ALASKA FIELD GUIDE FOR CFFDRS FIRE BEHAVIOR PREDICTION (FBP) SYSTEM

March 2, 2014

ABSTRACT

Based on the Canadian Forest Fire Danger Rating System (CFFDRS) component parts, the Fire Weather Index (FWI) System and the Fire Behavior Prediction (FBP) System

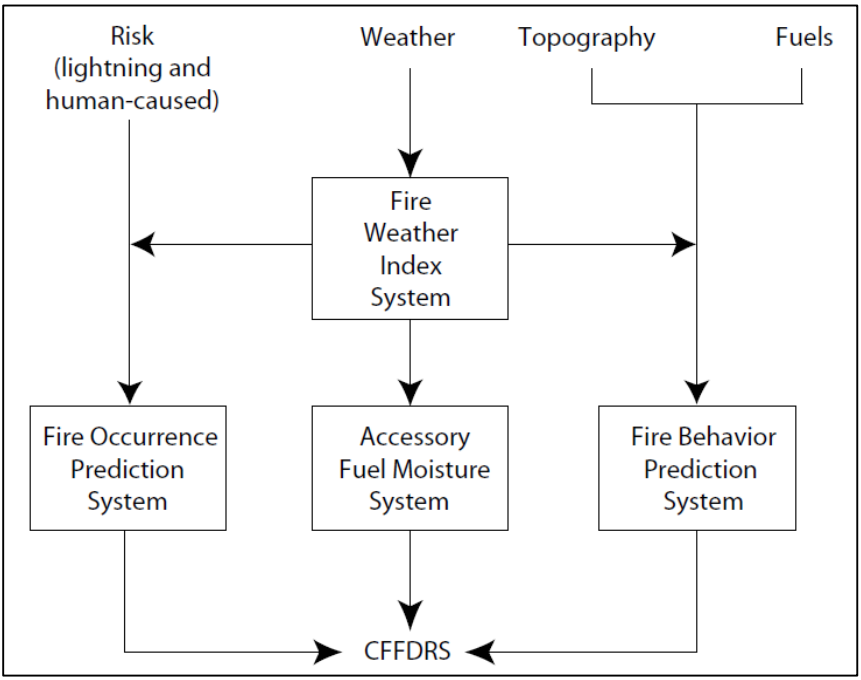
Contents

1 CFFDRS System Overview 2
1.1 Key References & Training Resources 3
2 Fire Behavior Prediction (FBP) System 5
2.1 Background 5
2.2 Fire Assessment Worksheet 6
2.3 Instructions 7
2.4 Inputs and Adjustments 10
2.4.1 Estimating Windspeed for FBP Calculations 10
2.4.2 Adjustments for Slope 12
2.4.3 Diurnal FFMC Adjustments, 1400-0759 13
2.4.4 Diurnal FFMC Adjustment Table, 0800-1359 AK/MI DST 14
2.4.5 Initial Spread Index (ISI) 15
2.4.6 Backing Initial Spread Index (BISI) 16
2.5 Fire Behavior Tables 17
2.5.1 System Fuel Groups and Types 17
2.5.2 O-1a, Matted Grass 20
2.5.3 O-1b, Standing Grass 21
2.5.4 C-1, Spruce/Lichen Woodland 22
2.5.5 C-2, Boreal Spruce 23
2.5.6 C-3, Mature Jack or Lodgepole Pine 24
2.5.7 C-4, Immature Jack or Lodgepole Pine 25
2.5.8 C-5, Red and White Pine 26
2.5.9 C-6, Conifer Plantation, 6ft crown base height 27
2.5.10 C-6, Conifer Plantation, 20 ft crown base height 28
2.5.11 C-7, Ponderosa Pine/Douglas-Fir 29
2.5.12 D-1, Leafless Aspen 30
2.5.13 D-2, Green Aspen 31
2.5.14 M-1, Boreal MixedWood, Leafless (25% conifer) 32
2.5.15 M-2, Boreal MixedWood, Green (25% conifer) 33
2.5.16 M-1, Boreal MixedWood, Leafless (50% conifer) 34
2.5.17 M-2, Boreal MixedWood, Green (50% conifer) 35
2.5.18 M-1, Boreal MixedWood, Leafless (75% conifer) 36
2.5.19 M-2, Boreal MixedWood, Green (75% conifer) 37
2.5.20 M-3, Leafless Mixedwood, Dead Fir 30% 38
2.5.21 M-4, Green Mixedwood, Dead Fir 30% 39
2.5.22 M-3, Leafless Mixedwood, Dead Fir 60% 40
2.5.23 M-4, Green Mixedwood, Dead Fir 60% 41
2.5.24 M-3, Leafless Mixedwood, Dead Fir 100% 42
2.5.25 M-4, Green Mixedwood, Dead Fir 100% 43
2.5.26 S-1, Jack or Lodgepole Pine Slash 44
2.5.27 S-2, White Spruce/Balsam Fir Slash 45
2.5.28 S-3, Coastal Cedar/Hemlock/Douglas-Fir Slash 46
2.6 Fire Area and Perimeter for Sheltered Fuels (C, M, D, S) 47
2.7 Fire Area and Perimeter for Open Fuels (O-1a, O-1b) 48
2.8 Fire Observation/Description 49

1 CFFDRS System Overview

This guide is intended as a reference for US users who may have reason to work with the system in the United States, where English units are primarily used. Keep in mind that the Canadian Forest Service has produced the definitive selection of reference publications and tools referenced below.

The Canadian Forest Fire Danger Rating System (CFFDRS) was first conceived in 1968. The Fire Weather Index (FWI) system was developed and introduced across Canada in 1970. The Fire Behavior Prediction (FBP) system was introduced in 1984. The Fire Occurrence Prediction (FOP) system and Accessory Fuel Moisture system are still in development, with several regional modules operational at this time



Though this guide attempts to be faithful to the models embedded in CFFDRS, there are a number of adaptations to the standard depictions found in materials produced by the Canadian Forest Service.

- Most important among these is the use of English units instead of the standard metric units employed in the system internationally.
- Fire Behavior Tables for O-1a, O-1b, M-3 and M-4 have been revised according to "*Updates and revisions to the 1992 Canadian Forest Fire Behavior Prediction System*" (Wotton, et.al, 2009).

- CFFBP models and tools do not expressly identify the relationship between standard wind measurements (10 meters sensor height) used and field measurements at eye level. In this guide, the relationship is featured in the ISI/BISI tables (sections 2.4.5 and 2.4.6) and the area/perimeter tables in sections 2.6 and 2.7. The relationship between "airport", "forestry" and winds measured at other heights (e.g. 6 ft for eye level) is taken from Lawson & Armitage (2008). Relationship between 10-m and 20-ft winds is provided in table in section 2.4.1. Each user is encouraged to interpret the winds as measured and apply them appropriately for the model used.

- A major adaptation with uncertain validity is the use of flame length for fire intensity outputs in the fire behavior tables. FBP outputs (kW/m) were converted to BTU/ft/sec and then to flame length using the formula:

$$Flame\ Length = \ .45 * "BTU/Ft/Sec"\text{^}.46$$

The table below identifies the CFFBP Fire intensity thresholds in kW/m and the corresponding values in English units and flame length in feet. These thresholds are consistent with commonly held flame length thresholds for fire safety interpretations.

CFFBP Fire Intensity		Flame Length
kW/m	BTU/ft/sec	Feet
10	3	1
500	145	4
2000	578	8
4000	1156	12
10000	2891	18

- A Fire Behavior table for summer hardwoods (D-2) has been created using outputs from M-2 with 0% conifer. These outputs represent spread rates equal to 20% of D-1.

1.1 Key References & Training Resources

The content included in this reference is based largely on these references with several graphics and flow charts drawn directly from them.

Most of these references, resources, and tools can be found at http://www.frames.gov/cffdrs

Lawson, B.D.; Armitage, O.B. 2008. Weather guide for the Canadian Forest Fire Danger Rating System. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, AB.

Van Wagner, C.E. 1987. Development and structure of the Canadian Forest Fire Weather Index System. Canadian Forest Service, Ottawa, Ont. Forest Technical Report 35.

Taylor, Steve, Lawson, Bruce, and Sherman, Karen. Introduction to the Canadian Forest Fire Weather Index System, online video. Canadian Forest Service. 22 min.

Understanding the Fire Weather Index System Interactive Training and Reference, CD

Forestry Canada Fire Danger Group. 1992. Development and structure of the Canadian Forest Fire Behavior Prediction System. Information Report ST-X-3. Ottawa, Ontario, Canada: Forestry Canada, Science and Sustainable Development Directorate. 63 p.

Hirsch, K.G. 1996. Canadian Forest Fire Behavior Prediction (FBP) System User's Guide. Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre Special Report 7. Edmonton, Alberta.

De Groot, W.J., 1993, Examples of Fuel Types in the Canadian Forest Fire Behavior Prediction (FBP) System, Forestry Canada. Poster.

Canadian Forest Fire Behavior Prediction System Interactive Training and Reference, CD,

Tymstra, C.; Bryce, R.W.; Wotton, B.M.; Taylor, S.W.; Armitage, O.B. 2010. Development and structure of Prometheus: the Canadian Wildland Fire Growth Simulation Model. Nat. Resour. Can., Can. For. Serv., North. For. Cent., Edmonton, AB. Inf. Rep. NOR-X-417

Wotton, B.M.; Alexander, M.E.; Taylor, S.W. 2009. Updates and Revisions to the 1992 Canadian Forest Fire Behavior Prediction System. Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, Ontario, Canada. Information Report GLC-X-10, 45p.

Canadian Forestry Service. 1984. Tables for the Canadian Forest Fire Weather Index System. Environment Canada, Canadian Forestry Service, Forest Technical Report 25.

Taylor, S.W., Pike, R.G., Alexander, M.E. 1997. Field Guide to the Canadian Forest Fire Behavior Prediction (FBP) System. Fire Management Network, Canadian Forest Service, Northern Forestry Centre. Special Report 11.

Kidnie, S.M., Wotton, M.M., Droog, W.N. 2010. Field Guide for Predicting Fire Behaviour in Ontario's Tallgrass Prairie.

RunCFFDRS.exe is a stand-alone executable file produced by the Canadian Forest Service that includes documentation and references for the entire system as well as basic calculators for the FWI and FBP systems.

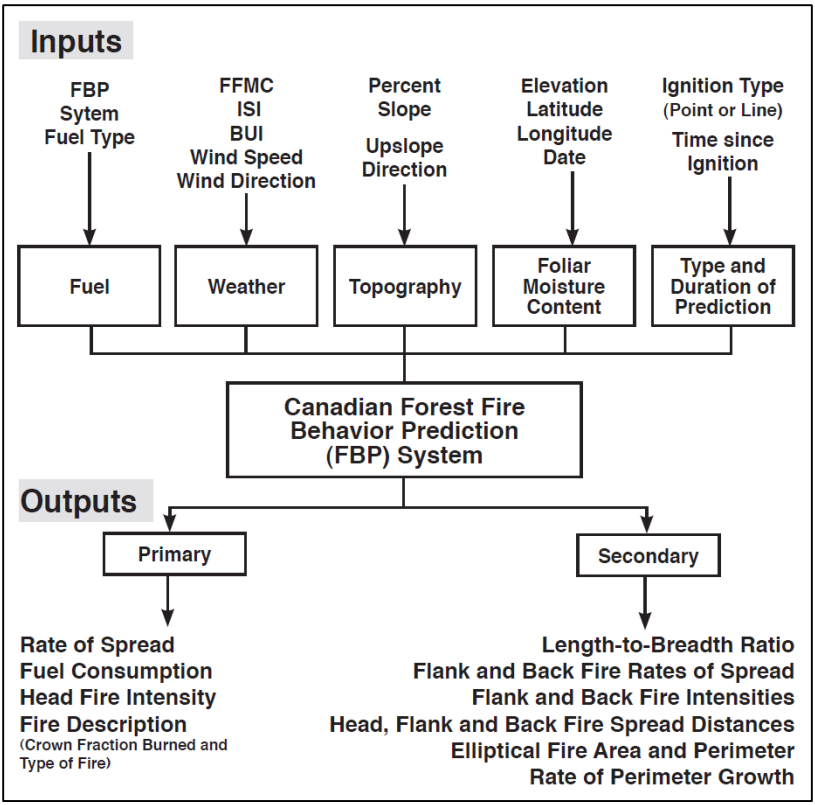
Prometheus, the CFFDRS Geospatial Fire Growth Model, is supported by the Canadian Interagency Forest Fire Center (CIFFC) and its members. It includes a separate FWI/FBP calculator as part of its installation.

2 Fire Behavior Prediction (FBP) System

2.1 Background

Though the basic categories of inputs to the system are similar to the US system of fire behavior models and tools, there are several important differences.

- Unlike the US Fire Behavior Fuel Models, CFFBP Fuel Types include both surface and canopy fuel characteristics, simplifying the fuel input and automating the evaluation of crown fire initiation and propagation to determine the fire description (surface, torching or passive crown, and active crown fire).
- Basic environmental inputs are produced by the Fire Weather Index (FWI) system. Fine Fuel Moisture Code (FFMC), both daily and hourly values, are estimated using FWI processes and combined with open 10 meter windspeeds to determine the Initial Spread Index (ISI), one of the key inputs. Buildup Index (BUI) is used to evaluate overall consumption and its contribution to spread and intensity estimates for all but open fuels.
- Foliar Moisture Content can be modeled according to phenology based on elevation and lat/long. It is a factor in crown fire prediction. However, for the fire behavior tables in this guide, it is assumed to be 100%.



2.2 Fire Assessment Worksheet

Incident:	Your Name:	Date/Time:

Daily Situation *Wx, fuels/terrain, and other info that highlights how conditions are similar or change from past obs to the forecast*	Ref. Obs/Source	Daily FFMC:
		Daily BUI:
		Daily ISI:
	Forecast/Source	Daily FFMC
		Daily BUI
		Daily ISI

Local Situation *Identify each in time and space*	Location			
	Date/Time			

Basic Inputs *(use inputs and adjustments tables in section 2.4 where necessary)*

Local FFMC *Use Daily FFMC (above) & local*	Daily FFMC			
	Temp/RH			
	Local FFMC			
Fuel Type *Identify each fuel/modifier*	**Fuel Type**			
	Modifier			
	Open/Closed			
Season Severity	**BUI (above)**			
Local/Backing ISI *Use 10m WSpd (show as neg. for downslope dir). Estimate Slope Equivalent Wspd from fuel type & slope. Combine for Effective WSpd.*	10m WSpd			
	Slope%(Up/Dn)			
	Aspect			
	Sl. Eq. WSpd			
	Eff. WSpd			
	Local ISI			
	Backing ISI			

Fire Behavior *(Use Fire Behavior Tables in section 2.5 on pages 20-47)*

Use Local FFMC, Fuel inputs, BUI, and Local/Backing ISI to est. Spread, Flame or Intensity and Rank.	ROS Head			
	ROS Back			
	Flame/Intens			
	Fire Descrip.			

Adjustments & Interpretations *(Document your judgement about FB outputs above)*

Adjust projected Fire Behavior based on past observations & other fcst factors	

Fire Growth/Size/Shape *(Use Area & Perimeter Tables 2.6 &2.7 on pages 48 & 49)*

Use significant times (travel time, time to task completion or escape time) to estimate fire size from a new start.	Time Needed			
	Spread Dist (head + back)			
	Area			
	Perimeter			

2.3 Instructions

The Fire Assessment Worksheet included in section 2.2 is provided to guide learning users through the fire behavior assessment process from fireline and field office locations. It can provide useful documentation when looking back during AAR and other review processes. Ultimately, even experienced decision-makers should consider the size and scope of the situation. In initiating and emerging situations, this guide can provide important detail on fire behavior.

Identifying the Daily and Local Situations

Even though the FBP system is empirically based on a number of actual fires, the results from the fire behavior tables in section 2.5 will always benefit from field validation. They need to be viewed in the context of fire siutations and observations from the recent past. With that, necessary adjustments can be made, strengthening the overall assessment.

The ***Daily Situation*** section of the worksheet provides the user the place to document a comparison between an observed situation from the recent past (Ref. Obs box) and the forecast situation (Forecast box). It may even be valuable to use the first column in the Local Situation below to "predict" FBP fire behavior for the Reference Observation to validate the model against observed spread & rank. Identify the source of your situation (date, observer, RAWS station, etc) as well.

Daily Situation *Wx, fuels/terrain, and other info that highlights how conditions are similar or change from past obs to the forecast*	Ref. Obs/Source	Daily FFMC:
		BUI:
		Daily ISI:
	Forecast/Source	Daily FFMC
		BUI
		Daily ISI

Document Daily FFMC, BUI, and ISI in the Daily Situation section for both reference and forecast conditions. The Fine Fuel Moisture Code (FFMC), Initial Spread Index (ISI) and Buildup Index (BUI) are used as direct inputs to the Canadian Forest Fire Behavior Prediction (CFFBP) system. Because daily FWI codes and indices (FFMC, BUI, and ISI) are calculated using standardized weather observations, collected consistently at fixed locations each day at 1400 in Alaska, they may not accurately reflect local conditions and the resulting fire behavior. These daily values are generally starting points for local assessments.

Sources of Daily FWI Codes and Indices

In Alaska and in the Lake States, CFFDRS has been implemented for fire management users. A variety of weather and CFFDRS records are available publicly at the following locations:

- Alaska Interagency Coordination Center Fire Weather & Fuels/Fire Danger records are available at http://fire.ak.blm.gov/aicc.php.
- Michigan, Minnesota, and Wisconsin CFFDRS records can be found at http://glffc.utah.edu/.

The ***Local Situation*** provides the user a place to identify up to 3 unique situations based on *Location* and *Date/Time* for which basic inputs can be documented and fire behavior outputs can be calculated and compared.

Local Situation *Identify each in time and space*	Location			
	Date/Time			

As mentioned above, it may be helpful to use the first column to "predict" fire behavior for a past, known situation. Comparing several fuel types, such as C2, M2, and O1b, is another common scenario. It may also be desirable to produce forecasts for 3 consecutive days of forecasted weather conditions.

Basic inputs for each local situation

Though it is acceptable to simply use the daily values for ISI and BUI produced for a given RAWS and proceed directly to the appropriate fire behavior table in section 2.5, adjustments to FFMC and ISI will provide a localized assessment.

Estimate a Local FFMC for each local situation. Diurnal Adjustment tables are provided. The first, in section 2.4.3 is most commonly used for the peak burning period and overnight. The second, in section 2.4.4, is used in the morning hours before the daily FFMC has been obtained.

Local FFMC *Use Daily FFMC (above) & local*	Daily FFMC
	Temp/RH
	Local FFMC

- ***Field estimates of FFMC*** may be obtained using a moisture probe to evaluate fuel moisture of 10 hr fuels (¼" to 1" in diameter) in the field. Simply subtract the estimated fuel moisture from 100 to derive current FFMC or consider using this table. They can be used directly as local FFMC.

10 Hr	5	6	7	8	9	10	11	12	13	14
FFMC	96	94	93	91	90	88	87	86	84	83

- ***Slope/Aspect adjustments for FFMC*** are rarely used, but are provided.

Identify the Fuel Type (and any modifier) for each local situation that a prediction is desired. Use the descriptions in section 2.5.1 to help identify which fuel type(s) are of interest. The "Fuel Model Guide to Alaska Vegetation" is also a valuable reference.

Fuel Type *Identify each fuel/modifier*	Fuel Type
	Modifier
	Open/Closed

Estimates of Local and Backing ISI for each local situation. Estimate 10m WSpd (negative for downslope direction). A modified Beaufort Wind Scale is provided to assist with ocular windspeed estimates. Determine Slope Equivalent WSpd based on fuel type & slope (2.4.2). Combine for Effective WSpd. Use the local FFMC from above and Effective WSpd to look up local ISI (2.4.5) and Backing ISI (2.4.6).

Local/Backing ISI *Use 10m WSpd (show as neg. for downslope dir). Estimate Slope Equivalent Wspd from fuel type & slope. Combine for Effective WSpd.*	10m WSpd
	Slope%(Up/Dn)
	Aspect
	Sl. Eq. WSpd
	Eff. WSpd
	Local ISI
	Backing ISI

Fire Behavior

Predictions for rate of spread (ROS), flame length/intensity class, and fire description (or "rank") are the primary results from this assessment process. In the basic inputs process, users end up with two ISIs (Local ISI and Backing ISI), the BUI for the day, and the Fuel Type/Modifier for the local situation. These are all that is needed as inputs for Fire Behavior Tables in Section 2.5.

Use Local FFMC, Fuel inputs, BUI, and Local/Backing ISI to est. Spread, Flame or Intensity and Rank.	ROS Head
	ROS Back
	Flame/Intens
	Fire Descrip.

Find the fire behavior table for the fuel type and modifier identified among the basic inputs. Using the Local ISI (and/or BISI) and BUI for the local situation, find the *ROS head* using Local ISI and *ROS Back* using Backing ISI. Results are in chains/hour in the body of the table. Several conversion factors are listed at the top of the page. Interpolate between rows and coluimns for best results.

- A flanking rate of spread can be estimated using this calculation: (ROS Head + ROS Back)/ (L: W ratio X 2) Length: Width Ratio in 2.4.1.

Flame Length/Intensity Class can be identified from the shading of cells in the body of the table. A reference is provided at the top of each fire behavior table. The table to the right suggests the surface flame length that may initiate crown fire.

Fuel Type	Torching Threshold (Flame Length)
C-1	4.8 ft
C-2	6.4 ft
C-3	12.6 ft
C-4	7.8 ft
C-5	22 ft
C-6	11.5 ft
C-7	14.7 ft
M	10.3 ft

Fire Description (or Rank) is noted as surface fire with "normal font", torching (or intermittent crown fire) as "***bold/italic/underline font"***, and active crown fire as "**bold white font**".

Adjustments & Interpretations

Though there are no formal processes here, this is the point where the user needs to look at the predictions and make sure they pass a "reality check". Compare to recent fire observations and use experience and judgement. Consider other factors (stability, frost, etc). Document any significant changes.

Fire Growth/Size/Shape (from point source)

Estimates of spread distance, fire size (area) and fireline length (perimeter) can be useful to fireline decisions. Inputs required are *Time (in hours), Effective windspeed (basic inputs) & ROS (Fire Behavior)*. Multiply ROS by time to get spread distance. Look up Area and Perimeter in 2.6 for open fuel types and 2.7 for closed fuel types.

Use significant times (travel time, time to task completion or escape time) to estimate fire size from start.	Time Needed
	Spread Dist (head + back)
	Area
	Perimeter

2.4 Inputs and Adjustments

2.4.1 Estimating Windspeed for FBP Calculations

The FBP system uses standard surface wind observations collected at 10 meters above prevailing cover. The following table, based on one from the Field Guide for Predicting Fire Behavior in Ontario's Tallgrass Prairie (Kidnie et.al.2010), provides a means for converting the wind measurement or forecasts to the "Forestry 10m winds" used in FBP calculations.

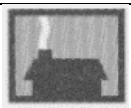
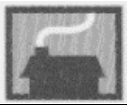
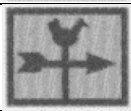
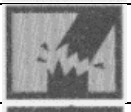
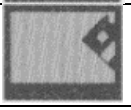
Forestry, RAWS 10m (mph)	Height of Wind Measurement/Estimate (in feet)									Airport or Fcst 10m (mph)	Fire Shape Length:Width	
	3	**6**	10	13	16	**20**	23	26	30		Open O-1	Closed C,M,D,S
1	1	**1**	1	1	1	**1**	1	1	1	2	1.4	1.0
2	1	**2**	2	2	2	**2**	2	2	2	3	1.4	1.0
3	2	**2**	2	3	3	**3**	3	3	3	5	1.9	1.1
4	3	**3**	3	3	4	**4**	4	4	4	7	1.9	1.1
5	3	**4**	4	4	5	**5**	5	5	5	8	2.3	1.1
6	4	**5**	5	5	5	**5**	6	6	6	10	2.6	1.2
7	5	**5**	6	6	6	**6**	7	7	7	12	2.6	1.2
8	5	**6**	7	7	7	**7**	8	8	8	13	2.9	1.3
9	6	**7**	7	8	8	**8**	9	9	9	15	2.9	1.3
10	7	**8**	8	9	9	**9**	10	10	10	17	3.2	1.5
12	8	**9**	10	10	11	**11**	12	12	12	20	3.4	1.6
14	9	**11**	11	12	13	**13**	14	14	14	23	3.6	1.8
16	11	**12**	13	14	14	**14**	16	16	16	27	4.0	2.1
18	12	**14**	15	16	16	**16**	17	17	18	30	4.2	2.3
20	14	**15**	16	17	18	**18**	19	19	20	33	4.4	2.5
25	17	**19**	20	22	23	**23**	24	24	25	42	4.8	3.1
30	20	**23**	25	26	27	**27**	29	29	30	50	5.2	3.7
35	24	**27**	29	30	32	**32**	34	34	34	58	5.6	4.3
40	27	**31**	33	34	36	**36**	39	39	39	67	6.0	4.9
45	30	**34**	37	39	41	**41**	44	44	44	75	6.4	5.4
50	34	**38**	41	43	45	**45**	49	49	49	83	6.7	5.9

Eye level winds can be represented by the highlighted column at ***6*** ft and NFDRS standard RAWS winds can be represented by the highlighted column at ***20*** ft.

In the same way, winds recorded at airports and very large openings tend to be higher than those at "forestry" locations and can be represented by the "***Airport or forecast 10m***" winds column on the right. Either can be converted by following the row to the left and reading the value in the "***Forestry, RAWS***" column.

Windspeed used in Initial Spread (ISI) calculations may need to be further adjusted to incorporate a Slope Equivalent Windspeed. See Section 3.3.2.

Visual Surface (10m) Wind Estimate - Modified Beaufort scale

Class	Windspeed	Terminology		Visible Effect
0	Less than 1 mph	Calm		Calm, Smoke rises vertically
1	1 to 3 mph	Very Light Breeze		Leaves of quaking aspen in constant motion; small branches sway, tall grasses and weeds sway and bend with wind, wind vane barely moves
2	4 to 7 mph	Light Breeze		Trees of pole size in the open sway gently, Wind felt distinctly on face; leaves rustle; loose scraps of paper move, wind flutters small flag
3	8 to 12 mph	Gentle Breeze		Leaves, small twigs in constant motion; Tops of trees in dense stands sway; light flags extended
4	13 to 18 mph	Moderate Breeze		Trees of pole size in the open sway violently; whole trees in dense stands sway noticeably; dust is raised in the road.
5	19 to 24 mph	Fresh Breeze		Branchlets are broken from trees; inconvenience is felt in walking against wind
6	25 to 31 mph	Strong Breeze		Tree damage increases with occasional breaking of exposed tops & branches; progress impeded when walking against wind.
7	32 to 38 mph	Moderate Gale		Severe damage to tree tops; very difficult to walk into wind; significant structural damage occurs.
8	39 to 46 mph	Fresh Gale		Surfaced strong Santa Ana; intense stress on all exposed objects, vegetation, buildings; canopy offers virtually no protection
9	47 to 54 mph	Strong Gale		Slight structural damage occurs; slate blown from roofs
10	55 to 63 mph	Whole Gale		Seldom experienced on land; trees broken; structural damage occurs
11	64 to 72 mph	Storm		Very rarely experienced on land; usually with widespread damage
12	73 mph or more	Hurricane Force		Violence and destruction

2.4.2 Adjustments for Slope

FFMC Slope-Aspect Adjustments

FFMC	1-15%				16-30%				31-45%				46-60%			
Flat	**N**	**E**	**S**	**W**	**N**	**E**	**S**	**W**	**N**	**E**	**S**	**W**	**N**	**E**	**S**	**W**
80	78	79	82	80	77	78	82	80	74	77	83	81	72	76	84	81
82	80	81	84	82	79	80	84	82	76	79	85	83	74	78	85	83
84	83	83	85	84	81	82	86	84	79	81	87	84	76	80	88	84
86	85	85	87	86	83	84	88	86	81	83	89	86	78	82	90	86
87	86	86	88	87	84	85	89	87	82	84	90	87	80	83	90	87
88	87	87	89	88	85	87	90	88	83	86	91	88	82	85	91	88
89	88	88	90	89	87	88	91	89	85	87	91	89	83	86	92	89
90	89	89	91	90	88	89	92	90	86	88	92	90	84	87	93	90
91	90	90	92	91	89	90	92	91	87	89	93	91	86	88	93	91
92	91	91	93	92	90	91	93	92	88	90	94	92	87	89	94	92
93	92	92	94	93	91	92	94	93	89	91	95	93	88	90	95	93
94	93	93	95	94	92	93	95	94	91	92	96	94	90	92	96	94

These adjustments should be used with caution as they have not been rigorously tested. They should only be applied in slash and open fuel types on clear days in March, April, August, September, or October between 1200 and 2000 LST. Determine the slope and aspect of the area you are projecting spread in, find the FFMC, then move horizontally to the column that best describes the prediction point and read adjusted FFMC.

Slope Equivalent Windspeeds

		Slope, %					
Fuel Type		**10**	**20**	**30**	**40**	**50**	**60**
C-1		1	2	3	4	5	6
C-2		2	5	7	11	14	18
C-3		1	2	4	5	7	9
C-4		2	5	7	11	14	18
C-5		1	2	3	4	6	7
C-6		1	3	4	6	8	10
C-7		1	3	6	8	11	13
D-1		2	4	7	10	13	16
M-1		3	6	9	12	16	20
M-2		2	5	8	11	14	18
M3	**30%DF**	2	4	7	10	13	16
	60%DF	2	5	8	11	15	20
	100%DF	2	6	9	13	18	25
M4	**30%DF**	1	3	5	7	9	11
	60%DF	1	4	6	8	11	14
	100%DF	2	5	8	11	16	20
S-1		2	5	9	12	17	22
S-2		2	4	7	10	13	17
S-3		1	2	4	6	8	10
O-1a		2	5	8	11	15	20
O-1b		2	4	7	10	13	16

Find the fuel type identifier, and then move horizontally to the most appropriate slope column to read the **slope equivalent windspeed**. If the FFMC is ≥ 95 and slope is ≥ 50%, add 3 mph to the table value.

Slope equivalent windspeed varies with FFMC. Those given above are for FFMC 90 and are accurate to ± 1-2 mph of the true value for FFMC 90-96. The values for FFMC ≥ 95 and slope ≥ 50% may be underestimated by ≥ 3 mph.

M-1 and M-2 values are for 50:50 conifer/hardwood mixture. M-3 and M-4 modifiers are percent dead fir (%DF).

2.4.3 Diurnal FFMC Adjustments, 1400-0759

AK/MI Daylight Time Today				STD FFMC	AK/MI Daylight Time (-1 hr elsewhere) Today						AK/MI Daylight Time (-1 hr elsewhere) Tomorrow							
1400	**1500**	**1600**	**1700**	**1800**	**1900**	**2000**	**2100**	**2200**	**2300**	**0000**	**0100**	**0200**	**0300**	**0400**	**0500**	**0600**	**0659**	**0759**
41	43	46	48	50	51	52	53	53	52	51	50	49	48	47	46	45	44	43
48	52	55	57	60	61	62	62	62	61	59	58	56	55	54	52	51	50	49
53	56	60	62	65	66	67	66	66	64	63	61	60	58	57	56	54	53	55
57	61	65	68	70	70	71	70	69	68	66	65	63	62	60	59	58	56	57
63	67	71	73	75	75	75	74	73	72	70	69	67	66	64	63	61	60	58
64	68	72	74	76	76	76	75	74	72	71	69	68	66	65	64	62	61	59
66	69	73	75	77	77	77	76	75	73	72	70	69	67	66	64	63	62	60
67	71	75	76	78	78	78	77	76	74	72	71	69	68	67	65	64	63	61
69	72	76	78	79	79	78	77	76	75	73	72	70	69	67	66	65	63	62
71	74	77	79	80	80	79	78	77	76	74	73	71	70	68	67	66	64	63
74	76	79	80	81	81	80	79	78	77	75	73	72	71	69	68	66	65	64
76	78	80	81	82	82	81	80	79	77	76	74	73	71	70	69	67	66	65
78	80	81	82	83	83	82	81	80	78	77	75	74	72	71	70	68	67	66
80	81	82	83	84	84	83	82	81	79	78	76	75	73	72	70	69	68	67
82	82	83	84	85	85	84	83	82	80	79	77	76	74	73	71	70	69	68
83	84	85	85	86	86	85	84	83	81	79	78	77	75	74	72	71	70	68
84	85	86	86	87	87	86	85	83	82	80	79	78	76	75	73	72	71	70
85	86	87	87	88	88	87	86	84	83	81	80	79	77	76	74	73	72	71
86	87	88	89	89	89	88	87	85	84	82	81	80	78	77	75	74	73	72
88	88	89	90	90	90	89	88	86	85	83	82	81	79	78	77	75	74	73
89	89	90	91	91	91	90	89	87	86	84	83	82	80	79	78	76	75	74
90	90	91	92	92	92	91	90	88	87	85	84	83	81	80	79	77	76	75
91	91	92	93	93	93	92	91	89	88	86	85	84	82	81	80	79	77	76
92	93	93	94	94	94	93	92	90	89	88	86	85	84	82	81	80	79	77
93	94	94	95	95	95	94	93	91	90	89	87	86	85	83	82	81	80	79
94	95	95	96	96	96	95	94	92	91	90	88	87	86	85	84	82	81	80
95	96	96	97	97	97	96	95	93	92	91	90	88	87	86	85	84	83	81
96	97	97	98	98	98	97	96	94	93	92	91	90	88	87	86	85	84	83
1400	**1500**	**1600**	**1700**	**1800**	**1900**	**2000**	**2100**	**2200**	**2300**	**0000**	**0100**	**0200**	**0300**	**0400**	**0500**	**0600**	**0659**	**0759**

2.4.4 Diurnal FFMC Adjustment Table, 0800-1359 AK/MI DST

Hour AK/MI DST	RH %	Yesterday's Standard Fine Fuel Moisture Code (FFMC)																									
		45-54	58-62	63-67	68-72	73-75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
800	<68	54	57	59	62	65	66	66	67	68	69	69	70	71	72	73	74	75	76	78	79	80	81	83	84	86	87
	68-87	48	53	55	58	62	63	63	64	65	66	66	67	68	69	70	71	72	73	74	75	76	77	78	80	81	82
	>87	43	49	52	55	59	60	60	61	62	63	64	65	66	67	67	68	69	71	72	73	74	75	76	77	79	80
900	<58	56	60	62	64	67	68	69	69	70	71	72	72	73	74	75	76	77	78	79	80	81	83	84	85	87	88
	58-77	49	54	57	60	63	64	65	66	67	67	68	69	70	71	72	73	74	75	76	77	78	79	81	82	83	84
	>77	44	49	53	56	60	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	77	78	79	81	82
1000	<48	59	63	65	67	70	70	71	72	72	73	74	75	75	76	77	78	79	80	81	82	83	84	85	86	88	89
	48-67	50	55	58	61	65	66	67	68	68	69	70	71	72	73	74	75	76	77	78	79	81	82	83	84	85	87
	>67	45	50	53	57	61	61	62	63	64	65	66	67	68	69	70	71	72	73	74	76	77	78	79	81	82	84
1100	<43	64	67	69	71	74	74	75	75	76	77	77	78	79	80	80	81	82	83	84	85	86	87	88	89	90	91
	43-62	56	60	63	66	69	70	71	72	72	73	74	75	76	77	77	78	79	80	81	82	83	85	86	87	88	89
	>62	51	56	58	62	65	66	66	67	68	69	70	70	71	72	73	74	75	76	77	78	79	80	82	83	84	85
1200	<38	70	72	74	76	78	78	79	79	80	81	81	82	82	83	84	85	85	86	87	88	89	90	91	92	93	94
	38-57	62	66	68	71	74	75	75	76	77	77	78	79	79	80	81	82	83	84	85	86	87	88	89	90	91	92
	>57	57	61	64	67	70	70	71	72	72	73	74	74	75	76	77	77	78	79	80	81	82	83	84	85	86	87
1300	<35.5	76	78	79	80	82	83	84	84	85	85	86	86	87	87	88	89	89	90	90	91	91	92	92	93	93	94
	35-54	69	72	74	76	79	80	80	81	82	82	83	83	84	85	85	86	87	87	88	88	89	89	90	91	91	92
	>54.5	64	68	70	72	75	76	76	77	77	78	78	79	80	80	81	81	82	82	83	84	84	85	85	86	86	87
1359	<33	82	83	84	85	87	87	88	88	88	89	89	89	90	90	90	91	91	91	92	92	92	92	93	93	93	94
	33-52	77	79	81	82	84	84	85	85	86	86	86	87	87	88	88	88	89	89	89	90	90	90	91	91	91	92
	>52	72	75	77	78	80	81	81	81	82	82	82	83	83	83	83	84	84	84	85	85	85	86	86	86	86	87

2.4.5 Initial Spread Index (ISI)

	Open Windspeed (Fcst = 10m x 0.7, 20ft = 10m/1.12, Eye Level Open [EL Op] = 10m/ 1.54), Use only 10m For Effective Windspeed																				
FCST	**0**	**1**	**4**	**6**	**9**	**10**	**13**	**16**	**17**	**20**	**21**	**24**	**26**	**29**	**30**	**33**	**34**	**37**	**39**	**41**	**44**
10m	**0**	**1**	**3**	**4**	**6**	**7**	**9**	**11**	**12**	**14**	**15**	**17**	**18**	**20**	**21**	**23**	**24**	**26**	**27**	**29**	**31**
20ft	**0**	**1**	**3**	**4**	**5**	**6**	**8**	**10**	**11**	**13**	**13**	**15**	**16**	**18**	**19**	**21**	**21**	**23**	**24**	**26**	**28**
EL Op	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
FINE FUEL MOISTURE CODE																					
70	0.6	0.7	0.8	0.9	1.0	1.1	1.3	1.5	1.7	1.9	2.1	2.5	2.7	3.2	3.4	4.0	4.4	5.1	5.4	5.9	6.3
71	0.6	0.7	0.8	0.9	1.1	1.1	1.3	1.6	1.7	2.0	2.2	2.6	2.8	3.3	3.5	4.2	4.5	5.3	5.6	6.1	6.5
72	0.7	0.7	0.9	0.9	1.1	1.2	1.4	1.6	1.8	2.1	2.3	2.7	2.9	3.4	3.7	4.3	4.7	5.4	5.8	6.3	6.7
73	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.7	1.8	2.2	2.3	2.8	3.0	3.5	3.8	4.5	4.9	5.7	6.0	6.5	7.0
74	0.7	0.8	0.9	1.0	1.2	1.3	1.5	1.8	1.9	2.3	2.5	2.9	3.1	3.7	4.0	4.7	5.1	5.9	6.3	6.8	7.3
75	0.8	0.8	1.0	1.1	1.2	1.4	1.6	1.9	2.0	2.4	2.6	3.0	3.3	3.9	4.2	4.9	5.4	6.2	6.6	7.2	7.7
76	0.8	0.9	1.0	1.1	1.3	1.4	1.7	2.0	2.2	2.5	2.7	3.2	3.5	4.1	4.5	5.2	5.7	6.6	7.0	7.6	8.1
77	0.9	0.9	1.1	1.2	1.4	1.5	1.8	2.1	2.3	2.7	2.9	3.5	3.7	4.4	4.8	5.6	6.1	7.1	7.5	8.2	8.7
78	0.9	1.0	1.2	1.3	1.5	1.7	2.0	2.3	2.5	2.9	3.2	3.7	4.1	4.8	5.2	6.1	6.6	7.7	8.1	8.8	9.4
79	1.0	1.1	1.3	1.4	1.7	1.8	2.1	2.5	2.7	3.2	3.5	4.1	4.4	5.2	5.7	6.6	7.2	8.4	8.9	9.7	10.3
80	1.1	1.2	1.5	1.6	1.8	2.0	2.4	2.8	3.0	3.5	3.8	4.5	4.9	5.8	6.2	7.3	8.0	9.2	9.8	10.7	11.4
81	1.3	1.4	1.6	1.8	2.1	2.2	2.6	3.1	3.4	3.9	4.3	5.0	5.5	6.4	7.0	8.2	8.9	10.3	10.9	11.9	12.7
82	1.4	1.5	1.8	2.0	2.3	2.5	3.0	3.5	3.8	4.4	4.8	5.7	6.1	7.2	7.8	9.2	10.0	11.6	12.3	13.4	14.3
83	1.6	1.8	2.1	2.2	2.6	2.8	3.4	3.9	4.3	5.0	5.4	6.4	7.0	8.2	8.9	10.4	11.3	13.1	13.9	15.2	16.1
84	1.8	2.0	2.3	2.5	3.0	3.2	3.8	4.5	4.9	5.7	6.2	7.3	7.9	9.3	10.1	11.9	12.9	15.0	15.8	17.3	18.4
85	2.1	2.3	2.7	2.9	3.4	3.7	4.4	5.1	5.6	6.6	7.1	8.4	9.1	10.7	11.6	13.6	14.8	17.1	18.1	19.8	21.1
86	2.4	2.6	3.1	3.3	3.9	4.3	5.0	5.9	6.4	7.5	8.2	9.6	10.4	12.3	13.3	15.6	17.0	19.7	20.8	22.7	24.2
87	2.8	3.0	3.6	3.9	4.5	4.9	5.8	6.8	7.4	8.7	9.4	11.1	12.0	14.1	15.3	18.0	19.5	22.7	24.0	26.2	27.9
88	3.2	3.5	4.1	4.5	5.2	5.7	6.7	7.9	8.5	10.0	10.9	12.8	13.9	16.3	17.7	20.8	22.5	26.2	27.7	30.2	32.2
89	3.7	4.0	4.7	5.1	6.0	6.6	7.7	9.1	9.8	11.6	12.5	14.7	16.0	18.8	20.4	24.0	26.0	30.2	32.0	34.9	37.1
90	4.3	4.6	5.5	5.9	7.0	7.6	8.9	10.5	11.3	13.3	14.5	17.0	18.5	21.7	23.5	27.7	30.0	34.9	36.9	40.3	42.9
91	4.9	5.4	6.3	6.8	8.0	8.7	10.3	12.1	13.1	15.4	16.7	19.6	21.3	25.0	27.2	31.9	34.6	40.2	42.6	46.5	49.4
92	5.7	6.2	7.3	7.9	9.3	10.1	11.8	13.9	15.1	17.7	19.2	22.6	24.5	28.9	31.3	36.8	39.9	46.4	49.1	53.5	57.0
93	6.6	7.1	8.4	9.1	10.7	11.6	13.6	16.0	17.4	20.4	22.1	26.0	28.2	33.2	36.0	42.4	45.9	53.4	56.5	61.6	65.6
94	7.5	8.2	9.6	10.4	12.3	13.3	15.6	18.4	20.0	23.5	25.5	29.9	32.5	38.2	41.4	48.7	52.8	61.3	64.9	70.9	75.4
95	8.7	9.4	11.0	12.0	14.1	15.3	18.0	21.1	22.9	26.9	29.2	34.4	37.3	43.8	47.5	55.9	60.6	70.4	74.5	81.3	86.5
96	9.9	11	12.7	13.7	16.1	17.5	20.6	24.2	26.2	30.9	33.5	39.4	42.7	50.2	54.5	64.0	69.5	80.7	85.4	93.2	99.2

2.4.6 Backing Initial Spread Index (BISI)

	Open Windspeed (Fcst = 10m x 0.7, 20ft = 10m/1.12, Eye Level Open [EL Op] = 10m/ 1.54), Use only 10m For Effective Windspeed																				
FCST	**0**	**1**	**4**	**6**	**9**	**10**	**13**	**16**	**17**	**20**	**21**	**24**	**26**	**29**	**30**	**33**	**34**	**37**	**39**	**41**	**44**
10m	**0**	**1**	**3**	**4**	**6**	**7**	**9**	**11**	**12**	**14**	**15**	**17**	**18**	**20**	**21**	**23**	**24**	**26**	**27**	**29**	**31**
20ft	**0**	**1**	**3**	**4**	**5**	**6**	**8**	**10**	**11**	**13**	**13**	**15**	**16**	**18**	**19**	**21**	**21**	**23**	**24**	**26**	**28**
EL Op	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
FINE FUEL MOISTURE CODE																					
70	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
71	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
72	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
73	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
74	0.7	0.7	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
75	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
76	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
77	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
78	0.9	0.9	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
79	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
80	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1
81	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1
82	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1
83	1.6	1.5	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.1
84	1.8	1.7	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.1
85	2.1	1.9	1.7	1.5	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2
86	2.4	2.2	1.9	1.8	1.5	1.4	1.2	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2
87	2.8	2.6	2.2	2.0	1.7	1.6	1.3	1.1	1.1	0.9	0.8	0.7	0.6	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2
88	3.2	3.0	2.5	2.3	2.0	1.8	1.6	1.3	1.2	1.0	1.0	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.3	0.3
89	3.7	3.4	2.9	2.7	2.3	2.1	1.8	1.5	1.4	1.2	1.1	0.9	0.9	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.3
90	4.3	4.0	3.4	3.1	2.6	2.4	2.1	1.8	1.6	1.4	1.3	1.1	1.0	0.8	0.8	0.7	0.6	0.5	0.5	0.4	0.3
91	4.9	4.6	3.9	3.6	3.0	2.8	2.4	2.0	1.9	1.6	1.5	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.6	0.5	0.4
92	5.7	5.3	4.5	4.1	3.5	3.2	2.7	2.3	2.2	1.8	1.7	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5
93	6.6	6.1	5.1	4.7	4.0	3.7	3.2	2.7	2.5	2.1	1.9	1.7	1.5	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5
94	7.5	7.0	5.9	5.5	4.6	4.3	3.6	3.1	2.9	2.4	2.2	1.9	1.8	1.5	1.4	1.2	1.1	0.9	0.8	0.7	0.6
95	8.7	8.0	6.8	6.3	5.3	4.9	4.2	3.5	3.3	2.8	2.6	2.2	2.0	1.7	1.6	1.3	1.2	1.1	1.0	0.8	0.7
96	9.9	9.1	7.8	7.2	6.1	5.6	4.8	4.1	3.7	3.2	2.9	2.5	2.3	2.0	1.8	1.5	1.4	1.2	1.1	0.9	0.8

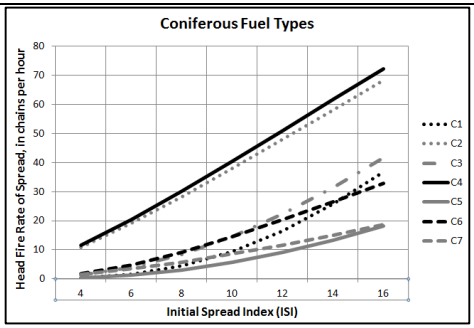
2.5 Fire Behavior Tables

2.5.1 System Fuel Groups and Types

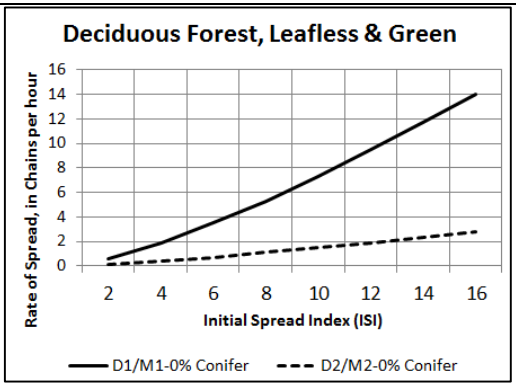
Designed specifically for use in predicting the full range of fire behavior in northern forest ecosystems, there are 16 fuel types among 5 fuel groups. The classification recognizes coarse vegetative cover and structure types.

Coniferous Group

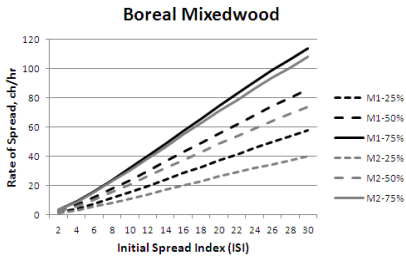
Fuel Type	CBH (m/ft)	CFL (kg/m2)
C-1	2	0.75
C-2	3	0.80
C-3	8	1.15
C-4	4	1.20
C-5	18	1.20
C-6	7(default)	1.80
C-7	10	0.50

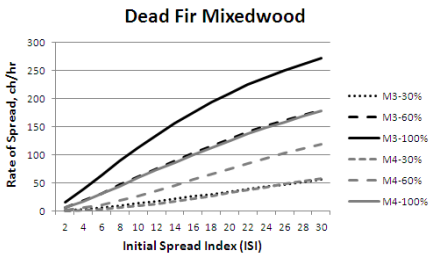


FUEL TYPE	FOREST FLOOR /ORGANIC	SURFACE & LADDER FUEL	STRUCTURE COMPOSITION
C-1-Spruce Lichen Woodland	Continuous reindeer lichen; organic layer absent or shallow, uncompacted	Very sparse herb/shrub cover and down woody fuels; tree crowns extend to ground	Open black spruce with dense clumps; assoc. sp. Jack pine, white birch; well drained upland sites.
C-2-Boreal Spruce	Continuous feather moss and/or Cladonia; deep, compacted organic layer.	Continuous shrub (e.g., Labrador tea); low to moderate down woody fuels,; tree crowns extend nearly to ground arboreal lichens, flaky bark	Moderately well stocked black spruce stands on both upland and lowland sites; Sphagnum bogs excluded.
C-3-Mature Jack or Lodgepole Pine	Continuous feather moss; moderately deep, compacted organic layer.	Sparse conifer understory may be present; sparse down woody fuels; tree crowns separated from the ground.	Fully stocked jack or lodgepole pine stands; mature.
C-4-Immature Jack or Lodgepole Pine	Continuous needle litter; moderately compacted organic layer.	Moderate shrub/herb cover; continuous vertical crown fuel continuity; heavy standing dead and down, dead woody fuel.	Dense jack or lodgepole pine stands; immature.
C-5-Red and White Pine	Continuous needle litter; moderately shallow organic layer	Moderate herb and shrub (e.g. hazel); moderate dense understory (e.g. red maple, balsam fir); tree crowns separated from ground.	Moderately well-stocked red and white pine stands; mature; assoc. sp. White spruce, white birch, and aspen.
C-6-Conifer Plantation	Continuous needle litter; moderately shallow organic layer	Absent herb/shrub cover; absent understory; tree crowns separated from ground	Fully stocked conifer plantations; complete crown closure regardless of mean stand height; mean stand crown base height controls ROS and crowning.
C-7-Ponderosa Pine /Douglas Fir	Continuous needle litter; absent to shallow organic layer	Discontinuous grasses, herbs, except in conifer thickets, where absent; light woody fuels; tree crowns separated from ground except in thickets.	Open ponderosa pine and Douglas-fir stands; mature uneven aged; assoc. sp. Western larch, lodgepole pine; understory conifer thickets.

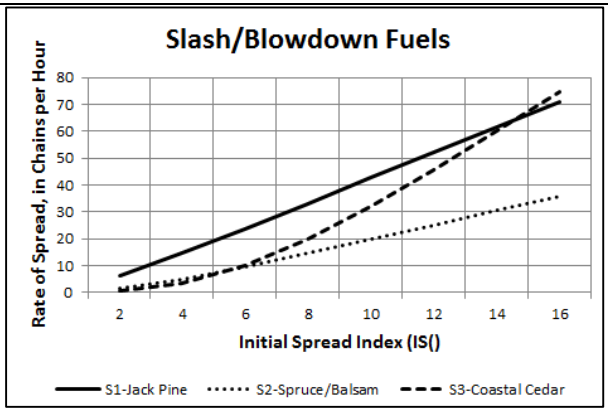


FUEL TYPE	FOREST FLOOR /ORGANIC	SURFACE & LADDER FUEL	STRUCTURE COMPOSITION
D-1-Leafless **D-2-Green**	Continuous leaf litter; shallow, uncompacted organic layer.	Moderate medium to tall shrubs and herb layers; absent conifer understory; sparse, dead, down woody fuels.	Moderately well stocked trembling aspen stands; semimature; leafless (i.e., spring, fall or defoliated) and green (summer).

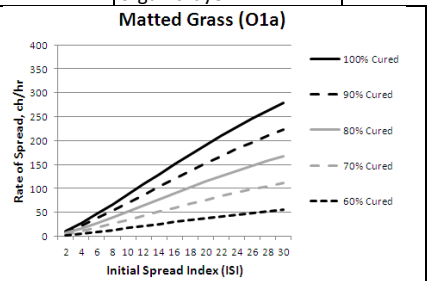


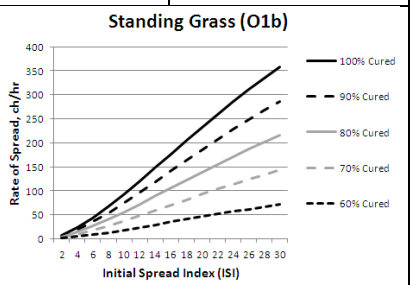


M-1-Boreal Mixedwood-leafless **M-2-Boreal Mixedwood-green**	Continuous leaf litter in deciduous portions of stands; discontinuous feather moss and needle litter in conifer portions of stand; organic layers shallow, uncompacted to moderately compacted.	Moderate shrub and continuous herb layers; low to moderate dead, down woody fuels; conifer crowns extend nearly to ground; scattered to moderate conifer understory	Moderately well stocked mixed stand of boreal conifers (e.g., black/white spruce, balsam/sub-alpine fir) and deciduous species (e.g., trembling aspen, white birch). Fuel types are differentiated by season and percent conifer vs. deciduous sp. composition
M-3-Dead Fir Mixedwood-leafless **M-4-Dead Fir Mixedwood-green**	Continuous leaf litter in deciduous portions of stands; discontinuous feather moss, needle litter, & hardwood leaves in mixed portions conifer portions of stands; organic layers moderately compacted, 8-10 cm.	Dense, continuous herbaceous cover after greenup; down woody fuels low initially, but becoming heavy several years after balsam mortality; ladder fuels dominated by dead balsam understory.	Moderately well stocked mixed stand of spruce, pine and birch with dead balsam fir, often as an understory. Fuel types differentiated by season and time since balsam mortality.



FUEL TYPE	FOREST FLOOR /ORGANIC	SURFACE & LADDER FUEL	STRUCTURE COMPOSITION
S-1-Jack Pine Slash	Continuous feather moss; discontinuous needle litter; moderately deep, compacted organic layer.	Continuous slash, moderate loading and depth; high foliage retention; absent to sparse shrub and herb cover	Slash from clearcut logging; mature jack or lodgepole pine stands
S-2-White Spruce & Balsam Slash	Continuous feather moss and needle litter; moderately deep, compacted organic layer	Continuous to discontinuous slash (due to skidder trails); moderate foliage retention; moderate loading and depth; moderate shrub and herb cover.	Slash from clearcut logging; mature or overmature white spruce, subalpine fir or balsam fir stands.
S-3-Coastal Cedar, Hemlock & Doug-Fir Slash	Continuous feather moss or compacted old needle litter below fresh needle litter from slash; moderately deep to deep, compacted organic layer.	Continuous slash, high foliage retention (cedar), moderate for other species; heavy loading, deep slash; sparse to moderate shrub and herb cover	Slash from clearcut logging; mature to overmature cedar, hemlock, or Douglas-fir stands.





O-1a-Matted Grass **O-1b-Standing Grass**	Continuous dead grass litter; organic layer absent to shallow and moderately compacted.	Continuous standing grass (current year crop). Subtypes for both early spring matted grass and late summer standing cured grass are included. Standard loading is 0.3 kg/m2, but other loading can be accommodated; percent cured or dead must be estimated. Scattered trees, shrubs, and/or down woody fuel.

2.5.2 O-1a, Matted Grass

Open, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

	Degree of Curing (%)									
ISI	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
1	0.0	0.0	0.1	0.2	0.4	0.8	2	2	3	4
2	0.0	0.1	0.3	0.6	1	2	4	6	9	11
3	0.1	0.2	0.5	1	2	4	7	11	15	19
4	0.1	0.3	0.7	1	3	5	11	16	22	27
5	0.2	0.4	1	2	4	7	15	22	29	37
6	0.2	0.6	1	2	5	9	19	28	37	47
7	0.2	0.7	1	3	6	11	23	34	45	57
8	0.3	0.8	2	4	7	13	27	40	54	67
9	0.3	0.9	2	4	8	15	31	46	62	77
10	0.4	1	2	5	9	18	35	53	70	88
11	0.4	1	3	5	10	20	39	59	79	98
12	0.5	1	3	6	11	22	44	65	87	109
13	0.5	1	3	6	12	24	48	72	96	120
14	0.5	2	3	7	13	26	52	78	104	130
15	0.6	2	4	7	14	28	56	84	112	141
16	0.6	2	4	8	15	30	60	90	121	151
17	1	2	4	8	16	32	64	97	129	161
18	1	2	4	9	17	34	68	103	137	171
19	1	2	5	9	18	36	72	109	145	181
20	1	2	5	10	19	38	76	114	153	191
21	1	2	5	10	20	40	80	120	160	200
22	1	3	5	11	21	42	84	126	168	210
23	1	3	6	11	22	44	88	132	175	219
24	1	3	6	12	23	46	91	137	183	228
25	1	3	6	12	24	47	95	142	190	237
26	1	3	6	13	25	49	98	148	197	246
27	1	3	7	13	26	51	102	153	204	255
28	1	3	7	14	26	53	105	158	210	263
29	1	3	7	14	27	54	109	163	217	271
30	1	3	7	15	28	56	112	168	223	279
31	1	3	8	15	29	57	115	172	230	287
32	1	4	8	15	30	59	118	177	236	295
33	1	4	8	16	30	60	121	181	242	302
34	1	4	8	16	31	62	124	186	248	310
35	1	4	8	17	32	63	127	190	254	317
36	1	4	8	17	33	65	130	194	259	324
37	1	4	9	17	33	66	132	198	265	331
38	1	4	9	18	34	67	135	202	270	337
39	1	4	9	18	35	69	138	206	275	344
40	1	4	9	18	35	70	140	210	280	350

2.5.3 O-1b, Standing Grass

Open, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Degree of Curing (%)

ISI	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
1	0.0	0.0	0.1	0.1	0.2	0.5	1	1	2	2
2	0.0	0.1	0.2	0.4	0.8	2	3	5	6	8
3	0.1	0.2	0.4	0.8	1	3	6	9	12	15
4	0.1	0.3	0.6	1	2	5	9	14	19	23
5	0.1	0.4	0.9	2	3	7	13	20	27	33
6	0.2	0.5	1	2	4	9	18	26	35	44
7	0.2	0.7	1	3	6	11	22	33	45	56
8	0.3	0.8	2	4	7	14	27	41	54	68
9	0.3	1	2	4	8	16	32	48	64	81
10	0.4	1	2	5	9	19	38	56	75	94
11	0.5	1	3	6	11	21	43	64	86	107
12	0.5	1	3	6	12	24	48	73	97	121
13	0.6	2	4	7	14	27	54	81	108	135
14	0.6	2	4	8	15	30	59	89	119	149
15	0.7	2	4	9	16	33	65	98	130	163
16	0.7	2	5	9	18	35	71	106	141	177
17	0.8	2	5	10	19	38	76	114	153	191
18	0.9	2	5	11	21	41	82	123	164	205
19	0.9	3	6	11	22	44	87	131	175	219
20	1	3	6	12	23	46	93	139	186	232
21	1	3	6	13	25	49	98	147	197	246
22	1	3	7	14	26	52	104	155	207	259
23	1	3	7	14	27	54	109	163	218	272
24	1	3	7	15	29	57	114	171	228	285
25	1	4	8	16	30	60	119	179	238	298
26	1	4	8	16	31	62	124	186	249	311
27	1	4	8	17	32	65	129	194	258	323
28	1	4	9	18	34	67	134	201	268	335
29	1	4	9	18	35	69	139	208	278	347
30	2	4	9	19	36	72	143	215	287	359
31	2	4	10	19	37	74	148	222	296	370
32	2	5	10	20	38	76	152	229	305	381
33	2	5	10	21	39	78	157	235	314	392
34	2	5	11	21	40	81	161	242	322	402
35	2	5	11	22	42	83	165	248	330	413
36	2	5	11	22	43	85	169	254	338	423
37	2	5	11	23	44	87	173	260	346	433
38	2	5	12	23	44	88	177	265	354	442
39	2	5	12	24	45	90	181	271	361	452
40	2	6	12	24	46	92	184	276	369	461

2.5.4 C-1, Spruce/Lichen Woodland

Open, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

***Torching*, Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
5	0.5	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	0.9
6	1	2	2	2	2	2	2	2	2	2
7	2	3	3	3	3	3	3	3	3	3
8	3	4	5	5	5	5	5	5	5	5
9	4	6	7	7	7	7	7	7	7	7
10	6	9	9	10	10	10	10	10	10	10
11	8	12	13	13	13	13	13	14	14	14
12	11	15	16	17	17	17	18	18	18	18
13	14	19	21	21	22	22	22	22	22	22
14	17	24	26	26	27	27	27	27	28	28
15	20	29	31	32	32	33	33	33	33	33
16	24	34	36	38	38	39	39	39	39	39
17	28	40	42	44	44	45	45	45	46	46
18	32	45	49	50	51	52	52	52	52	53
19	36	51	55	57	58	58	59	59	59	60
20	41	58	62	64	65	66	66	66	67	67
21	45	64	69	71	72	73	73	74	74	74
22	50	71	76	78	79	80	81	81	82	82
23	54	77	83	85	87	88	88	89	89	89
24	59	84	90	92	94	95	96	96	97	97
25	63	90	97	100	101	102	103	104	104	104
26	68	97	104	107	109	110	111	111	112	112
27	72	103	110	114	116	117	118	118	119	119
28	77	109	117	121	123	124	125	126	126	127
29	81	115	124	127	130	131	132	133	133	134
30	85	121	130	134	136	138	139	140	140	141
31	89	127	136	140	143	144	145	146	147	147
32	93	133	142	147	149	151	152	153	153	154
33	97	138	148	153	155	157	158	159	160	160
34	101	143	154	159	161	163	164	165	166	166
35	105	149	159	164	167	169	170	171	172	172
36	108	153	165	170	172	174	176	177	177	178
37	111	158	170	175	178	180	181	182	183	183
38	114	163	174	180	183	185	186	187	188	188
39	117	167	179	185	188	190	191	192	193	193
40	120	171	183	189	192	194	196	197	198	198

2.5.5 C-2, Boreal Spruce

Open, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

***Torching*, Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.3	1	1	2	2	2	2	2	2	2
2	0.9	3	4	4	5	5	5	5	5	5
3	2	6	7	8	8	9	9	9	9	9
4	3	8	11	12	12	13	13	13	14	14
5	4	11	15	16	17	18	18	18	19	19
6	5	15	19	21	22	23	23	24	24	24
7	6	18	23	26	27	28	29	29	30	30
8	7	22	28	31	32	34	34	35	35	36
9	8	25	32	36	38	39	40	41	41	42
10	9	29	37	41	43	45	46	47	48	48
11	10	33	42	46	49	51	52	53	54	54
12	11	37	47	52	55	57	58	59	60	61
13	12	41	52	57	61	63	64	66	66	67
14	14	45	57	63	66	69	70	72	73	74
15	15	49	62	68	72	75	77	78	79	80
16	16	52	66	74	78	81	83	84	85	86
17	17	56	71	79	84	87	89	91	92	93
18	18	60	76	84	89	93	95	97	98	99
19	20	64	81	90	95	99	101	103	104	105
20	21	68	86	95	101	104	107	109	111	112
21	22	72	91	100	106	110	113	115	117	118
22	23	75	95	106	112	116	119	121	123	124
23	24	79	100	111	117	122	125	127	129	130
24	25	83	105	116	123	127	130	133	135	136
25	26	86	109	121	128	133	136	139	141	142
26	27	90	114	126	133	138	142	144	146	148
27	28	93	118	131	138	143	147	150	152	154
28	29	97	122	136	144	149	153	155	158	159
29	30	100	127	140	149	154	158	161	163	165
30	31	103	131	145	153	159	163	166	168	170
31	32	106	135	150	158	164	168	171	174	176
32	33	110	139	154	163	169	173	176	179	181
33	34	113	143	158	168	174	178	181	184	186
34	35	116	147	163	172	179	183	186	189	191
35	36	119	151	167	177	183	188	191	194	196
36	37	122	155	171	181	188	193	196	199	201
37	38	125	158	175	185	192	197	201	204	206
38	39	128	162	179	190	197	202	205	208	210
39	40	130	165	183	194	201	206	210	213	215
40	41	133	169	187	198	205	210	214	217	220

2.5.6 C-3, Mature Jack or Lodgepole Pine

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
3	0.2	0.5	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7
4	0.4	1	1	2	2	2	2	2	2	2
5	0.8	2	2	3	3	3	3	3	3	3
6	1	3	4	4	5	5	5	5	5	5
7	2	5	6	6	7	7	7	7	7	7
8	3	7	8	9	9	10	10	10	10	10
9	4	9	11	12	13	13	13	***13***	***14***	***14***
10	5	12	14	16	16	***17***	***17***	***17***	***18***	***18***
11	6	15	18	19	***20***	***21***	***21***	***22***	***22***	***22***
12	7	18	22	24	***25***	***26***	***26***	***27***	***27***	***27***
13	8	22	26	***28***	***30***	***31***	***31***	***32***	***32***	***32***
14	10	25	31	***33***	***35***	***36***	***37***	***37***	***38***	***38***
15	11	29	36	***39***	***41***	***42***	43	43	44	44
16	13	34	***41***	***44***	46	48	49	49	50	51
17	15	38	***46***	***50***	53	54	55	56	57	57
18	16	43	***52***	56	59	61	62	63	63	64
19	18	47	***57***	62	65	67	69	70	70	71
20	20	52	***63***	69	72	74	76	77	78	78
21	22	57	69	75	79	81	83	84	85	86
22	24	62	75	82	86	88	90	91	92	93
23	26	***67***	81	88	92	95	97	99	100	101
24	28	***72***	87	95	99	102	104	106	107	108
25	30	***77***	94	102	106	109	112	113	115	116
26	32	***82***	100	108	113	117	119	121	122	123
27	34	***87***	106	115	120	124	126	128	130	131
28	35	***92***	112	121	127	131	133	135	137	138
29	37	***97***	118	128	134	138	141	143	144	146
30	39	***102***	124	134	141	145	148	150	152	153
31	41	***107***	130	141	147	152	155	157	159	160
32	43	112	135	147	154	158	162	164	166	167
33	45	117	141	153	160	165	168	171	173	174
34	46	121	147	159	167	172	175	178	180	181
35	48	126	152	165	173	178	182	184	187	188
36	50	130	158	171	179	184	188	191	193	195
37	52	134	163	177	185	191	194	197	200	201
38	53	139	168	182	191	197	201	204	206	208
39	55	143	173	188	197	202	207	210	212	214
40	56	147	178	193	202	208	212	216	218	220

2.5.7 C-4, Immature Jack or Lodgepole Pine

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

***Torching*, Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.6	1	2	2	2	2	2	2	2	2
2	2	4	4	5	5	5	5	5	5	5
3	3	7	8	8	8	9	9	9	9	9
4	5	10	11	12	13	13	13	13	13	14
5	6	14	16	17	17	18	18	18	18	18
6	8	17	20	21	22	23	23	23	24	24
7	10	21	25	27	27	28	29	29	29	29
8	12	26	30	32	33	34	34	35	35	35
9	14	30	35	37	38	39	40	40	41	41
10	16	34	40	42	44	45	46	46	47	47
11	18	39	45	48	50	51	52	52	53	53
12	21	43	50	54	55	57	58	58	59	59
13	23	48	55	59	61	63	64	64	65	65
14	25	52	61	65	67	69	70	70	71	72
15	27	57	66	70	73	75	76	77	77	78
16	29	61	71	76	79	80	82	83	83	84
17	31	66	76	81	84	86	88	89	89	90
18	33	70	82	87	90	92	94	95	96	96
19	36	75	87	92	96	98	100	101	102	102
20	38	79	92	98	101	104	105	107	107	108
21	40	83	97	103	107	109	111	112	113	114
22	42	88	102	109	112	115	117	118	119	120
23	44	92	107	114	118	121	122	124	125	126
24	46	96	112	119	123	126	128	129	131	132
25	48	100	116	124	128	131	133	135	136	137
26	50	104	121	129	134	137	139	140	142	143
27	52	108	126	134	139	142	144	146	147	148
28	53	112	130	139	144	147	149	151	152	153
29	55	116	135	144	149	152	154	156	158	159
30	57	120	139	148	154	157	160	161	163	164
31	59	124	143	153	158	162	164	166	168	169
32	60	127	148	157	163	167	169	171	173	174
33	62	131	152	162	168	171	174	176	178	179
34	64	134	156	166	172	176	179	181	182	184
35	65	138	160	170	176	180	183	185	187	188
36	67	141	164	174	181	185	188	190	191	193
37	69	144	167	178	185	189	192	194	196	197
38	70	147	171	182	189	193	196	199	200	202
39	72	151	175	186	193	197	200	203	205	206
40	73	154	178	190	197	201	205	207	209	210

2.5.8 C-5, Red and White Pine

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min

***Torching*, Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
4	0.1	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
5	0.3	0.6	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8
6	0.5	1	1	1	1	1	1	1	1	1
7	0.8	2	2	2	2	2	2	2	2	2
8	1	3	3	3	3	3	3	3	3	3
9	2	4	4	4	5	5	5	5	5	5
10	2	5	6	6	6	6	6	6	7	7
11	3	6	7	8	8	8	8	8	8	9
12	4	8	9	10	10	10	10	11	11	11
13	5	10	11	12	12	12	13	13	13	13
14	5	11	13	14	15	15	15	15	15	16
15	6	13	16	17	17	18	18	18	18	18
16	7	15	18	19	20	20	21	21	21	21
17	8	18	20	22	22	23	23	24	24	24
18	9	20	23	24	25	26	26	27	27	27
19	10	22	25	27	28	29	29	29	30	30
20	11	24	28	30	31	32	32	32	33	***33***
21	13	26	31	33	34	34	35	35	***36***	***36***
22	14	29	33	35	37	37	38	38	***39***	***39***
23	15	31	36	38	39	40	41	***41***	***42***	***42***
24	16	33	38	41	42	43	***44***	***44***	***45***	***45***
25	17	*35*	41	43	45	46	***46***	***47***	***47***	***48***
26	18	*37*	43	46	47	48	***49***	***50***	***50***	***51***
27	19	*39*	45	48	50	51	***52***	***52***	***53***	***53***
28	19	*41*	47	51	52	54	***54***	***55***	***55***	***56***
29	20	*43*	50	53	55	56	***57***	***57***	***58***	***58***
30	21	*44*	52	55	57	***58***	***59***	***60***	***60***	***61***
31	22	*46*	54	57	59	***61***	***61***	***62***	***63***	63
32	23	48	55	59	61	***63***	***64***	***64***	65	65
33	24	49	57	61	63	***65***	***66***	***66***	67	68
34	24	51	59	63	65	***67***	***68***	69	69	70
35	25	52	61	65	67	***69***	***70***	70	71	72
36	26	54	62	66	69	***70***	***71***	72	73	73
37	26	55	64	68	***70***	***72***	***73***	74	75	75
38	27	56	65	69	***72***	***74***	75	76	76	77
39	27	57	67	71	***73***	***75***	76	77	78	78
40	28	58	68	72	***75***	***77***	78	79	79	80

2.5.9 C-6, Conifer Plantation, 6ft crown base height

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
3	0.3	0.7	0.8	0.9	0.9	0.9	1	1	1	1
4	0.7	2	2	2	2	3	4	4	4	4
5	1	3	3	5	7	8	9	9	10	10
6	2	4	7	12	14	15	16	17	17	17
7	3	6	15	20	23	24	24	25	25	26
8	4	8	24	29	32	33	33	34	34	34
9	5	10	33	39	41	42	42	43	43	43
10	6	20	43	47	49	50	51	51	52	52
11	7	31	52	56	58	59	59	60	60	60
12	8	42	60	64	65	66	67	67	67	67
13	10	52	68	71	72	73	73	73	74	74
14	11	61	74	77	78	79	79	79	80	80
15	12	69	81	83	84	84	85	85	85	85
16	13	76	86	88	89	89	90	90	90	90
17	14	83	91	93	94	94	94	94	94	94
18	16	88	96	97	98	98	98	98	99	99
19	17	94	100	101	102	102	102	102	102	102
20	18	98	104	105	105	106	106	106	106	106
21	19	103	108	108	109	109	109	109	109	109
22	20	107	111	112	112	112	112	112	112	112
23	21	110	114	115	115	115	115	115	115	115
24	22	114	117	117	118	118	118	118	118	118
25	23	117	120	120	120	120	120	120	120	120
26	24	120	122	123	123	123	123	123	123	123
27	24	122	125	125	125	125	125	125	125	125
28	25	125	127	127	127	127	127	127	127	127
29	26	127	129	129	129	129	129	129	129	130
30	26	129	131	131	131	131	131	131	131	131
31	27	131	133	133	133	133	133	133	133	133
32	28	133	135	135	135	135	135	135	135	135
33	28	135	136	137	137	137	137	137	137	137
34	29	137	138	138	138	138	138	138	138	138
35	29	138	140	140	140	140	140	140	140	140
36	30	140	141	141	141	141	141	141	141	141
37	30	141	143	143	143	143	143	143	143	143
38	30	143	144	144	144	144	144	144	144	144
39	31	144	145	145	145	145	145	145	145	145
40	31	145	146	146	147	147	147	147	147	147

2.5.10 C-6, Conifer Plantation, 20 ft crown base height

Closed, Rate of Spread in ch/hr
Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
3	0.3	0.7	0.8	0.9	0.9	0.9	1	1	1	1
4	0.7	2	2	2	2	2	2	2	2	2
5	1	3	3	3	3	4	4	4	4	4
6	2	4	5	5	5	5	5	6	6	6
7	3	6	7	7	8	8	9	12	***13***	***14***
8	4	8	9	10	10	***16***	***20***	***22***	***24***	***25***
9	5	10	12	12	***20***	***27***	***31***	***33***	***34***	***35***
10	6	12	14	17	***32***	***38***	***42***	***43***	***45***	***45***
11	7	15	17	***31***	***44***	***49***	***51***	***53***	***54***	***55***
12	8	17	20	***44***	***54***	***58***	***60***	***62***	***63***	***63***
13	10	20	23	***55***	***63***	***67***	***68***	***70***	***70***	***71***
14	11	23	***32***	***64***	***71***	***74***	***76***	***76***	***77***	***77***
15	12	25	***46***	***73***	***79***	***81***	***82***	***83***	***83***	***83***
16	13	28	***59***	***80***	***85***	***87***	87	88	88	89
17	14	30	***69***	***87***	***90***	92	92	93	93	93
18	16	33	***78***	***92***	95	96	97	97	98	98
19	17	35	***85***	***97***	100	101	101	101	102	102
20	18	38	***92***	102	104	105	105	105	105	105
21	19	40	***98***	106	107	108	108	109	109	109
22	20	42	***103***	109	111	111	112	112	112	112
23	21	44	***107***	113	114	114	115	115	115	115
24	22	46	***111***	116	117	117	117	118	118	118
25	23	48	115	119	120	120	120	120	120	120
26	24	50	118	122	122	122	123	123	123	123
27	24	51	121	124	125	125	125	125	125	125
28	25	53	124	126	127	127	127	127	127	127
29	26	54	126	129	129	129	129	129	129	129
30	26	56	128	131	131	131	131	131	131	131
31	27	57	131	133	133	133	133	133	133	133
32	28	58	133	134	135	135	135	135	135	135
33	28	59	135	136	137	137	137	137	137	137
34	29	60	136	138	138	138	138	138	138	138
35	29	61	138	139	140	140	140	140	140	140
36	30	62	140	141	141	141	141	141	141	141
37	30	63	141	142	143	143	143	143	143	143
38	30	66	143	144	144	144	144	144	144	144
39	31	72	144	145	145	145	145	145	145	145
40	31	***76***	145	146	146	146	146	147	147	147

2.5.11 C-7, Ponderosa Pine/Douglas-Fir

Closed, Rate of Spread in ch/hr
Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
3	0.5	0.8	0.9	1	1	1	1	1	1	1
4	0.8	2	2	2	2	2	2	2	2	2
5	1	2	3	3	3	3	3	3	3	3
6	2	3	3	4	4	4	4	4	4	4
7	2	4	5	5	5	5	5	5	5	5
8	3	5	6	6	6	6	6	6	7	7
9	4	6	7	7	8	8	8	8	8	8
10	4	8	9	9	9	9	9	10	10	10
11	5	9	10	11	11	11	11	11	11	11
12	6	10	12	12	12	13	13	13	13	13
13	7	12	13	14	14	14	15	15	15	15
14	8	13	15	16	16	16	16	17	17	17
15	9	15	17	17	18	18	18	19	19	19
16	10	17	18	19	20	20	20	21	21	21
17	11	18	20	21	22	22	22	***23***	***23***	***23***
18	12	20	22	23	***24***	***24***	***24***	***25***	***25***	***25***
19	12	21	24	***25***	***26***	***26***	***26***	***27***	***27***	***27***
20	13	23	26	***27***	***28***	***28***	***28***	***29***	***29***	***29***
21	14	25	***28***	***29***	***30***	***30***	***31***	***31***	***31***	***31***
22	15	26	***29***	***31***	***32***	***32***	***33***	***33***	***33***	***33***
23	16	28	***31***	***33***	***34***	***34***	***35***	***35***	***35***	***35***
24	17	***30***	***33***	***35***	***36***	***36***	***37***	***37***	***37***	***37***
25	18	***32***	***35***	***37***	***38***	***38***	***39***	***39***	***39***	***40***
26	19	***33***	***37***	***39***	***40***	***40***	***41***	***41***	***41***	***42***
27	20	***35***	***39***	***41***	***42***	***42***	***43***	***43***	***44***	***44***
28	21	***37***	***41***	***43***	***44***	***44***	***45***	***45***	***46***	***46***
29	22	***38***	***43***	***45***	***46***	***46***	***47***	***47***	***48***	***48***
30	23	***40***	***44***	***46***	***48***	***48***	***49***	***49***	***50***	50
31	24	***41***	***46***	***48***	***50***	***50***	51	51	52	52
32	25	***43***	***48***	***50***	51	52	53	53	54	54
33	26	***45***	***50***	***52***	53	54	55	55	56	56
34	27	***46***	***51***	54	55	56	57	57	58	58
35	28	***48***	***53***	56	57	58	59	59	60	60
36	29	***49***	55	57	59	60	61	61	61	62
37	29	***51***	56	59	61	62	62	63	63	64
38	30	***52***	58	61	62	63	64	65	65	65
39	31	***54***	60	62	64	65	66	66	67	67
40	32	***55***	61	64	66	67	68	68	69	69

2.5.12 D-1, Leafless Aspen

Open Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
2	0.4	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
3	0.8	1	1	1	1	1	1	1	1	1
4	1	2	2	2	2	2	2	2	2	2
5	2	3	3	3	3	3	3	3	3	3
6	2	3	4	4	4	4	4	4	4	4
7	3	4	5	5	5	5	5	5	5	5
8	4	5	6	6	6	6	6	6	6	6
9	4	6	7	7	7	7	7	7	7	7
10	5	7	8	8	8	8	8	8	8	8
11	6	8	9	9	9	9	9	9	9	9
12	7	9	10	10	10	11	11	11	11	11
13	7	10	11	11	12	12	12	12	12	12
14	8	11	12	13	13	13	13	13	13	13
15	9	13	13	14	14	14	14	14	14	15
16	10	14	15	15	15	15	16	16	16	16
17	10	15	16	16	17	17	17	17	17	17
18	11	16	17	18	18	18	18	18	18	18
19	12	17	18	19	19	19	19	20	20	20
20	13	18	19	20	20	21	21	21	21	21
21	14	19	21	21	22	22	22	22	22	22
22	14	20	22	23	23	23	23	24	24	24
23	15	22	23	24	24	25	25	25	25	25
24	16	23	24	25	26	26	26	26	26	26
25	17	24	26	26	27	27	27	27	28	28
26	18	25	27	28	28	28	29	29	29	29
27	18	26	28	29	29	30	30	30	30	30
28	19	27	29	30	31	31	31	31	31	32
29	20	28	30	31	32	32	32	33	33	33
30	21	29	32	32	33	33	34	34	34	34
31	21	30	33	34	34	35	35	35	35	35
32	22	32	34	35	35	36	36	36	36	37
33	23	33	35	36	37	37	37	37	38	38
34	24	34	36	37	38	38	38	39	39	39
35	24	35	37	38	39	39	40	40	40	40
36	25	36	38	39	40	41	41	41	41	41
37	26	37	39	41	41	42	42	42	42	43
38	27	38	40	42	42	43	43	43	44	44
39	27	39	41	43	43	44	44	44	45	45
40	28	40	43	44	45	45	45	46	46	46

2.5.13 D-2, Green Aspen

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min

Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
3	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
4	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
5	0.2	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
6	0.3	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8
7	0.4	0.7	0.9	0.9	0.9	1	1	1	1	1
8	0.4	0.9	1	1	1	1	1	1	1	1
9	0.5	1	1	1	1	1	1	1	2	2
10	0.6	1	1	2	2	2	2	2	2	2
11	0.7	1	2	2	2	2	2	2	2	2
12	0.8	2	2	2	2	2	2	2	2	2
13	0.9	2	2	2	2	2	2	2	2	2
14	0.9	2	2	3	3	3	3	3	3	3
15	1	2	3	3	3	3	3	3	3	3
16	1	2	3	3	3	3	3	3	3	3
17	1	3	3	3	3	3	3	4	4	4
18	1	3	3	3	4	4	4	4	4	4
19	1	3	3	4	4	4	4	4	4	4
20	2	3	4	4	4	4	4	4	4	4
21	2	3	4	4	4	4	5	5	5	5
22	2	4	4	4	5	5	5	5	5	5
23	2	4	4	5	5	5	5	5	5	5
24	2	4	5	5	5	5	5	5	5	5
25	2	4	5	5	5	5	6	6	6	6
26	2	4	5	5	6	6	6	6	6	6
27	2	5	5	6	6	6	6	6	6	6
28	2	5	6	6	6	6	6	6	6	7
29	2	5	6	6	6	6	7	7	7	7
30	2	5	6	6	7	7	7	7	7	7
31	3	5	6	7	7	7	7	7	7	7
32	3	6	6	7	7	7	7	7	7	8
33	3	6	7	7	7	7	8	8	8	8
34	3	6	7	7	8	8	8	8	8	8
35	3	6	7	8	8	8	8	8	8	8
36	3	6	7	8	8	8	8	8	8	9
37	3	6	7	8	8	8	9	9	9	9
38	3	7	8	8	8	9	9	9	9	9
39	3	7	8	8	9	9	9	9	9	9
40	3	7	8	9	9	9	9	9	9	9

2.5.14 M-1, Boreal MixedWood, Leafless (25% conifer)

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.2	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6
2	0.6	1	1	2	2	2	2	2	2	2
3	1	2	3	3	3	3	3	3	3	3
4	2	4	4	5	5	5	5	5	5	5
5	2	5	6	6	7	7	7	7	7	7
6	3	7	8	8	8	9	9	9	9	9
7	4	8	9	10	10	11	11	11	11	11
8	5	10	11	12	13	13	13	13	13	13
9	6	12	13	14	15	15	15	16	16	16
10	6	13	15	16	17	17	18	18	18	18
11	7	15	18	19	19	20	20	20	21	21
12	8	17	20	21	22	22	23	23	23	23
13	9	19	22	23	24	25	25	25	25	26
14	10	21	24	26	26	27	27	28	28	28
15	11	23	26	28	29	30	30	30	31	31
16	12	24	28	30	31	32	32	33	33	33
17	13	26	30	32	34	34	35	35	36	36
18	13	28	33	35	36	37	37	38	38	39
19	14	30	35	37	38	39	40	40	41	41
20	15	32	37	39	41	42	42	43	43	44
21	16	34	39	42	43	44	45	45	46	46
22	17	36	41	44	46	47	47	48	48	49
23	18	37	43	46	48	49	50	50	51	51
24	19	39	46	49	50	51	52	53	53	54
25	20	41	48	51	53	54	55	55	56	56
26	20	43	50	53	55	56	57	58	58	59
27	21	45	52	55	57	58	59	60	61	61
28	22	46	54	57	59	61	62	62	63	63
29	23	48	56	59	62	63	64	65	65	66
30	24	50	58	61	64	65	66	67	67	68
31	24	51	60	64	66	67	68	69	70	70
32	25	53	62	66	68	69	71	71	72	72
33	26	55	63	68	70	72	73	74	74	75
34	27	56	65	70	72	74	75	76	76	77
35	27	58	67	71	74	76	77	78	78	79
36	28	59	69	73	76	78	79	80	81	81
37	29	61	71	75	78	80	81	82	83	83
38	30	62	72	77	80	82	83	84	85	85
39	30	64	74	79	82	84	85	86	87	87
40	31	65	76	81	84	85	87	88	89	89

2.5.15 M-2, Boreal MixedWood, Green (25% conifer)

Closed, Rate of Spread in ch/hr
Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.2	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
2	0.5	1	1	1	1	1	1	1	1	1
3	0.8	2	2	2	2	2	2	2	2	2
4	1	3	3	3	4	4	4	4	4	4
5	2	4	4	5	5	5	5	5	5	5
6	2	5	6	6	6	6	6	6	7	7
7	3	6	7	7	8	8	8	8	8	8
8	3	7	8	9	9	9	9	10	10	10
9	4	8	10	10	11	11	11	11	11	11
10	5	10	11	12	12	13	13	13	13	13
11	5	11	13	13	14	14	14	15	15	15
12	6	12	14	15	16	16	16	16	16	17
13	6	13	16	17	17	18	18	18	18	18
14	7	15	17	18	19	19	20	20	20	20
15	8	16	19	20	20	21	21	22	22	22
16	8	17	20	21	22	23	23	23	23	24
17	9	19	22	23	24	24	25	25	25	25
18	9	20	23	25	25	26	26	27	27	27
19	10	21	25	26	27	28	28	28	29	29
20	11	22	26	28	29	29	30	30	30	31
21	11	24	27	29	30	31	32	32	32	32
22	12	25	29	31	32	33	33	34	34	34
23	12	26	30	32	34	34	35	35	36	36
24	13	27	32	34	35	36	36	37	37	37
25	14	29	33	35	37	37	38	38	39	39
26	14	30	35	37	38	39	40	40	40	41
27	15	31	36	38	40	41	41	42	42	42
28	15	32	37	40	41	42	43	43	44	44
29	16	33	39	41	43	44	44	45	45	45
30	16	34	40	42	44	45	46	46	47	47
31	17	35	41	44	45	46	47	48	48	49
32	17	37	42	45	47	48	49	49	50	50
33	18	38	44	47	48	49	50	51	51	51
34	18	39	45	48	50	51	51	52	53	53
35	19	40	46	49	51	52	53	53	54	54
36	19	41	47	50	52	53	54	55	55	56
37	20	42	48	52	53	55	55	56	57	57
38	20	43	49	53	55	56	57	57	58	58
39	21	44	51	54	56	57	58	59	59	60
40	21	45	52	55	57	58	59	60	60	61

2.5.16 M-1, Boreal MixedWood, Leafless (50% conifer)

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.4	0.7	0.9	0.9	1	1	1	1	1	1
2	1	2	2	3	3	3	3	3	3	3
3	2	4	4	5	5	5	5	5	5	5
4	3	6	7	7	7	8	8	8	8	8
5	4	8	9	10	10	10	11	11	11	11
6	5	10	12	13	13	13	14	14	14	14
7	6	13	15	16	16	17	17	17	17	17
8	7	15	18	19	19	20	20	20	21	21
9	8	18	21	22	23	23	24	24	24	24
10	10	20	24	25	26	27	27	27	28	28
11	11	23	27	29	30	30	31	31	31	32
12	12	26	30	32	33	34	34	35	35	35
13	14	29	33	35	37	37	38	38	39	39
14	15	31	36	39	40	41	42	42	43	43
15	16	34	40	42	44	45	45	46	46	47
16	18	37	43	46	47	48	49	50	50	50
17	19	40	46	49	51	52	53	53	54	54
18	20	42	49	53	54	56	57	57	58	58
19	22	45	52	56	58	59	60	61	61	62
20	23	48	56	59	61	63	64	65	65	66
21	24	51	59	63	65	66	67	68	69	69
22	25	53	62	66	68	70	71	72	72	73
23	27	56	65	69	72	73	75	75	76	77
24	28	59	68	73	75	77	78	79	80	80
25	29	61	71	76	79	80	82	83	83	84
26	30	64	74	79	82	84	85	86	87	87
27	32	66	77	82	85	87	88	89	90	91
28	33	69	80	85	88	90	92	93	94	94
29	34	71	83	88	91	94	95	96	97	98
30	35	74	86	91	95	97	98	99	100	101
31	36	76	88	94	98	100	101	103	103	104
32	37	79	91	97	101	103	105	106	107	107
33	38	81	94	100	104	106	108	109	110	111
34	40	83	96	103	107	109	111	112	113	114
35	41	85	99	106	109	112	114	115	116	117
36	42	88	102	108	112	115	117	118	119	120
37	43	90	104	111	115	118	119	121	122	123
38	44	92	107	114	118	120	122	124	125	126
39	45	94	109	116	120	123	125	126	128	128
40	46	96	111	119	123	126	128	129	130	131

2.5.17 M-2, Boreal MixedWood, Green (50% conifer)

Closed, Rate of Spread in ch/hr
Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
***Torching*, Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.3	0.7	0.8	0.8	0.9	0.9	0.9	0.9	0.9	0.9
2	0.9	2	2	2	2	3	3	3	3	3
3	2	3	4	4	4	4	5	5	5	5
4	2	5	6	6	7	7	7	7	7	7
5	3	7	8	9	9	9	9	9	10	10
6	4	9	10	11	12	12	12	12	12	12
7	5	11	13	14	14	15	15	15	15	15
8	6	13	15	16	17	17	18	18	18	18
9	7	16	18	19	20	20	21	21	21	21
10	9	18	21	22	23	23	24	24	24	24
11	10	20	23	25	26	27	27	27	27	28
12	11	23	26	28	29	30	30	30	31	31
13	12	25	29	31	32	33	33	34	34	34
14	13	27	32	34	35	36	36	37	37	37
15	14	30	35	37	38	39	40	40	40	41
16	15	32	37	40	41	42	43	43	44	44
17	16	35	40	43	44	45	46	47	47	47
18	18	37	43	46	47	48	49	50	50	51
19	19	39	46	49	50	51	52	53	53	54
20	20	42	48	51	53	55	55	56	57	57
21	21	44	51	54	56	58	59	59	60	60
22	22	46	54	57	59	61	62	62	63	63
23	23	49	56	60	62	64	65	65	66	66
24	24	51	59	63	65	67	68	68	69	69
25	25	53	61	66	68	69	71	71	72	72
26	26	55	64	68	71	72	73	74	75	75
27	27	57	67	71	73	75	76	77	78	78
28	28	59	69	74	76	78	79	80	81	81
29	29	62	71	76	79	81	82	83	84	84
30	30	64	74	79	81	83	85	86	86	87
31	31	66	76	81	84	86	87	88	89	90
32	32	68	78	84	87	89	90	91	92	92
33	33	70	81	86	89	91	93	94	94	95
34	34	71	83	88	92	94	95	96	97	98
35	35	73	85	91	94	96	98	99	100	100
36	36	75	87	93	96	98	100	101	102	103
37	37	77	89	95	99	101	102	104	104	105
38	37	79	91	97	101	103	105	106	107	108
39	38	80	93	99	103	105	107	108	109	110
40	39	82	95	102	105	108	109	111	112	112

2.5.18 M-1, Boreal MixedWood, Leafless (75% conifer)

Closed, Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

***Torching*, Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.5	1.0	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.4
2	1.4	2.9	3.3	3.5	3.7	3.7	3.8	3.9	3.9	3.9
3	2.5	5.2	6.0	6.4	6.6	6.8	6.9	6.9	7.0	7.1
4	3.7	8	9	10	10	10	10	11	11	11
5	5.1	11	12	13	14	14	14	14	15	15
6	7	14	16	17	18	18	18	19	19	19
7	8	17	20	21	22	22	23	23	23	23
8	10	20	24	25	26	27	27	27	28	28
9	11	24	28	30	31	31	32	32	32	33
10	13	27	32	34	35	36	37	37	37	38
11	15	31	36	38	40	41	41	42	42	42
12	17	35	40	43	44	45	46	47	47	47
13	18	38	44	47	49	50	51	52	52	52
14	20	42	49	52	54	55	56	57	57	57
15	22	46	53	57	59	60	61	62	62	63
16	24	49	57	61	63	65	66	67	67	68
17	25	53	62	66	68	70	71	71	72	73
18	27	57	66	70	73	74	76	76	77	78
19	29	60	70	75	77	79	80	81	82	83
20	30	64	74	79	82	84	85	86	87	88
21	32	68	78	84	87	89	90	91	92	92
22	34	71	83	88	91	93	95	96	97	97
23	36	75	87	92	96	98	99	101	101	102
24	37	78	91	97	100	102	104	105	106	107
25	39	82	95	101	104	107	109	110	111	112
26	40	85	99	105	109	111	113	114	115	116
27	42	88	102	109	113	116	117	119	120	121
28	44	92	106	113	117	120	122	123	124	125
29	45	95	110	117	121	124	126	128	129	130
30	47	98	114	121	125	128	130	132	133	134
31	48	101	117	125	129	132	134	136	137	138
32	49	104	121	129	133	136	139	140	141	142
33	51	107	124	132	137	140	143	144	145	146
34	52	110	128	136	141	144	146	148	149	151
35	54	113	131	140	145	148	150	152	153	154
36	55	116	134	143	148	152	154	156	157	158
37	56	119	138	147	152	155	158	160	161	162
38	58	121	141	150	155	159	161	163	165	166
39	59	124	144	153	159	162	165	167	168	170
40	60	127	147	157	162	166	169	170	172	173

2.5.19 M-2, Boreal MixedWood, Green (75% conifer)

Closed, Rate of Spread in ch/hr
Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.5	1	1	1	1	1	1	1	1	1
2	1	3	3	3	4	4	4	4	4	4
3	2	5	6	6	6	7	7	7	7	7
4	4	8	9	9	10	10	10	10	10	10
5	5	10	12	13	13	13	14	14	14	14
6	6	13	15	16	17	17	18	18	18	18
7	8	16	19	20	21	21	22	22	22	22
8	9	20	23	24	25	26	26	26	27	27
9	11	23	26	28	29	30	30	31	31	31
10	12	26	30	32	34	34	35	35	36	36
11	14	30	34	37	38	39	39	40	40	40
12	16	33	38	41	42	43	44	45	45	45
13	17	37	42	45	47	48	49	49	50	50
14	19	40	46	50	51	52	53	54	54	55
15	21	44	51	54	56	57	58	59	59	60
16	22	47	55	58	60	62	63	63	64	64
17	24	51	59	62	65	66	67	68	69	69
18	26	54	63	67	69	71	72	73	73	74
19	27	57	67	71	74	75	76	77	78	79
20	29	61	71	75	78	80	81	82	83	83
21	31	64	75	79	82	84	86	86	87	88
22	32	68	78	84	87	89	90	91	92	92
23	34	71	82	88	91	93	94	95	96	97
24	35	74	86	92	95	97	99	100	101	101
25	37	77	90	96	99	101	103	104	105	106
26	38	81	93	100	103	106	107	108	109	110
27	40	84	97	104	107	110	111	113	114	114
28	41	87	101	107	111	114	116	117	118	119
29	43	90	104	111	115	118	120	121	122	123
30	44	93	108	115	119	122	124	125	126	127
31	46	96	111	118	123	125	127	129	130	131
32	47	99	114	122	126	129	131	133	134	135
33	48	101	118	125	130	133	135	137	138	139
34	50	104	121	129	134	137	139	140	142	143
35	51	107	124	132	137	140	142	144	145	146
36	52	110	127	136	140	144	146	148	149	150
37	53	112	130	139	144	147	149	151	152	153
38	55	115	133	142	147	150	153	155	156	157
39	56	117	136	145	150	154	156	158	159	160
40	57	120	139	148	153	157	159	161	163	164

2.5.20 M-3, Leafless Mixedwood, Dead Fir 30%

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	1	2	2	2	2	2	2	2	2	2
2	2	5	5	6	6	6	6	6	6	6
3	4	8	9	10	10	***10***	***10***	***10***	***11***	***11***
4	6	11	13	***14***	***14***	***15***	***15***	***15***	***15***	***15***
5	8	15	***17***	***18***	***19***	***19***	***20***	***20***	***20***	***20***
6	10	19	***22***	***23***	***24***	24	***25***	***25***	***25***	***25***
7	11	23	***26***	***28***	***29***	***29***	***30***	***30***	***30***	***30***
8	13	***26***	***30***	***32***	***33***	***34***	***35***	***35***	***35***	***35***
9	15	***30***	***35***	***37***	***38***	39	39	40	40	40
10	17	***34***	***39***	41	43	44	44	45	45	45
11	19	***38***	***43***	46	47	48	49	50	50	50
12	21	***41***	47	50	52	53	54	54	55	55
13	23	***45***	51	54	56	57	58	59	59	60
14	25	***48***	55	59	61	62	63	63	64	64
15	27	52	59	63	65	66	67	68	68	69
16	28	55	63	66	69	70	71	72	72	73
17	30	58	66	70	73	74	75	76	77	77
18	32	61	70	74	76	78	79	80	81	81
19	33	64	73	78	80	82	83	84	84	85
20	35	67	76	81	84	85	87	88	88	89
21	36	70	80	84	87	89	90	91	92	92
22	38	72	83	88	90	92	94	95	95	96
23	39	75	86	91	94	95	97	98	99	99
24	40	77	88	94	97	99	100	101	102	102
25	42	80	91	96	100	102	103	104	105	106
26	43	82	94	99	102	105	106	107	108	109
27	44	84	96	102	105	107	109	110	111	112
28	45	86	99	104	108	110	112	113	114	114
29	47	89	101	107	110	113	114	115	116	117
30	48	91	103	109	113	115	117	118	119	120
31	49	93	106	112	115	118	119	120	121	122
32	50	94	108	114	118	120	122	123	124	125
33	51	96	110	116	120	122	124	125	126	127
34	52	98	112	118	122	124	126	127	128	129
35	53	100	114	120	124	126	128	129	131	131
36	54	101	115	122	126	128	130	132	133	133
37	55	103	117	124	128	130	132	134	135	135
38	56	104	119	126	130	132	134	135	136	137
39	57	106	120	127	131	134	136	137	138	139
40	57	107	122	129	133	136	138	139	140	141

2.5.21 M-4, Green Mixedwood, Dead Fir 30%

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.3	1	1	1	1	1	1	1	1	1
2	1	2	2	2	2	2	2	2	2	2
3	1	3	4	4	4	4	4	4	4	4
4	2	5	5	6	6	6	6	6	6	6
5	3	6	7	8	8	8	8	9	9	9
6	4	8	9	10	10	11	11	11	11	11
7	5	10	11	12	13	13	13	13	13	13
8	6	12	13	14	15	15	15	16	16	16
9	6	13	16	17	17	18	18	18	18	18
10	7	15	18	19	20	20	20	21	21	21
11	8	17	20	21	22	22	23	23	23	23
12	9	19	22	24	24	25	25	26	26	26
13	10	21	24	26	27	27	28	28	28	28
14	11	23	26	28	29	30	30	30	31	31
15	12	24	28	30	31	32	32	33	33	33
16	12	26	30	32	33	34	35	35	35	36
17	13	28	32	34	36	36	37	37	38	38
18	14	29	34	36	38	39	39	40	40	40
19	15	31	36	38	40	41	41	42	42	43
20	16	33	38	40	42	43	44	44	44	45
21	16	34	40	42	44	45	46	46	47	47
22	17	36	42	44	46	47	48	48	49	49
23	18	37	43	46	48	49	50	50	51	51
24	18	39	45	48	50	51	52	52	53	53
25	19	40	47	50	51	53	53	54	54	55
26	20	41	48	51	53	54	55	56	56	57
27	20	43	50	53	55	56	57	58	58	59
28	21	44	51	55	56	58	59	59	60	60
29	22	45	53	56	58	59	60	61	62	62
30	22	47	54	58	60	61	62	63	63	64
31	23	48	55	59	61	62	63	64	65	65
32	23	49	57	60	63	64	65	66	66	67
33	24	50	58	62	64	65	66	67	68	68
34	24	51	59	63	65	67	68	69	69	70
35	25	52	60	64	67	68	69	70	71	71
36	25	53	61	66	68	69	71	71	72	72
37	26	54	63	67	69	71	72	73	73	74
38	26	55	64	68	70	72	73	74	75	75
39	26	56	65	69	71	73	74	75	76	76
40	27	57	66	70	73	74	75	76	77	77

2.5.22 M-3, Leafless Mixedwood, Dead Fir 60%

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	2	3	4	4	4	4	4	5	5	5
2	4	9	10	11	11	11	11	11	12	12
3	7	15	17	18	19	19	19	19	20	20
4	10	21	24	26	27	27	28	28	28	28
5	13	28	32	34	35	36	37	37	37	38
6	17	34	40	42	44	45	45	46	46	47
7	20	41	48	51	52	53	54	55	55	56
8	23	48	55	59	61	62	63	64	64	65
9	26	54	63	67	69	71	72	73	73	74
10	30	61	70	75	77	79	80	81	82	83
11	33	67	78	83	86	87	89	90	91	91
12	36	73	85	90	93	95	97	98	99	100
13	39	79	92	98	101	103	105	106	107	108
14	41	85	98	105	108	111	112	114	115	115
15	44	91	105	111	115	118	120	121	122	123
16	47	96	111	118	122	125	127	128	129	130
17	49	101	117	124	129	131	134	135	136	137
18	52	106	123	130	135	138	140	142	143	144
19	54	111	128	136	141	144	146	148	149	150
20	57	115	133	142	147	150	152	154	155	156
21	59	120	138	147	152	156	158	160	161	162
22	61	124	143	152	158	161	164	166	167	168
23	63	128	148	157	163	166	169	171	172	173
24	65	132	152	162	168	171	174	176	177	179
25	67	136	157	167	172	176	179	181	182	184
26	68	139	161	171	177	181	183	186	187	188
27	70	143	165	175	181	185	188	190	192	193
28	72	146	168	179	185	189	192	194	196	197
29	73	149	172	183	189	193	196	198	200	201
30	75	152	175	186	193	197	200	202	204	205
31	76	155	178	190	196	201	204	206	208	209
32	78	157	182	193	200	204	207	209	211	213
33	79	160	184	196	203	207	210	213	215	216
34	80	162	187	199	206	210	214	216	218	219
35	81	165	190	202	209	213	217	219	221	222
36	83	167	193	205	212	216	220	222	224	225
37	84	169	195	207	214	219	222	225	227	228
38	85	171	197	210	217	222	225	228	229	231
39	86	173	200	212	219	224	228	230	232	234
40	87	175	202	214	222	227	230	233	234	236

2.5.23 M-4, Green Mixedwood, Dead Fir 60%

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min

Divide by 80 to get miles/hour

Divide by 3 to get meters/min

Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.6	1	2	2	2	2	2	2	2	2
2	2	4	4	4	5	5	5	5	5	5
3	3	6	7	8	8	8	8	8	8	9
4	4	9	11	11	12	12	12	13	13	13
5	6	13	15	16	16	16	17	17	17	17
6	8	16	19	20	20	21	21	22	22	22
7	9	19	23	24	25	26	26	26	26	27
8	11	23	27	29	30	30	31	31	31	32
9	13	27	31	33	34	35	36	36	36	37
10	14	30	35	38	39	40	40	41	41	42
11	16	34	39	42	44	45	45	46	46	47
12	18	38	44	47	48	49	50	51	51	52
13	20	41	48	51	53	54	55	56	56	56
14	21	45	52	55	57	59	60	60	61	61
15	23	48	56	60	62	63	64	65	66	66
16	25	52	60	64	66	68	69	70	70	71
17	26	55	64	68	71	72	73	74	75	75
18	28	58	68	72	75	77	78	79	79	80
19	29	62	71	76	79	81	82	83	84	84
20	31	65	75	80	83	85	86	87	88	89
21	32	68	79	84	87	89	90	91	92	93
22	34	71	82	88	91	93	94	95	96	97
23	35	74	86	91	95	97	98	99	100	101
24	36	77	89	95	98	100	102	103	104	105
25	38	79	92	98	102	104	106	107	108	109
26	39	82	95	101	105	108	109	111	111	112
27	40	85	98	105	108	111	113	114	115	116
28	41	87	101	108	112	114	116	117	118	119
29	43	90	104	111	115	117	119	121	122	123
30	44	92	107	114	118	121	122	124	125	126
31	45	94	109	117	121	124	126	127	128	129
32	46	97	112	119	124	127	129	130	131	132
33	47	99	115	122	126	129	131	133	134	135
34	48	101	117	125	129	132	134	136	137	138
35	49	103	119	127	132	135	137	138	140	141
36	50	105	122	129	134	137	139	141	142	143
37	51	107	124	132	137	140	142	144	145	146
38	52	108	126	134	139	142	144	146	147	148
39	52	110	128	136	141	144	147	148	150	151
40	53	112	130	138	143	147	149	151	152	153

2.5.24 M-3, Leafless Mixedwood, Dead Fir 100%

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	3	6	6	7	7	7	7	7	7	8
2	7	14	16	17	18	18	18	19	19	19
3	11	23	27	29	30	31	31	32	32	32
4	16	34	39	42	43	44	45	45	46	46
5	21	44	51	55	57	58	59	60	60	61
6	26	55	64	68	70	72	73	74	75	75
7	31	66	76	81	84	86	87	88	89	90
8	36	76	88	94	98	100	101	103	103	104
9	41	87	100	107	111	113	115	117	118	118
10	46	97	112	120	124	127	129	130	131	132
11	51	107	124	132	136	140	142	143	145	146
12	55	116	135	144	149	152	154	156	158	159
13	60	125	145	155	161	164	167	169	170	171
14	64	134	156	166	172	176	179	181	182	183
15	68	143	166	176	183	187	190	192	194	195
16	72	151	175	187	193	198	201	203	205	206
17	75	159	184	196	203	208	211	214	216	217
18	79	166	193	206	213	218	221	224	226	227
19	83	174	201	215	222	227	231	234	236	237
20	86	180	209	223	231	236	240	243	245	247
21	89	187	217	231	240	245	249	252	254	256
22	92	193	224	239	248	253	257	260	262	264
23	95	199	231	246	255	261	265	268	271	272
24	97	205	238	253	263	269	273	276	278	280
25	100	210	244	260	269	276	280	283	286	288
26	102	215	250	266	276	282	287	290	293	295
27	105	220	256	273	282	289	293	297	299	301
28	107	225	261	278	288	295	300	303	306	308
29	109	229	266	284	294	301	305	309	312	314
30	111	234	271	289	299	306	311	315	317	320
31	113	238	276	294	304	311	316	320	323	325
32	115	241	280	299	309	316	321	325	328	330
33	116	245	284	303	314	321	326	330	333	335
34	118	248	288	307	318	325	331	334	337	340
35	120	252	292	311	322	330	335	339	342	344
36	121	255	295	315	326	334	339	343	346	348
37	122	258	299	318	330	337	343	347	350	352
38	124	260	302	322	333	341	346	350	353	356
39	125	263	305	325	337	344	350	354	357	359
40	126	265	308	328	340	348	353	357	360	363

2.5.25 M-4, Green Mixedwood, Dead Fir 100%

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	1	2	3	3	3	3	3	3	3	3
2	3	6	7	7	8	8	8	8	8	8
3	5	10	12	13	13	14	14	14	14	14
4	7	15	18	19	20	20	21	21	21	21
5	10	21	24	26	27	27	28	28	28	29
6	13	27	31	33	34	35	35	36	36	36
7	15	32	38	40	42	43	43	44	44	44
8	18	38	45	48	49	50	51	52	52	53
9	21	44	52	55	57	58	59	60	60	61
10	24	51	59	62	65	66	67	68	69	69
11	27	57	66	70	72	74	75	76	77	77
12	30	63	73	77	80	82	83	84	85	86
13	33	69	80	85	88	90	91	92	93	94
14	35	74	86	92	95	98	99	100	101	102
15	38	80	93	99	103	105	107	108	109	110
16	41	86	100	106	110	113	114	116	117	118
17	44	92	106	113	117	120	122	123	124	125
18	46	97	113	120	124	127	129	131	132	133
19	49	102	119	127	131	134	136	138	139	140
20	51	108	125	133	138	141	143	145	146	147
21	54	113	131	139	144	148	150	152	153	154
22	56	118	137	146	151	154	157	158	160	161
23	58	123	142	152	157	161	163	165	166	168
24	60	127	148	157	163	167	169	171	173	174
25	63	132	153	163	169	173	175	177	179	180
26	65	136	158	168	175	179	181	183	185	186
27	67	141	163	174	180	184	187	189	191	192
28	69	145	168	179	185	190	193	195	197	198
29	71	149	173	184	191	195	198	200	202	204
30	73	153	177	189	196	200	203	206	207	209
31	74	157	182	194	201	205	208	211	213	214
32	76	160	186	198	205	210	213	216	218	219
33	78	164	190	203	210	215	218	221	222	224
34	80	167	194	207	214	219	223	225	227	229
35	81	171	198	211	219	223	227	230	232	233
36	83	174	202	215	223	228	231	234	236	238
37	84	177	205	219	227	232	235	238	240	242
38	86	180	209	222	230	236	239	242	244	246
39	87	183	212	226	234	240	243	246	248	250
40	88	186	215	229	238	243	247	250	252	254

2.5.26 S-1, Jack or Lodgepole Pine Slash

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.8	2	3	3	3	3	3	3	3	3
2	2	5	6	7	7	7	7	7	7	7
3	3	8	10	11	11	12	12	12	12	12
4	5	12	14	15	16	17	17	17	17	18
5	6	15	19	20	21	22	22	23	23	23
6	7	19	23	25	26	27	28	28	28	29
7	9	23	28	30	32	33	33	34	34	34
8	10	27	33	35	37	38	39	39	40	40
9	12	31	37	40	42	44	44	45	46	46
10	13	35	42	46	48	49	50	51	51	52
11	15	38	47	51	53	54	56	56	57	58
12	16	42	51	56	58	60	61	62	63	63
13	18	46	56	61	63	65	67	68	68	69
14	19	50	60	66	69	71	72	73	74	75
15	21	54	65	70	74	76	77	79	79	80
16	22	57	69	75	79	81	83	84	85	86
17	23	61	74	80	84	86	88	89	90	91
18	25	64	78	85	89	91	93	94	95	96
19	26	68	82	89	93	96	98	99	101	102
20	27	71	86	94	98	101	103	105	106	107
21	29	75	90	98	103	106	108	109	111	112
22	30	78	94	102	107	110	113	114	116	117
23	31	81	98	107	112	115	117	119	120	121
24	32	84	102	111	116	119	122	124	125	126
25	34	87	106	115	120	124	126	128	130	131
26	35	90	109	119	124	128	131	133	134	135
27	36	93	113	123	128	132	135	137	139	140
28	37	96	117	127	132	136	139	141	143	144
29	38	99	120	130	136	140	143	145	147	148
30	39	102	123	134	140	144	147	149	151	152
31	40	105	127	137	144	148	151	153	155	157
32	41	107	130	141	148	152	155	157	159	160
33	42	110	133	144	151	156	159	161	163	164
34	43	112	136	148	155	159	162	165	167	168
35	44	115	139	151	158	163	166	168	170	172
36	45	117	142	154	161	166	169	172	174	175
37	46	119	145	157	164	169	173	175	177	179
38	47	122	147	160	168	172	176	179	181	182
39	48	124	150	163	171	176	179	182	184	186
40	48	126	153	166	174	179	182	185	187	189

2.5.27 S-2, White Spruce/Balsam Fir Slash

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.2	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7
2	0.5	1	2	2	2	2	2	2	2	2
3	1	3	3	4	4	4	4	4	4	4
4	2	4	5	6	6	6	6	6	6	6
5	2	6	7	8	8	8	9	9	9	9
6	3	8	9	10	11	11	11	11	11	12
7	4	10	12	13	13	14	14	14	14	14
8	5	12	14	15	16	17	17	17	17	18
9	5	14	17	18	19	20	20	20	21	21
10	6	16	19	21	22	23	23	23	24	24
11	7	18	22	24	25	26	26	27	27	27
12	8	20	25	27	28	29	29	30	30	30
13	9	23	27	30	31	32	33	33	33	34
14	9	25	30	32	34	35	36	36	37	37
15	10	27	33	35	37	38	39	39	40	40
16	11	29	35	38	40	41	42	43	43	43
17	12	31	38	41	43	44	45	46	46	47
18	13	33	40	44	46	47	48	49	49	50
19	14	35	43	46	48	50	51	52	52	53
20	14	37	45	49	51	53	54	55	55	56
21	15	39	47	51	54	55	57	57	58	59
22	16	41	50	54	57	58	59	60	61	61
23	16	43	52	56	59	61	62	63	64	64
24	17	45	54	59	62	63	65	66	66	67
25	18	46	56	61	64	66	67	68	69	70
26	19	48	58	63	66	68	70	71	72	72
27	19	50	60	66	69	71	72	73	74	75
28	20	51	62	68	71	73	74	76	76	77
29	20	53	64	70	73	75	77	78	79	79
30	21	55	66	72	75	77	79	80	81	82
31	22	56	68	74	77	79	81	82	83	84
32	22	57	70	76	79	81	83	84	85	86
33	23	59	71	77	81	83	85	86	87	88
34	23	60	73	79	83	85	87	88	89	90
35	24	61	74	81	85	87	89	90	91	92
36	24	63	76	82	86	89	91	92	93	94
37	25	64	77	84	88	90	92	94	95	96
38	25	65	79	85	89	92	94	95	96	97
39	25	66	80	87	91	94	96	97	98	99
40	26	67	81	88	92	95	97	99	100	101

2.5.28 S-3, Coastal Cedar/Hemlock/Douglas-Fir Slash

Rate of Spread in ch/hr

Multiply by 1.1 to get feet/min
Divide by 80 to get miles/hour
Divide by 3 to get meters/min
Torching, **Active Crown Fire**

Intensity Class		Flame Length	FLI kW/m	FLI BTU/ft/sec
1	up to	1	10	3
2	up to	4	500	145
3	up to	8	2000	578
4	up to	12	4000	1156
5	up to	18	10000	2891
6	> than	18	10000	2891

Buildup Index (BUI)

ISI	10	30	50	70	90	110	130	150	170	190
1	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
2	0.2	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
3	0.5	1	2	2	2	2	2	2	2	2
4	1	3	3	4	4	4	4	4	4	4
5	2	5	6	7	7	7	7	8	8	8
6	3	8	10	11	11	11	12	12	12	12
7	5	12	14	15	16	17	17	17	17	18
8	6	16	19	21	22	23	23	23	24	24
9	8	21	25	27	28	29	30	30	31	31
10	10	26	31	34	36	37	37	38	38	39
11	12	31	38	41	43	44	45	46	46	47
12	14	37	45	49	51	52	53	54	55	55
13	16	43	52	56	59	61	62	63	63	64
14	19	49	59	64	67	69	70	71	72	73
15	21	54	66	72	75	77	79	80	81	81
16	23	60	73	79	83	85	87	88	89	90
17	25	66	80	87	91	93	95	97	98	99
18	27	72	87	94	98	101	103	105	106	107
19	30	77	93	101	106	109	111	113	114	115
20	32	82	100	108	113	116	119	121	122	123
21	33	87	106	115	120	124	126	128	129	131
22	35	92	111	121	127	130	133	135	137	138
23	37	97	117	127	133	137	140	142	143	145
24	39	101	122	133	139	143	146	148	150	151
25	40	105	127	138	145	149	152	154	156	157
26	42	109	132	143	150	154	158	160	162	163
27	43	113	136	148	155	160	163	165	167	169
28	45	116	141	153	160	165	168	170	172	174
29	46	119	145	157	164	169	173	175	177	179
30	47	122	148	161	168	173	177	180	182	183
31	48	125	152	165	172	177	181	184	186	188
32	49	128	155	168	176	181	185	188	190	192
33	50	130	158	171	179	185	189	191	193	195
34	51	133	161	175	183	188	192	195	197	199
35	52	135	163	177	186	191	195	198	200	202
36	52	137	166	180	188	194	198	201	203	205
37	53	139	168	182	191	197	201	204	206	208
38	54	140	170	185	193	199	203	206	208	210
39	54	142	172	187	196	201	205	208	211	213
40	55	144	174	189	198	203	208	211	213	215

2.6 Fire Area and Perimeter for Sheltered Fuels (C, M, D, S)

		Effective Windspeed (in Miles per Hour); Eye Level (EL)														
10m		1	3	5	6	8	9	11	12	14	15	18	21	24	27	30
EL Open		1	2	3	4	5	6	7	8	9	10	11	13	15	17	19
		Burned Area (in Acres)														
Total Spread Distance (in chains)	5	2	2	1	1	1	1	1	1	1	1	1	0	0	0	0
	10	8	7	6	5	5	4	3	3	3	3	2	2	2	1	1
	15	17	16	13	12	10	9	8	7	6	6	5	4	4	3	3
	20	31	28	24	22	18	16	14	13	11	10	9	7	6	6	5
	25	49	44	37	34	28	26	22	20	17	16	13	11	10	9	8
	30	70	63	54	49	41	37	31	29	25	23	19	17	15	13	12
	35	95	86	73	67	55	50	42	39	34	31	26	22	20	18	16
	40	124	113	96	87	72	66	55	51	44	41	34	29	26	23	21
	45	157	143	121	110	91	83	70	64	55	52	43	37	33	30	27
	50	194	176	150	136	113	103	86	79	68	64	53	46	40	36	33
	55	235	213	181	165	136	124	104	96	83	77	64	55	49	44	40
	60	279	254	215	196	162	148	124	114	98	92	77	66	58	53	48
	65	328	298	253	230	190	173	146	134	116	108	90	78	68	62	56
	70	380	345	293	267	221	201	169	156	134	125	104	90	79	71	66
	75	437	396	337	307	253	231	194	179	154	144	120	103	91	82	75
	80	497	451	383	349	288	263	221	203	175	164	136	117	104	93	86
	85	561	509	432	394	325	297	249	230	198	185	154	133	117	105	97
	90	629	571	485	441	365	333	279	257	222	207	173	149	131	118	108
	95	700	636	540	492	407	370	311	287	247	231	192	166	146	132	121
	100	776	704	598	545	450	411	345	318	274	256	213	183	162	146	134
	150	1746	1585	1346	1226	1014	924	775	715	616	575	480	413	364	328	301
	200	3105	2818	2393	2180	1802	1642	1378	1271	1094	1022	853	734	648	584	535
	250	4851	4402	3739	3407	2816	2566	2154	1985	1710	1597	1332	1147	1012	912	836
	300	6985	6340	5384	4905	4054	3695	3101	2859	2462	2300	1919	1651	1457	1313	1203
		Fireline Perimeter (in Chains)														
Total Spread Distance (in chains)	5	16	15	14	13	13	12	12	12	11	11	11	11	10	10	10
	10	31	30	28	27	25	25	23	23	22	22	22	21	21	21	21
	15	47	45	42	40	38	37	35	35	34	33	32	32	31	31	31
	20	62	60	56	54	50	49	47	46	45	44	43	42	42	42	41
	25	78	75	69	67	63	61	59	58	56	55	54	53	52	52	52
	30	94	89	83	80	76	74	70	69	67	67	65	64	63	62	62
	35	109	104	97	94	88	86	82	81	78	78	76	74	73	73	72
	40	125	119	111	107	101	98	94	92	90	89	86	85	84	83	83
	45	141	134	125	121	113	110	106	104	101	100	97	96	94	94	93
	50	156	149	139	134	126	123	117	115	112	111	108	106	105	104	103
	55	172	164	153	148	138	135	129	127	123	122	119	117	115	115	114
	60	187	179	167	161	151	147	141	138	134	133	130	127	126	125	124
	65	203	194	181	174	164	159	152	150	146	144	140	138	136	135	135
	70	219	209	195	188	176	172	164	161	157	155	151	149	147	146	145
	75	234	224	208	201	189	184	176	173	168	166	162	159	157	156	155
	80	250	239	222	215	201	196	188	184	179	177	173	170	168	167	166
	85	265	253	236	228	214	208	199	196	191	188	184	181	178	177	176
	90	281	268	250	241	227	221	211	207	202	200	195	191	189	187	186
	95	297	283	264	255	239	233	223	219	213	211	205	202	199	198	197
	100	312	298	278	268	252	245	235	231	224	222	216	212	210	208	207
	150	468	447	417	402	378	368	352	346	336	333	324	319	315	312	310
	200	625	596	556	537	503	490	469	461	448	443	432	425	420	416	414
	250	781	745	695	671	629	613	586	576	560	554	540	531	525	521	517
	300	937	895	834	805	755	735	704	692	672	665	648	637	630	625	621

2.7 Fire Area and Perimeter for Open Fuels (O-1a, O-1b)

		Effective Windspeed (in Miles per Hour), Eye Level (EL)														
10 Meter		**1**	**3**	**5**	**6**	**8**	**9**	**11**	**12**	**14**	**15**	**18**	**21**	**24**	**27**	**30**
EL Open		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**14**	**16**	**18**	**20**
		Burned Area (in Acres)														
Total Spread Distance (in chains)	**5**	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	10	6	3	3	2	2	2	2	2	2	2	2	1	1	1	1
	15	13	8	6	6	5	5	4	4	4	4	3	3	3	3	3
	20	22	14	11	10	9	8	7	7	7	7	6	6	5	5	5
	25	35	22	17	15	14	13	12	11	11	10	9	9	8	8	7
	30	50	31	25	22	20	19	17	16	15	15	14	13	12	11	11
	35	69	42	34	30	27	25	23	22	21	20	19	17	16	15	15
	40	90	55	44	39	35	33	30	29	27	26	24	23	21	20	19
	45	114	70	56	50	45	42	38	36	35	33	31	29	27	25	24
	50	140	86	70	61	55	52	47	45	43	41	38	36	33	31	30
	55	170	104	84	74	67	63	57	54	52	49	46	43	40	38	36
	60	202	124	100	88	79	74	67	64	62	59	54	51	47	45	43
	65	237	146	117	104	93	87	79	75	72	69	64	60	55	53	50
	70	275	169	136	120	108	101	92	87	84	80	74	70	64	61	58
	75	316	194	156	138	124	116	105	100	96	92	85	80	74	70	67
	80	359	221	178	157	141	132	120	114	110	105	97	91	84	80	76
	85	405	249	201	177	160	149	135	129	124	118	109	103	95	90	86
	90	454	279	225	199	179	167	151	145	139	133	122	116	106	101	96
	95	506	311	251	222	199	187	169	161	155	148	136	129	118	113	107
	100	561	345	278	245	221	207	187	178	172	164	151	143	131	125	119
	150	1262	776	626	552	497	465	421	402	386	368	340	321	295	280	268
	200	2244	1379	1112	982	883	827	748	714	686	654	604	571	524	499	476
	250	3506	2154	1738	1534	1380	1292	1169	1116	1072	1023	944	892	818	779	744
	300	5049	3102	2503	2209	1987	1860	1683	1606	1544	1473	1359	1285	1178	1122	1071
		Fireline Perimeter (in Chains)														
Total Spread Distance (in chains)	**5**	14	12	11	11	11	11	11	11	11	11	10	10	10	10	10
	10	27	23	22	22	22	22	21	21	21	21	21	21	21	21	21
	15	41	35	34	33	33	32	32	32	32	32	31	31	31	31	31
	20	54	47	45	44	43	43	43	42	42	42	42	42	41	41	41
	25	68	59	56	55	54	54	53	53	53	53	52	52	52	51	51
	30	81	70	67	66	65	65	64	64	63	63	63	62	62	62	62
	35	95	82	79	77	76	75	75	74	74	74	73	73	72	72	72
	40	108	94	90	88	87	86	85	85	84	84	84	83	83	82	82
	45	122	106	101	99	98	97	96	95	95	95	94	94	93	93	92
	50	136	117	112	110	109	108	106	106	106	105	104	104	103	103	103
	55	149	129	124	121	119	118	117	117	116	116	115	114	114	113	113
	60	163	141	135	132	130	129	128	127	127	126	125	125	124	124	123
	65	176	152	146	143	141	140	138	138	137	137	136	135	134	134	134
	70	190	164	157	154	152	151	149	148	148	147	146	146	145	144	144
	75	203	176	169	165	163	161	160	159	158	158	157	156	155	154	154
	80	217	188	180	176	174	172	170	170	169	168	167	166	165	165	164
	85	230	199	191	187	185	183	181	180	179	179	177	177	176	175	175
	90	244	211	202	198	195	194	192	191	190	189	188	187	186	185	185
	95	258	223	214	209	206	205	202	201	201	200	198	197	196	196	195
	100	271	235	225	220	217	215	213	212	211	210	209	208	207	206	205
	150	407	352	337	330	326	323	319	318	317	315	313	312	310	309	308
	200	542	469	450	441	434	431	426	424	422	420	418	416	413	412	411
	250	678	587	562	551	543	538	532	530	528	525	522	520	517	515	514
	300	937	895	834	805	755	735	704	692	672	665	648	637	630	625	621

2.8 Fire Observation/Description

Rank 1 Smoldering	Rank 2 Creeping	Rank 3 Running	Rank 4 Torch/Spot	Rank 5 Crowning	Rank 6 Erratic
• No open flame in surface fuels • **White smoke** • Smoldering ground fire	• Visible open flame, **1-4 ft.** in surface fuels • Surface fire only • Unorganized flame front • Little or no spread	• Organized surface flame front, **4-8 ft.** in surface fuels • Moderate rate of spread • Vigorous surface fire • May see some candling or torching along the perimeter and/or within the fire	• Organized surface flame front, **8-12 ft.** in surface fuels • Moderate to fast ROS on the ground • **Grey to black smoke** • Torching/Short range spotting • Disorganized crown involvement	• Organized crown fire front • Moderate to long range spotting • Independent spot fire growth • **Black to copper smoke** • **12-18 ft** flames in open and slash fuels	• Organized crown fire front • Moderate to long range spotting • Independent spot fire growth • Presence of fire balls and whirls • Violent fire behavior