

LANDFIRE Canadian Forest Fire Danger Rating System Attribute Data Dictionary

Attribute	Description
VALUE	
1-995	Value assignment.
DESCRIPTIV	Short description of predominate vegetation and what would have an impact on the fire site.
Spruce-Lichen Woodland C1	This fuel type is characterized by open, parklike black spruce (<i>Picea mariana</i> (Mill.) B.S.P.) stands occupying well-drained uplands in the subarctic zone of western and northern Canada. Jack pine (<i>Pinus banksiana</i> Lamb.) and white birch (<i>Betula papyrifera</i> Marsh.) are minor associates in the overstory. Forest cover occurs as widely spaced individuals and dense clumps. Tree heights vary considerably, but bole branches (live and dead) uniformly extend to the forest floor and layering development is extensive. Accumulation of woody surface fuel is very light and scattered. Shrub cover is exceedingly sparse. The ground surface is fully exposed to the sun and covered by a nearly continuous mat of reindeer lichens (<i>Cladonia</i> spp.), averaging 3-4 cm in depth above mineral soil.
Boreal Spruce C2	This fuel type is characterized by pure, moderately well-stocked black spruce (<i>Picea mariana</i> (Mill.) B.S.P.) stands on lowland (excluding Sphagnum bogs) and upland sites. Tree crowns extend to or near the ground, and dead branches are typically draped with bearded lichens (<i>Usnea</i> spp.). The flaky nature of the bark on the lower portion of stem boles is pronounced. Low to moderate volumes of down woody material are present. Labrador tea (<i>Ledum groenlandicum</i> Oeder) is often the major shrub component. The forest floor is dominated by a carpet of feather mosses and/or ground-dwelling lichens (chiefly <i>Cladonia</i>). Sphagnum mosses may occasionally be present, but they are of little hindrance to surface fire spread. A compacted organic layer commonly exceeds a depth of 20–30 cm.
Mature Jack or Lodgepole Pine C3	This fuel type is characterized by pure, fully stocked (1000–2000 stems/ha) jack pine (<i>Pinus banksiana</i> Lamb.) or lodgepole pine (<i>Pinus contorta</i> Dougl. ex Loud.) stands that have matured at least to the stage of complete crown closure. The base of live crown is well above the ground. Dead surface fuels are light and scattered. Ground cover is feather moss (<i>Pleurozium schreberi</i>) over a moderately deep (approximately 10 cm), compacted organic layer. A sparse conifer understory may be present.
Immature Jack or Lodgepole Pine C4	This fuel type is characterized by pure, dense jack pine (<i>Pinus banksiana</i> Lamb.) or lodgepole pine (<i>Pinus contorta</i> Dougl. ex Loud.) stands (10,000–30,000 stems/ha) in which natural thinning mortality results in a large quantity of standing dead stems and dead downed woody fuel. Vertical and horizontal fuel continuity is characteristic of this fuel type. Surface fuel loadings are greater than in fuel type C3, and organic layers are shallower and less compact. Ground cover is mainly needle litter suspended within a low shrub layer (<i>Vaccinium</i> spp.).

Attribute	Description
Red and White Pine C5	This fuel type is characterized by mature stands of red pine (<i>Pinus resinosa</i> Ait.) and eastern white pine (<i>Pinus strobus</i> L.) in various proportions, sometimes with small components of white spruce (<i>Picea glauca</i> (Moench) Voss) and old white birch (<i>Betula papyrifera</i> Marsh.) or aspen (<i>Populus</i> spp.). The understory is of moderate density, usually red maple (<i>Acer rubrum</i> L.) or balsam fir (<i>Abies balsamea</i> (L.) Mill.). A shrub layer, usually beaked hazel (<i>Corylus cornuta</i> Marsh.), may be present in moderate proportions. The ground surface cover is a combination of herbs and pine litter. The organic layer is usually 5–10 cm deep.
Conifer Plantation C6	This fuel type is characterized by pure, fully stocked conifer plantations with closed crowns and no understory or shrub layer. The forest floor is covered by needle litter with an underlying duff layer up to 10 cm deep. The crown base height is taken into account in predicting fire spread rate and crowning.
Ponderosa Pine-Douglas-Fir C7	This fuel type is characterized by uneven-aged stands of ponderosa pine (<i>Pinus ponderosa</i> Laws.) and Douglasfir (<i>Pseudotsuga menziesii</i> (Mirb.) Franco) in various proportions. Western larch (<i>Larix occidentalis</i> Nutt.) and lodgepole pine (<i>Pinus contorta</i> Dougl. ex Loud.) may be significant stand components on some sites and at some elevations. Stands are open, with occasional clumpy thickets of multi-aged Douglas-fir and/or larch as a discontinuous understory. Canopy closure is less than 50% overall, although thickets are closed and often dense. Woody surface fuel accumulations are light and scattered. Except within Douglas-fir thickets, the forest floor is dominated by perennial grasses, herbs, and scattered shrubs. Within tree thickets, needle litter is the predominant surface fuel. Duff layers are nonexistent to shallow (<3 cm).
Leafless Aspen D1	This fuel type is characterized by pure, semimature trembling aspen (<i>Populus tremuloides</i> Michx.) stands before bud break in the spring or following leaf fall and curing of the lesser vegetation in the autumn. A conifer understory is noticeably absent, but a well-developed medium to tall shrub layer is typically present. Dead and down roundwood fuels are a minor component of the fuel complex. The principal fire carrying surface fuel consists chiefly of deciduous leaf litter and cured herbaceous material that is directly exposed to wind and solar radiation. In the spring the duff mantle (F and H horizons) seldom contributes to the available combustion fuel because of its high moisture content.
Green Aspen D2	This fuel type is characterized by the Build Up Index (BUI) at a level (70) where fire spread does not occur. In other words, there needs to be a BUI of at least 70 for fire spread to occur in Green Aspen (D2). Below this point and a fuel type won't carry a fire. The Canadian Forest Fire Weather Index (FWI) System consists of six components that account for the effects of fuel moisture and weather conditions on fire behavior. BUI is a measure of fuel loading and availability, a numeric rating of the total amount of fuel available for combustion. BUI sets thresholds to describe the severity of the fuel situation based on fuel type, loading, and dryness.
Aspen	D1/D2

Attribute	Description
Jack or Lodgepole Pine Slash S1	This fuel type is characterized by slash resulting from tractor or skidder clear-cut logging of mature jack pine (<i>Pinus banksiana</i> Lamb.) or lodgepole pine (<i>Pinus contorta</i> Dougl. ex Loud.) stands. The slash is typically one or two seasons old, retaining up to 50% of the foliage, particularly on branches closest to the ground. No post-logging treatment has been applied, and slash fuels are continuous. Tops and branches left on site result in moderate fuel loads and depths. Ground cover is continuous feather moss mixed with discontinuous fallen needle litter. Organic layers are moderately deep and fairly compact.
White Spruce-Balsam Slash S2	This fuel type is characterized by slash resulting from tractor or skidder clear-cut logging of mature to overmature stands of white spruce (<i>Picea glauca</i> (Moench) Voss) and sub-alpine fir (<i>Abies lasiocarpa</i> (Hook.) Nutt.) or balsam fir (<i>Abies balsamea</i> (L.) Mill.). Slash is typically one or two seasons old, retaining from 10% to 50% of the foliage on the branches. No post logging treatment has been applied. Fuel continuity may be broken by skid trails unless the site was logged in winter. Tops have been left on site, and most branch fuels have broken off during skidding of logs to landings, which results in moderate fuel loads and depths. Quantities of shattered large and rotten woody fuels may be significant. Ground cover is feather moss with considerable needle litter fallen from the slash. Organic layers are moderately deep and compact.
Coastal Cedar-Hemlock-Douglas-Fir Slash S3	This fuel type is characterized by slash resulting from high lead clear cut logging of mature to overmature coastal British Columbia mixed conifer stands. Predominant species are western redcedar (<i>Thuja plicata</i> Donn.), western hemlock (<i>Tsuga heterophylla</i> (Raf.) Sarg.), and Douglas-fir (<i>Pseudotsuga menziesii</i> (Mirb.) Franco). Slash is typically one season old, with the cedar component retaining all its foliage in a cured condition on the branches, whereas the hemlock and Douglas-fir components will have dropped up to 50% of their foliage. Slash fuels tend to be continuous and uncompacted. Very large loadings of broken and rotten unmerchantable material may be present, depending on degree of stand decadence. Slash fuel depths may range from 0.5 to 2.0 m. Ground cover may be feather moss or just compact old needle litter under significant quantities of recent needle litter fallen from the slash. Organic layers are moderately deep to deep and compact. Minor to moderate shrub and herbaceous understory components may be present. This fuel type designation may also be applied to wet belt cedar-hemlock slash of coastal and interior British Columbia where the Douglas-fir component is absent.
Matted Grass O1a	This fuel type is characterized by continuous grass cover, with no more than occasional trees or shrub clumps that do not appreciably affect fire behavior. Two subtype designations are available for grasslands; one for the matted grass condition common after snowmelt or in the spring (O1-a) and the other for standing dead grass common in late summer to early fall (O1-b). The proportion of cured or dead material in grasslands has a pronounced effect on fire spread there and must be estimated with care.

Attribute	Description
Standing Grass O1b	This fuel type is characterized by continuous grass cover, with no more than occasional trees or shrub clumps that do not appreciably affect fire behavior. Two subtype designations are available for grasslands; one for the matted grass condition common after snowmelt or in the spring (O1-a) and the other for standing dead grass common in late summer to early fall (O1-b). The proportion of cured or dead material in grasslands has a pronounced effect on fire spread there and must be estimated with care.
Grass	O1a/O1b
Boreal Mixedwood-Leafless M1	This fuel type (and its "green" counterpart, M2) is characterized by stand mixtures consisting of the following coniferous and deciduous tree species in varying proportions: black spruce (<i>Picea mariana</i> (Mill.) B.S.P.), white spruce (<i>Picea glauca</i> (Moench) Voss), balsam fir (<i>Abies balsamea</i> (L.) Mill.), subalpine fir (<i>Abies lasiocarpa</i> (Hook.) Nutt.), trembling aspen (<i>Populus tremuloides</i> Michx.), and white birch (<i>Betula papyrifera</i> Marsh.). On any specific site, individual species can be present or absent from the mixture. In addition to the diversity in species composition, stands exhibit wide variability in structure and development, but are generally confined to moderately well drained upland sites. M1, the first phase of seasonal variation in flammability, occurs during the spring and fall. The rate of spread is weighted according to the proportion (expressed as a percentage) of softwood and hardwood components.
Boreal Mixedwood Green M2	This fuel type (and its "leafless" counterpart, M1) is characterized by stand mixtures consisting of the following coniferous and deciduous tree species in varying proportions: black spruce (<i>Picea mariana</i> (Mill.) B.S.P.), white spruce (<i>Picea glauca</i> (Moench) Voss), balsam fir (<i>Abies balsamea</i> (L.) Mill.), subalpine fir (<i>Abies lasiocarpa</i> (Hook.) Nutt.), trembling aspen (<i>Populus tremuloides</i> Michx.), and white birch (<i>Betula papyrifera</i> Marsh.). On any specific site, individual species can be present or absent from the mixture. In addition to the diversity in species composition, stands exhibit wide variability in structure and development, but are generally confined to moderately well drained upland sites. M2, the second phase of seasonal variation in flammability, occurs during the summer. The rate of spread is weighted according to the proportion (expressed as a percentage) of softwood and hardwood components. In the summer, when the deciduous overstory and understory are in leaf, fire spread is greatly reduced, with maximum spread rates only one-fifth that of spring or fall fires under similar burning conditions. For purposes of refining fire behavior calculation this fuel type has been separated into three distinct classes based on the amount of softwood and/or hardwood that exists within the site. M2A denotes sites that are Boreal Mixwood that are green and < 25% conifer and ≥75% hardwood. M2B characterizes sites that are Boreal Mixwood that are green and 50/50 conifer/hardwood. M-2C depicts sites that are < 25% hardwood and ≥75% conifer.
Boreal Mixedwood	M1/M2

Attribute	Description
Dead Balsam Fir Mixedwood-Leafless M3	<p>This fuel type (and its "green" counterpart, M4) is characterized by mixedwood stands in which balsamfir (<i>Abies balsamea</i> (L.) Mill.) grows, often as an understory species, in a heterogeneous mix with spruce (<i>Picea</i> spp.), pine (<i>Pinus</i> spp.), and birch (<i>Betula</i> spp.). These stands are found in the Great Lakes – St. Lawrence and Boreal Forest regions of Canada and are not to be confused with the pure balsam fir stands typical of Nova Scotia and New Brunswick. Repeated annual defoliation (due to spruce budworm (<i>Choristoneura fumiferana</i> Clemens) attack) causes balsam fir mortality, followed by peeling bark, draped lichen (Spanish moss or old man's beard, <i>Usnea</i> spp.) development, top breakage, and windthrow, peaking 5–8 years after mortality. The volume of down woody material is initially low but increases substantially with progressive stand decomposition following mortality. The forest floor is a mixture of feather mosses, conifer needles, and hardwood leaves. The organic layer is moderately compacted and 8–10 cm deep. After mortality, spring fires in this fuel type behave extremely vigorously, with continuous crowning and downwind spotting.</p>
Dead Balsam Fir Mixedwood-Green M4	<p>This fuel type (and its "leafless" counterpart, M3) is characterized by mixedwood stands in which balsam fir (<i>Abies balsamea</i> (L.) Mill.) grows, often as an understory species, in a heterogeneous mix with spruce (<i>Picea</i> spp.), pine (<i>Pinus</i> spp.), and birch (<i>Betula</i> spp.). These stands are found in the Great Lakes – St. Lawrence and Boreal Forest regions of Canada and are not to be confused with the pure balsam fir stands typical of Nova Scotia and New Brunswick. Repeated annual defoliation (due to spruce budworm (<i>Choristoneura fumiferana</i> Clemens) attack) causes balsam fir mortality, followed by peeling bark, draped lichen (Spanish moss or old man's beard, <i>Usnea</i> spp.) development, top breakage, and windthrow, peaking 5–8 years after mortality. The volume of down woody material is initially low but increases substantially with progressive stand decomposition following mortality. The forest floor is a mixture of feather mosses, conifer needles, and hardwood leaves. The organic layer is moderately compacted and 8–10 cm deep. Summer fires are hampered by the proliferation of green understory vegetation resulting from the opening of stand canopy. As sufficient surface fuel accumulates through stand decomposition (usually after 4–5 years), fires will spread through the fuel complex, although not as vigorously as in spring. Forest fire behavior potential is greatest 5–8 years after mortality, decreasing gradually as the surface fuels decompose and the understory vegetation continues to proliferate. For purposes of refining fire behavior calculation this fuel type has been separated into three distinct classes based on the amount of softwood and/or hardwood that exists within the site. M-4A denotes sites that are Boreal Mixwood that are green and < 25% conifer and ≥75% hardwood. M-4B characterizes sites that are Boreal Mixwood that are green and 50% conifer and 50% hardwood. M-4C depicts sites that are < 25% hardwood and ≥75% conifer.</p>
Dead Balsam Fir Mixedwood	M3/M4
Not Available	Non-fuel
Non-fuel	Non-fuel

Attribute	Description
Water	Non-fuel
Unknown	Non-fuel
Unclassified	Non-fuel
Vegetated Non-Fuel	Non-fuel
FUEL_TYPE	Canadian Forest Fire Danger Rating System fuel type designator. These fuel types have been defined "as an identifiable association of fuel elements of distinctive species, form, size, arrangement, and continuity that will exhibit characteristic fire behavior under defined burning conditions" (Pyne, Andrews and Laven, 1996). The Canadian Fire Behavior Protection System arranges fuel types into five major groups with 16 discrete fuel types which are qualitatively distinguished by variations in their forest floor and organic layer, their surface and ladder fuels, and their stand structure and composition.
C	Spruce-Lichen Woodland, Boreal Spruce, Mature Jack or Lodgepole Pine, Immature Jack or Lodgepole Pine, Red and White Pine, Conifer Plantation, and Ponderosa Pine-Douglas-Fir. See the attribute table for more specific details and values.
D	Leafless Aspen, Green Aspen, and Aspen. See the attribute table for more specific details and values.
S	Jack or Lodgepole Pine Slash, White Spruce-Balsam Slash, or Coastal Cedar-Hemlock-Douglas-Fire Slash. See the attribute table for more specific details and values.
O	Matted Grass, Standing Grass, or Grass. See the attribute table for more specific details and values.
M	Boreal Mixedwood or Dead Balsam Fir Mixedwood. See the attribute table for more specific details and values.
Non-fuel	Not available, Non-fuel, Unknown, Unclassified, Water, and Vegetated Non-Fuel. See the attribute table for more specific details and values.
HUE	Hue is the color of a point, as found along the spectrum or around a color wheel.
SATURATION	Saturation is an indicator of the intensity of a hue. Higher saturation hues appear 'stronger', for example being 'more red' or 'more blue'.
LIGHTNESS	Lightness is a measure of how bright or dark a hue is. Physically, this is found in the amplitude and consequent energy of the electromagnetic waves of light.

Attribute	Description
R	Red color value range /255
G	Green color value range /255
B	Blue color value range /255
RED	Red color value range 0 - 1
GREEN	Green color value range 0 - 1
BLUE	Blue color value range 0 - 1