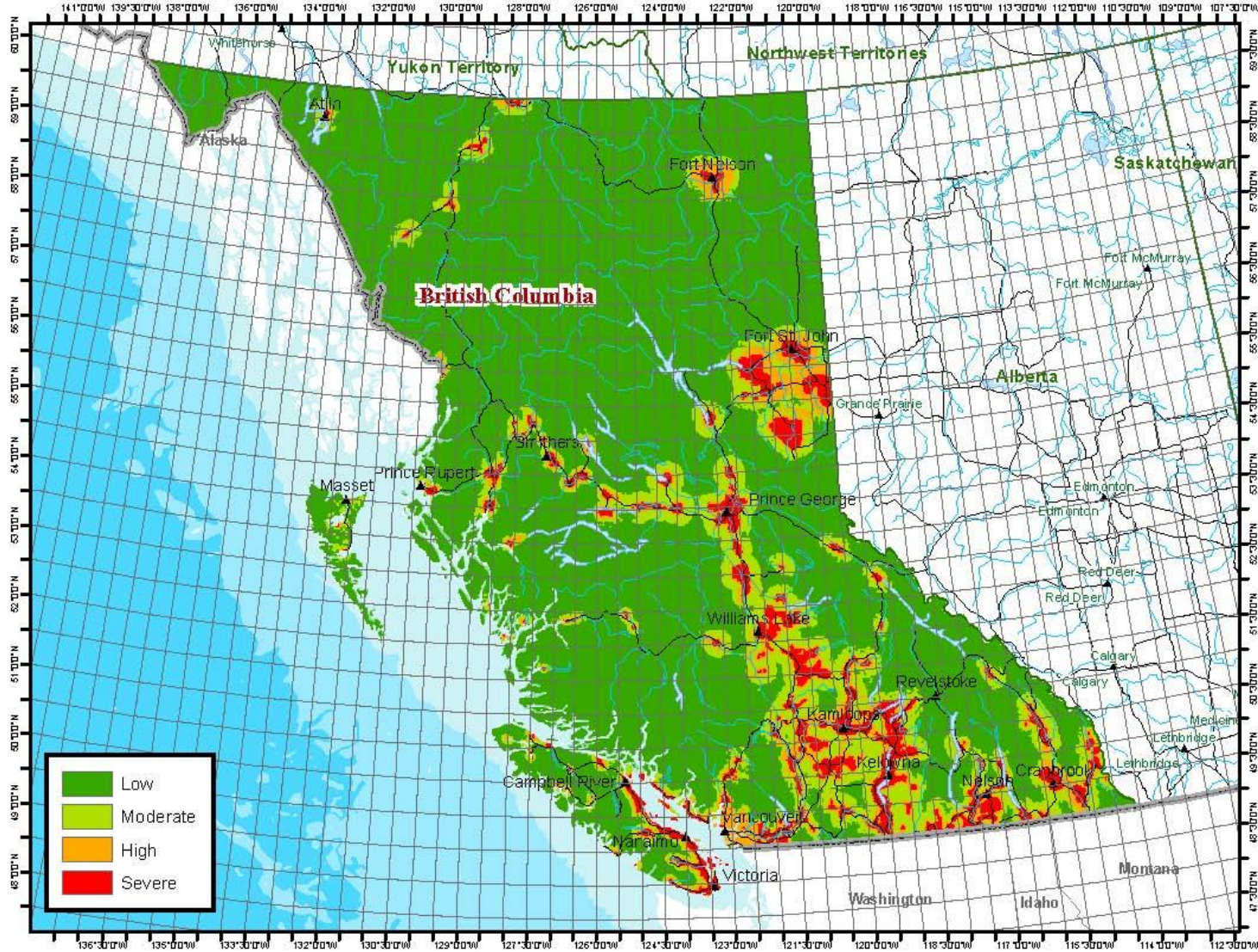
1. STEP 1: DETERMINE THE LOCATION OF THE POTENTIAL FIRE HAZARD

Determine the location of the potential fire hazard on the British Columbia Fire Risk Map below. Use the electronic version found on the BC Wildfire website to zoom in for greater clarity: [British Columbia Fire Risk Map as it relates to hazard abatement](#).

Note that there are two versions of the map available on the website; one using Google Earth (note: Google Earth has to be downloaded before using this version), and the other is a webpage that does not require Google Earth.

Map 1 – [British Columbia Fire Risk Map as it relates to hazard abatement](#)

This map shows the fire risk in relation to distance to interface values. The map is also available on the BC Wildfire Internet site for use in determining the location of the fire hazard as it relates to interface areas.



The colour coding is a combination of interface and fire risk, expressed in four different classes: low, moderate, high and severe.

A person may rely on this map for relative compliance purposes, but where refinement is desired due to close proximity to boundaries, the person may wish to check with the local government regarding municipal or fire protection area boundaries for further clarification.

This map is available on the BC Wildfire website, found [here](#):

Once the potential fire hazard at the location of the site of the industrial or prescribed activity has been identified, go to Step 2.

2. STEP 2: DETERMINE THE FUEL HAZARD RATING

A. Using the fuel hazard charts found in either:

Appendix 1 – Chart 1: Fuel Hazard Chart for dispersed fuels only (Page 17), or
Appendix 2 - Chart 2: Fuel Hazard Chart for piled fuels ONLY

B. Determining the fuel factor number:

1. Select appropriate dominant woody species using the four tables provided;
2. Select type and amount of debris;
 - i. For scattered debris, select the appropriate tonnes per hectare of debris using an average of tons per hectare for relatively uniform areas, or, stratified sampling for highly variable areas;
 - ii. For Piled Debris: determine the number of piles per hectare;
3. Select appropriate slope as a percentage;
 - i. For uniform slopes use an average slope;
 - ii. For highly variable areas with greater than 30% of the area in variance, stratify the area and use appropriate average slopes for stratified sites.
4. Select appropriate aspect (i.e. north, south, east or west);
 - i. For uniform sites use an average aspect;
 - ii. For highly variable areas with greater than 30% of the area in variance, stratify the area and use appropriate average aspects for stratified sites.

Note: Mixed wood slash and piles are defined as containing 50% volume or greater of hardwood species such as poplar (aspen), birch, cottonwood or maple

C. Once the table provides the fuel factor number based on all of the above, go to Step 3.

NOTE FOR CHART 1 - DISPERSED FUELS ONLY:

Fine fuels (<7 cm in diameter or thickness) are the fuels that contribute the most to rapid fire spread. Since it may not be practical to separate dispersed fuels by size, hazard abatement of dispersed fuels will likely involve larger fuels as well. The objective will be to reduce dispersed fuels to levels below those noted in the tables. The most accurate way to determine

fuel load is using fuel sampling mensuration methods ([FRDA 001 Handbook](#)), however, a forest professional may wish to use an alternative approach.

Alternatively, slash photo guides may be applied to select the representative fuel load for the dominant slash species on site. Where there is no break in the fuel continuity **then Chart 1 (Appendix A) is the default**. For areas where different harvesting methods are used, (combinations of some dispersed and some piled within the same area) then areas of dispersed could use Chart 1 and **areas of piled debris would use Chart 2 (Appendix 2)**, treating each type of debris separately.

To determine the dominant woody species utilize the greatest estimated amount of volume of slash for a given species for the cutblock. For cutblocks with significant variability, the block can be stratified according to the process established by a forest professional.

Considerations for non abatement of dispersed fuels may include no or highly limited access and/or low ignition probability due to constant wet conditions (e.g. coastal hyper-maritime and other very wet areas). In all cases, the potential for fire spread to adjacent areas should be considered and documented by a forest professional in a hazard abatement strategy when determining the level and timing of abatement. Where abatement measures have not been specified by a forest professional, a person may seek an exemption from the local fire centre under sections [25](#) or [26](#) of the Regulation.

NOTE FOR CHART 2- PILED DEBRIS ONLY:

Chart 2 is for debris piled fuels only. Debris piles are considered to be piled material that is greater or equal to 5m³ in terms of the air volume occupied by the pile. In general, all roadside and landing piles should be abated because roadside piles are often a higher hazard due to the potential for human caused ignitions.

Considerations for non abatement of roadside and landing piles may include no or highly limited access and/or low ignition probability due to constant wet conditions (e.g. coastal hyper-maritime and other very wet areas). In all cases, the potential for fire spread to adjacent areas should be considered and documented by a forest professional in a hazard abatement strategy when determining the level and timing of abatement. Where abatement measures have not been specified by a forest professional, a person may seek an exemption from the local fire centre under sections [25](#) or [26](#) of the Regulation.

The number of piles created will be considered as debris piled fuels for the purposes of Chart 2. For determining the numbers of piles per hectare in an area which has been windrowed, calculate the volume of the windrow and divide by 5m³ (minimum pile size is considered 5m³).

3. STEP 3: CONSULT HAZARD ABATEMENT TABLE BELOW:

1. Values at Risk are determined by the location of fuel hazard found in the Risk Map in Step 1.

Risk Map Class	Fuel Hazard Threshold (Charts 1 or 2)
Low	100
Moderate	70
High	40
Severe	25

2. Fuel Hazard Threshold is found by determining the corresponding fuel factor from Step 2.
3. If the number from the Charts (Step 2) is higher than the number displayed on this Table, then abatement is required in accordance with the legislation.
4. Fuel should be abated to less than the number provided above in the table.

APPENDIX 1 –

CHART 1: FUEL HAZARD CHART FOR DISPERSED FUELS ONLY

NOTE: Interpolation of values for intermediate slopes, slash loadings, aspects and fuel types can be conducted by a forest professional

Dominant Woody Species - Lodgepole, Ponderosa or Jack pine (S - 1 Slash / Fuel Type)

Tonnes/Ha	1-5 t/ha				6-19 t/ha				20-49 t/ha				50-99+ t/ha			
Slope (%)	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South
0-15	23	23	25	30	30	30	33	35	40	40	43	50	63	63	68	80
16-30	28	30	35	40	35	40	45	50	48	55	63	70	75	85	100	110
31-45	30	40	55	63	40	50	70	80	55	70	98	113	85	110	155	175
46%+	48	55	78	90	60	70	100	115	83	100	135	160	130	155	213	250

Dominant Woody Species – Spruce and Balsam Fir or Larch (S - 2 Slash / Fuel Type)

Tonnes/Ha	1-5 t/ha				6-19 t/ha				20-49 t/ha				50-99 t/ha			
Slope (%)	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South
0-15	18	18	20	25	23	23	30	35	28	28	35	43	40	40	50	60
16-30	20	25	30	35	30	35	40	45	35	43	50	58	50	50	70	80
31-45	23	33	43	50	33	43	58	68	40	53	73	85	55	75	100	120
46%+	30	43	60	70	40	58	80	95	50	73	100	118	70	100	140	165

Dominant Woody Species – Cedar / Hemlock / Douglas Fir (S - 3 Slash / Fuel Type)

Tonnes/Ha	1-5 t/ha				6-19 t/ha				20-49 t/ha				50-99 t/ha			
Slope (%)	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South
0-15	35	35	43	58	40	40	50	65	50	50	63	83	60	60	75	100
16-30	35	50	58	75	40	55	65	85	50	70	83	108	60	85	100	130
31-45	35	50	80	130	40	55	93	140	50	70	118	188	60	85	140	225
46%+	35	58	113	158	40	65	130	180	50	83	163	225	60	100	195	270

Dominant Woody Species – Mixedwood / Broadleaf Species (S - Mw Slash / Fuel Type)

Tonnes/Ha	1-5 t/ha				6-19 t/ha				20-49 t/ha				50-99 t/ha			
Slope (%)	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South
0-15	5	5	8	10	8	8	10	13	10	10	13	15	15	15	20	25
16-30	5	8	10	13	8	8	13	18	10	15	18	23	15	20	28	33
31-45	5	8	13	18	8	13	13	25	10	15	25	35	15	25	38	50
46%+	8	10	18	23	10	15	28	33	15	20	35	45	20	30	55	68

APPENDIX 2

CHART 2: FUEL HAZARD CHART FOR DEBRIS PILED FUELS

Dominant Woody Species - Lodgepole, Ponderosa or Jack pine (S - 1 Slash / Fuel Type)

Dominant Woody Species – Spruce and Balsam Fir or Larch (S - 2 Slash / Fuel Type)

Dominant Woody Species – Cedar / Hemlock / Douglas Fir (S - 3 Slash / Fuel Type)

	1-5 Piles/ha				6-10 Piles/ha				11-24 Piles/ha				25+ Piles/ha			
Slope (%)	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South
0-15	18	18	21	26	22	22	26	32	28	28	33	41	38	38	45	56
16-30	19	25	29	35	25	30	35	42	31	39	46	55	43	51	63	75
31-45	19	29	42	57	25	35	52	67	32	45	67	90	44	63	92	121
46%+	26	36	59	74	33	45	51	91	43	60	93	117	61	83	128	160

Piled S-Mw - Mixed Wood and Broadleaf Fuels

	1-5 Piles/ha				6-10 Piles/ha				11-24 Piles/ha				25+ Piles/ha			
Slope (%)	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South	North	East	West / Flat	South
0-15	4	4	6	7	6	6	7	9	7	7	9	11	11	11	14	18
16-30	4	6	7	9	6	6	9	13	7	11	13	16	9	14	20	23
31-45	4	6	9	13	6	9	9	18	7	11	18	25	11	18	27	35
46%+	6	7	13	16	7	11	20	23	11	14	25	32	14	21	39	48

Links to Other Information Sources

Countryman, 1966, Pyne *et al*, 1996.

Lawson, B.D. and O.B. Armitage. Canadian Forest Service, Northern Forestry Centre, 2008, Natural Resources Canada, [Weather Guide to the Canadian Forest Fire Danger Rating System](#)

McCrae, D.J., “[Prescribed Burning of Boreal Mixedwood Slash in the Ontario Clay Belt Region.](#)” Great Lakes Forest Research Centre, Canadian Forestry Service, Government of Canada, 1985.

National Wildfire Coordinating Group (NWCG), [PMS 475 – Basic Land Navigation – June 2007 – Chapter 2 – “Estimating Slope”](#) [Note this is a US publication and measurements are in feet and inches]

Natural Resources Canada, Canadian Forestry Service, 1984, [Canadian Forest Fire Danger Rating System](#)

Trowbridge, R, B. Hawkes, A. Macadam and J. Parminter, “[Field Handbook for Prescribed Fire Assessments in British Columbia: Logging Slash Fuels](#)”, April 1989 Reprint.

[UBC, Faculty of Forestry](#), 2005, *Forestry Handbook for British Columbia*, 5th ed., published by the Forestry Undergraduate Society.

[UBC Press](#), 1997, *Field Guide to the Canadian Forest Fire Behaviour Prediction (FPB) System* Canadian Forest Service, Forestry Canada Fire Danger Group Information Report ST-X-3., 1997

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