

Alaska fuel model guidebook

This section of the document is the guidebook to Alaska fuel models. It contains fuel and fire behavior information gleaned from workshop participants, and vegetation characteristics taken from Viereck and others (1992). The fuel type name was taken from the common characteristics of the individual IVth-level classification names in the Viereck and others classification. Up to three illustrative photos are included for each Alaska fuel type, if available. More photos can be added as they become available. The caption of each photo lists the 4th level Viereck vegetation class and the source of the photo, if available.

Next, the most appropriate fuel models identified by the participants are listed. The primary carrier of fire is listed next, followed by any comments regarding fire behavior noted by the participants.

In the next section, a description of vegetation characteristics identified by compiling descriptions from the Viereck and others classification. This section describes the common characteristics of all 4th level classes in the fuel type.

The next section lists the individual 4th-level Viereck and others classes included in the fuel type. See Viereck and others (1992) for a detailed description of vegetation characteristics and distribution of each class.

Finally, the last section lists fuel types of similar characteristics. See the guidebook page in this document for information regarding each fuel type listed here.

(1) Closed Sitka Spruce-Western Hemlock Forest



1A1A. Closed Sitka Spruce Forest (Photo Courtesy of M. Fleming, SAIC)



1A1A. Closed Sitka Spruce Forest (Photo Courtesy of M. Fleming, SAIC)



1A1C. Closed Sitka Spruce Forest – Western Hemlock Forest (Photo Courtesy of J. Koltun, GRS)



1A2A. Open Sitka Spruce Forest (Photo Courtesy Lake Clark National Park & Preserve)



1A2A. Open Sitka Spruce Forest (Photo Courtesy US Forest Service)

Fuel models:

- FBFM40 – TL1
- FBFM13 - 8
- CFFBPS – C6 – in closed settings
- CFFBPS – C7 in open or M4 C5 for closed in open settings

Primary carrier of fire:

- compact needle litter, Moss and shrubs
- Litter if alder is present
- Litter and shrub mix in open forest

Fire behavior comments:

- rarely burns except under extreme drought conditions
- live fuels seldom contribute to fire behavior

Vegetation characteristics:

Overstory is dominated by Sitka spruce ~~and~~, western ~~and~~ mountain hemlock. Other species, such as ~~mountain hemlock~~, western redcedar, Alaska-cedar, sub-alpine fir, and Pacific silver fir ~~are may be~~ present and may dominate the overstory. Canopy cover ranges from ~~60~~25-100%. The shrub layer is often well-developed ranging in height from 1 – 1.5 m (3 – 5 ft). Cover may be as high as ~~70~~50%. *Vaccinium* species ~~and~~ *rusty menziesia* are present at many sites. ~~Some open stands may have taller alders and devil's club, providing more leaf litter.~~ Herbs, ferns, and some ~~moss~~ grasses may be present with less than 30% cover ~~in closed stands, but may be present with cover up to 80% in open stands.~~ Moss is usually abundant. Hummocks and hollows may be present at some sites.

Comment [UFS1]: We (Beth, Rob, Nathan) recommend that the similar "not likely to burn" types be gathered together near the end of the guide. We suggest changing the name of this entry to "Sitka spruce -Hemlock forests" and combine the closed and open (1) and (4) into a single entry - with comments on different models. Still might go to 2 pages when combined.

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Comment [UFS2]: I'm not familiar with the fuels models - so not sure what distinguishes the closed and open types. More forest in the open or woodland level of cover in these types

Comment [SL3]: This was included in Veg type #4, which was merged with this

Viereck vegetation classes:

- 1A1A Closed Sitka Spruce Forest
- 1A1B Closed Western Hemlock Forest
- 1A1C Closed Sitka Spruce-Western Hemlock Forest
- 1A1D Closed Western Hemlock-Sitka Spruce-(Western Redcedar) Forest
- 1A1E Closed Western Hemlock-Alaska-Cedar
- 1A1F Closed Mountain Hemlock Forest
- 1A1G Closed Western Hemlock-Western Redcedar Forest
- 1A1H Closed Silver Fir-Western Hemlock Forest
- 1A1I Closed Subalpine Fir Forest
- 1A2A Open Sitka Spruce Forest
- 1A2B Open Western Hemlock-Sitka Spruce Forest
- 1A2C Open Mountain Hemlock Forest
- 1A2D Open Mixed Conifer Forest
-

-Similar fuel types:

- ~~(4) Open Western Hemlock-Sitka Spruce Forest~~

(2) Closed White Spruce Forest



1A1J. Closed White Spruce Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



1A1J. Closed White Spruce Forest (Photo Courtesy of the National Park Service)



1A1F. Closed White Spruce Forest (Photo Courtesy of Denali National Park & Preserve)

Fuel models:

- [FBFM40](#) – [TU4](#)[TU2](#)
[upland](#)
[TU1 riparian](#)
- FBFM13 - 10
- CFFBPS - C3

Primary carrier of fire:

- feathermoss, litter, duff

Fire behavior comments:

- [Riparian areas](#) [Riparian areas](#) fire will tend to smolder with occasional torching will have higher fuel moisture compared to lower fuel moisture in upland sites.
- Immature stands in both riparian and upland areas will exhibit fire behavior similar to Closed Black Spruce Forest (3), Viereck Class 1A1K, fuel model (TU3)
- [Crown initiation](#) is lower, due to high CBH.
- [Consider changing to TU3 in uplands depending on what you're observing for more extreme conditions](#)

Vegetation characteristics:

The closed white spruce forest type represents the most productive site in the Alaska taiga. Some scattered paper birch or balsam poplar maybe present. Canopy cover ranges from 60-100%. Shrubs exist as a sparsely developed layer of alders and willows with little cover. Mosses such as the feathermosses are well-developed. Herbs are sparse.

[Canopy WS 02 in photo fuel guide is a good example. Has canopy characteristic data.](#)

Viereck vegetation classes:

- 1A1J Closed White Spruce Forest

Similar fuel types:

- (3) Closed Black Spruce Forest
- (5) Open White Spruce Forest

(3) Closed Black Spruce Forest



1A1K. Closed Black Spruce Forest (Photo Courtesy of Yukon - Charley Rivers National Preserve)



1A1L. Closed Black Spruce-White Spruce Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



1A1K. Closed Black Spruce Forest (Photo Courtesy of BLM Alaska Fire Service)

Fuel models:

- FBFM40 – TU3/TU4***??
- FBFM13 - 9 (adjusted)
- CFFBPS - C2

Primary carrier of fire:

- feathermosses

Fire behavior comments:

- ~~Norum's equations (TU4) under-predicts rate of spread. For this dynamic model, use live herbaceous moisture content as a surrogate for duff moisture code. If this is a mixed spruce floodplain site without feathermosses, this might over-predict fire behavior.~~
- In areas without feathermosses, such as riparian areas, ~~use~~ consider using TU1
- Consider SH5 for dry conditions (low 30's RH), as input in fire behavior models using Finney Crown Fire Method
- Canadian FBP system works best for more active fire behavior predictions, Behave plus better for less active conditions

****This is a proposed change. Needs testing in models (perhaps retrospectively) and during fires summer 2015.**

Vegetation characteristics:

The overstory is dominated by black spruce with low productivity, high tree density with low volume, and

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abundant regeneration of black spruce, primarily from layering of lower branches. Tree cover is greater than 60%. White spruce and paper birch may be present. Alder may grow several meters tall and mix with the black spruce. Low shrubs such as rose, Labrador tea (*Ledum palustre*), blueberry (*Vaccinium uliginosum*), cranberry (*V. vitis-idaea*), and willow (*Salix spp.*) are common in the understory. Feathermosses are usually present. The moss layer varies from patchy to continuous and ranges from 20 – 100 cm (8 – 39 in) thick. *Sphagnum* species exist on wetter sites.

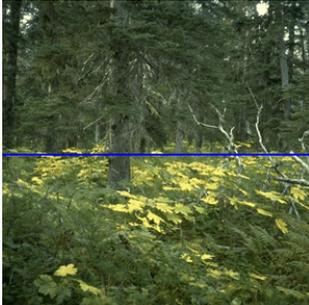
Viereck vegetation classes:

- 1A1K Closed Black Spruce Forest
- 1A1L Closed Black Spruce-White Spruce Forest

Similar fuel types:

- (6) Open Black Spruce Forest
- (7) Open Black Spruce-Tamarack Forest

(4) Open Western Hemlock-Sitka Spruce Forest



1A2A. Open Sitka Spruce Forest (Photo Courtesy
Late Clark National Park & Preserve)



Fuel models:

- FBFM40 – TL1
- FBFM13 – 8
- CFFBPS – M4

Primary carrier of fire:

- Litter and moss
- Litter and shrub mix (open mountain hemlock forest)

Fire behavior comments:

- C7 is another option for a CFFDRS fuel model selection for this group.
- Fire may be infrequent and have more *Vaccinium spp.* in all open mountain hemlock forests types

Vegetation characteristics:

Overstory is composed of species such as Sitka spruce, mountain hemlock, western hemlock, or mixed conifer forests (Alaska cedar, western hemlock, mountain hemlock, and Sitka spruce, western red cedar, pacific yew), which may dominate the overstory with cover ranging from 35-65%. Open Sitka spruce stands are dominated by alder species and devil's club ranging in height from 1–3.5 m (3–12 ft). More commonly, in other stand types, a well-developed shrub layer is present, 1–1.5 m (3–5 ft) tall and ranging in cover from 20-70% composed of species such as *Vaccinium spp.* (blueberry) and *rusty menzeisia*. Ferns and herbs are present, some with cover ranging 40-80%.

Viereck vegetation classes:

- 1A2A – Open Sitka Spruce Forest
- 1A2B – Open Western Hemlock-Sitka Spruce Forest
- 1A2C – Open Mountain Hemlock Forest
- 1A2D – Open Mixed Conifer Forest

Similar fuel types:

- (1) Closed Sitka Spruce-Western Hemlock Forest
- (8) Woodland Sitka Spruce-Pine

Comment [UFS4]: Combine with (1) Sitka Spruce – Hemlock Forests

Comment [UFS5]: But here is another picture. I like this one in that it shows a situation with few shrubs and an abundance of skunk cabbage – not likely to burn!!

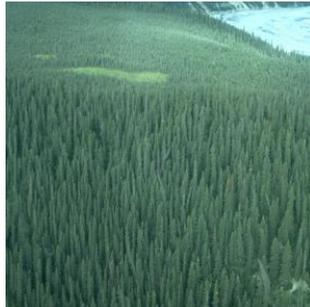
Comment [UFS6]: Really any type in open stands will have lots of shrubs

- ~~(23) Closed Tall Alder Willow Shrub (Open Sitka Spruce Community)~~

(5) Open White Spruce Forest



1A2E. Open White Spruce Forest (Photo Courtesy of Yukon - Charley Rivers National Preserve)



1A2E. Open White Spruce Forest (Photo Courtesy of National Park Service)



1A2E. Open White Spruce Forest (Photo Courtesy of National Park Service)

Fuel models:

- FBFM40 – TU5
- FBFM13 - 10
- CFFBPS - [C7C3](#)

Primary carrier of fire:

- [Shrub and litter](#)
- [Feathermoss](#)
- [—](#)
- [—](#)

Fire behavior comments:

- Sites with more deciduous shrubs (alder, willow, and rose) use TU5.
- [Sites with feathermosses and ericaceous shrubs, use TU4.](#)
- [TU1 in riparian areas](#)
- [Can have dramatic crown fire behavior](#)

Vegetation characteristics: [\(check Ottmar\)](#)

Overstory is composed of stands dominated by white spruce, ranging in cover from 25–60%. Black spruce, paper birch, and aspen may be present with little cover. ~~A well developed shrub layer, 1–2 m (3–7 ft) tall, is composed of resin birch.~~ Alder and willows may be present on wetter sites; and some low shrubs may be present on lowland sites. Ground cover is composed of herbs or feathermosses (beneath tall shrubs).

Viereck vegetation classes:

- 1A2E Open White Spruce Forest

Similar fuel types:

- (6) Open Black Spruce Forest
- (19) Spruce-Paper Birch-Aspen
- (20) White Spruce-Paper Birch-Balsam Poplar

(5) Coastal Boreal Transition Open White /Lutz Spruce Forest/ Coastal Boreal Transition Forest



Picea x lutzii/Menziesia ferruginea community on Kenai Peninsula, Viereck et al. (1992) did not describe *P. x lutzii* types. Dominants at this site include: Lutz spruce (60% cover), rusty menziesia (40%), crowberry (10%), and buchberry (10%).
Photo courtesy of Chugach National Forest Ecology Program.

Fuel models:

- FBFM40 – [TU1](#)
- FBFM13 - ~~xx8-9~~
- CFFBPS - ~~xxD1/D2~~ or M1/M2 with low conifer

Primary carrier of fire:

- Grass in more open sites
- ~~Moss and lichens in others~~
- [Shrub and herb litter with more tree cover](#)

Fire behavior comments:

- Sites with more herbaceous [TU1 if fern dominated, TU3 if shrub/grass dominated. Selected this because it was the only dynamic model](#)
- [Sites with grass dominated understory GR4 low moisture of extinction, does not plateau at high wind.](#)
-

Vegetation characteristics:

[The Coastal Boreal Transition Forest occurs on the Kenai Peninsula and is transitional between Sitka spruce-hemlock rainforests of the south-coastal region and the white spruce boreal forests of the interior. Common tree species include white spruce, Lutz spruce \(hybrids between white and Sitka spruce\), paper birch, black cottonwood, quaking aspen, and mountain hemlock. Sitka and black spruce are sometimes present. Species common in the undergrowth are bluejoint reedgrass, rusty menziesia, early blueberry, devil's club, Labrador tea, soapberry, prickly rose, Sitka mountain ash, salmonberry, wood fern, lowbush cranberry, crowberry, splendid feathermoss, and Schreber's feathermoss.](#)

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Overstory is composed of stands dominated by white spruce, ranging in cover from 25–60%. Black spruce, paper birch, and aspen may be present with little cover. A well-developed shrub layer, 1–2 m (3–7 ft) tall, is composed of resin birch. Alder and willows may be present on wetter sites; and some low shrubs may be present on lowland sites. Ground cover is composed of herbs or feathermosses (beneath tall shrubs).

Viereck vegetation classes:

- 1A2E Open White Spruce Forest

Similar fuel types:

- (6) Open Black Spruce Forest
- (19) Spruce-Paper Birch-Aspen
- (20) White Spruce-Paper Birch-Balsam Poplar

Comment [SL7]: Does this need editing?

(6) Open Black Spruce Forest



1A2F. Open Black Spruce Forest (Photo Courtesy of Yukon - Charley Rivers National Preserve)



1A2F. Open Black Spruce Forest (Photo Courtesy of Ducks Unlimited)



1A2G. Open Black Spruce-White Spruce Forest (Photo Courtesy of Yukon - Charley Rivers National Preserve)

Fuel models:

- FBFM40 – TU4/TU3???
- FBFM13 - 9 (adjusted)
- CFFBPS - [C4C2](#)

Primary carrier of fire:

- [Feathermosses](#)
- [Ericaceous shrubs](#)

Fire behavior comments:

- Dwarf birch/labrador tea understory will have higher fire behavior, than sites with alder/willow understory.
- If site has a lot of sphagnum, it will have lower fire behavior (TU5)
- [Consider SH5 for dry conditions \(low 30's RH\), as input in fire behavior models using Finney Crown Fire Method](#)

****This is a proposed change. Needs testing in models (perhaps retrospectively) and during fires summer 2015.**

Vegetation characteristics: consider using FBP description instead.

Stands are dominated by either black spruce or black/white spruce as co-dominants, ranging in cover from 25–60%. Tree sizes are small (dbh 5 – 10 cm / 1.5 – 4 in). Other species present are paper birch, tamarack, and quaking aspen. A well-developed shrub layer composed of birch, 1 – 2 m (3 – 7 ft) tall, may reside near the tree line. Alder and willows may be present on moist sites. Low shrubs, 10 – 100 cm (4 – 39 in) tall and nearly continuous in cover, are present. The ground layer is dominated by feathermosses. Lichens may be present. Grasses and sedges may be common in younger stands. Herbs are scarce.

Viereck vegetation classes:

- 1A2F Open Black Spruce Forest
- 1A2G Open Black Spruce-White Spruce Forest

Similar fuel types:

- (3) Closed Black Spruce Forest
- (5) Open White Spruce Forest
- (7) Open Black Spruce-Tamarack Forest
- (10) Black Spruce Woodland with tussock
- (11) Black Spruce Woodland with lichen-moss
- (19) Spruce-Paper Birch-Aspen
- (22) Dwarf Tree Black Spruce Scrub

(7) Open Black Spruce - Tamarack Peatland Forest



1A2H. Open Black Spruce - Tamarack Forest
(Photo Courtesy of Gates of the Arctic National Park & Preserve)



1A2H. Open Black Spruce - Tamarack Forest
(Photo Courtesy of Gates of the Arctic National Park & Preserve)

Fuel models:

- FBFM40 - [TU5TU2](#)
- FBFM13 - 10
- CFFBPS - C1

Primary carrier of fire:

- [Feathermosses and shrub](#) [Shrub and shrub litter](#)
-

Fire behavior comments:

- [wetter sites have more sphagnum moss present; availability for burning depends on drought conditions. Slower fire spread than feathermoss](#)
- [Microtopography can dictate whether Sphagnum or feathermosses dominate](#)

[Need pictures. Is an example in Viereck](#)

Vegetation characteristics: [Includes woodland and open canopies](#)

[These stands are dominated by open \(less than 60% cover\), small, and stunted black spruce and tamarack. Low shrubs, nearly continuous in cover, 10—100 cm \(4—39 in\) tall, are characteristic of this stand type. This type is found on wet lowlands in interior Alaska with shallow active layer above permafrost.](#)

Vioreck vegetation classes:

- 1A2H Open Black Spruce-Tamarack Forest

Similar fuel types:

- (6) Open Black Spruce Forest

(8) ~~Woodland Sitka Spruce-Pine~~ Coastal Woodland Rainforest

Comment [UFS8]: I think the "sitka spruce" variant is kinda rare. A better name might be "coastal rainforest woodlands"

Comment [UFS9]: I think I will be able to provide photos, but am having difficulty getting to them at the moment.

Fuel models:

- FBFM40 – TL1
- FBFM13 - 8
- CFFBPS - M2 [with low conifer % or D2](#)

Primary carrier of fire:

- Litter and [low](#) shrub

Fire behavior comments:

- fire is infrequent in this forest type
- [Shore pine \(Pinus contorta\)](#) ~~Lodgepole~~ pine woodland [is s](#) are not similar to [its counterpart](#) lodgepole pine woodlands in [wetter](#) [drier?](#) climates (like [Montana](#))

Comment [SL10]: Could alternatively move to veg characteristics section

Comment [UFS11]: I think we are talking about lodge pole in SE, right? Maybe refer to as shore pine to distinguish

Vegetation characteristics:

The overstory is dominated by [stunted either lodgepole shore pine, mountain hemlock, Alaska yellow-cedar, pine](#) or [stunted](#) Sitka spruce with cover ranging from 10–25%. Other species that may be present are [Alaska cedar](#), western redcedar, and [mountain western](#) hemlock.

Shrubs ranging in height from 1 – 2 m (3 – 7 ft) provide little cover or may be absent and rooted on mounds at the bases of trees. Low/dwarf shrubs are common, providing up to 15% cover. Herbs are well represented. Mosses are abundant.

Viereck vegetation classes:

- 1A3A Lodgepole Pine [Woodland](#)
- 1A3B Sitka Spruce Woodland

Comment [UFS12]: Oh, I see, this is its name in Viereck et al. and only 2 woodland types for coastal forests. Mixed conifer (described as open in Viereck et al is often with cover more like woodland...

Similar fuel types:

- (4) [Open Western Hemlock](#)-Sitka Spruce Forest – [Hemlock forests](#)
- [\(32\) Open Low Birch-Willow/Ericaceous Shrub/Bog??](#)

(9) White Spruce Woodland



1A3C. White Spruce Woodland (Photo Courtesy of the Fish and Wildlife Service)



1A3C. White Spruce Woodland (Photo Courtesy of National Park Service)

Fuel models:

- FBFM40 – [TU5SH2](#)
- FBFM13 - 10
- CFFBPS - [C4M-2, 25% conifer](#)

Primary carrier of fire:

- Feathermoss and shrub

Fire behavior comments:

- [If grass understory, use GR model](#)
- [Highly variable; fuel model may be different depending on understory. N/A](#)

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Vegetation characteristics:

Overstory is dominated by white spruce ranging from 10–25% cover. Paper birch, black spruce, and occasionally some aspen may be present with little cover. Open, low/dwarf shrubs such as resin birch are common and may behave as a carrier of fire. Feathermosses and lichens reside beneath and within the shrub layer. These stands are most common at tree-line.

Viereck vegetation classes:

- 1A3C White Spruce Woodland

Similar fuel types:

- (5) Open White Spruce Forest
- (6) Open Black Spruce Forest
- (31) Open Low Birch-Ericaceous Shrub/Bog
- (37) Dwarf Shrub Tundra

(10) Black Spruce Woodland with tussock



1A3D. Black Spruce Woodland with tussock (Photo Courtesy of the Steese-White Mountains Recreational Area - BLM)



1A3D. Black Spruce Woodland with tussock (Photo Courtesy of BLM Alaska Fire Service)

Fuel models:

- FBFM40 – [GR2GS2](#)
- FBFM13 - 1
- CFFBPS - [O4C1](#)

Primary carrier of fire:

- ~~Tussocks, low shrub~~
~~Shrub and tussocks~~
- ~~_____~~

Fire behavior comments:

- ~~N/A~~ [Change to GS3 under drier conditions](#)
- [Spruce canopy cover <15% consider O1 for CFFBPS](#)

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Vegetation characteristics:

Stands are dominated by black spruce ranging in cover from 10 – ~~45-24~~ %. ~~Paper birch and tamarack may be present with little cover.~~ Tall shrubs consist of scattered clumps of alder, birch, and some willow. Low shrubs are common, composed primarily of *Vaccinium spp.* and dwarf birch. Sedges are common, primarily tussock cotton grass (*Eriophorum vaginatum*) or Bigelow's sedge (*Carex bigelowii*). Mosses and lichens are ~~nearly continuous common.~~

Viereck vegetation classes:

- 1A3D Black Spruce Woodland

Similar fuel types:

- (6) Open Black Spruce Forest
- (11) Black Spruce Woodland with lichen-moss
- (22) Dwarf Tree Black Spruce Scrub
- (30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog
- (31) Open Low Birch-Ericaceous Shrub/Bog

(11) Black Spruce Woodland with lichen-moss

[Get new pictures that represent woodland canopy!!](#)



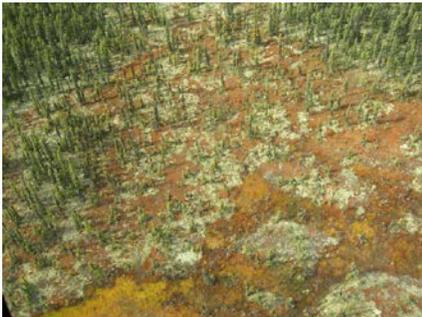
1A3D. Black Spruce Woodland (Photo Courtesy of Ducks Unlimited)



1A3D. Black Spruce Woodland



1A3D. Black Spruce Woodland (Photo Courtesy of Yukon Flats National Wildlife Refuge)



[1A3D. Black Spruce Woodland with Sphagnum moss and lichen \(Photo Courtesy of Kanuti National Wildlife Refuge\)](#)



[1A3D. Black Spruce Woodland with Sphagnum moss and lichen, burned habitat in foreground \(Photo Courtesy of Kanuti National Wildlife Refuge\)](#)

Fuel models:

- FBFM40 – TU4
- FBFM13 - 9 (adjusted)
- CFFBPS - [C2C1](#)

Primary carrier of fire:

- Feathermoss and lichen

Fire behavior comments:

- [Includes lichen and feathermoss types. If sphagnum is present, expect lower spread rates and use fuel model \[TU5TU2\]\(#\) \(see \[#7\]\(#\)\).](#)
- [Can switch to GR2 at more open canopy, drier conditions](#)

Vegetation characteristics:

Stands are dominated by black spruce ranging in cover from 10 – [45-25%](#). [Paper birch and tamarack may be present with little cover.](#) Tall shrubs consist of scattered clumps of alder, birch, and some willow. Low shrubs are common composed primarily of Vaccinium species (blueberry, [lowbush cranberry](#)). Herbs range from sparse to dense. Mosses and lichens are nearly continuous.

Viereck vegetation classes:

- 1A3D Black Spruce Woodland

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- 1A3E Black Spruce-White Spruce Woodland

Similar fuel types:

- (6) Open Black Spruce Forest
- (22) Dwarf Tree Black Spruce Scrub
- (30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog
- (31) Open Low Birch-Ericaceous Shrub/Bog
- [\(7\)](#)

(12) Closed Red Alder Forest

Comment [UFS13]: We suggest combining with (13) – see that section



1B1A. Closed Red Alder Forest. (Photo Courtesy of USDA Forest Service)

Fuel models:

- FBFM40 – TL2
- FBFM13 - 8
- CFFBPS - M2

Primary carrier of fire:

- Leaf litter

Fire behavior comments:

- This type is not common.

Vegetation characteristics:

This stand is dominated by red alder with cover greater than 60%. This type has only been described from the Stinkine area in SE Alaska. Woody plants other than alder are rare. Grasses, sedges, and herbs are present.

Viereck vegetation classes:

- 1B1A Closed Red Alder Forest

Similar fuel types:

- (4) Open Western Hemlock-Sitka Spruce Forest [???](#)
- (26) Open Tall Willow Alder Shrub

(13) Closed Black Cottonwood-Balsam Poplar Forest and Closed Red Alder Forests



1B1B. Closed Black Cottonwood Forest (Photo Courtesy of M. Fleming, SAIC)



1B1C. Closed Balsam Poplar Forest (Photo Courtesy of Yukon Flats National Wildlife Refuge)



1B1C. Closed Balsam Poplar Forest (Photo Courtesy of Yukon Flats National Wildlife Refuge)



1B1A. Closed Red Alder Forest (Photo Courtesy of USDA Forest Service)

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Fuel models:

- FBFM40 – TL2
- FBFM13 - 8
- CFFBPS - [M2D1/D2](#)

Primary carrier of fire:

- Leaf litter

Fire behavior comments:

- In floodplains, this type rarely burns due to heavy silt on litter.
- [Red Alder type is not common.](#)
- [If more fire behavior observed in balsam poplar, see vegetation type #14.](#)
-

Vegetation characteristics:

Stands are dominated by either black cottonwood or balsam poplar with greater than 60% canopy cover. In young stands, shrubs may be sparse due to the closed canopy. As overstory ages, shrubs such as alder, willow, and rose become more common. Bluejoint is common in the herb layer along with some

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mosses and lichens when flooding is infrequent. More commonly, mosses and lichens are absent due to high leaf litter and frequent flooding.

The red alder type may have cover greater than 60%. This type has only been described from the Stinkine area in SE Alaska. Woody plants other than alder are rare. Grasses, sedges, and herbs are present.

Viereck vegetation classes:

- 1B1B Closed Black Cottonwood Forest
- 1B1C Closed Balsam Poplar Forest
- 1B1A Closed Red Alder Forest

Similar fuel types:

- (17) Open Balsam Poplar (Black Cottonwood) Forest
- (19) Spruce-Paper Birch-Aspen
- (23) Closed Tall Alder Willow Shrub
- (26) Open Tall Willow Alder Shrub

(14) Closed Paper Birch-Quaking Aspen Forest



1B1D. Closed Paper Birch Forest (Photo Courtesy of J. Koltun, GRS)



1B1D. Closed Paper Birch Forest (Photo Courtesy of Yukon - Charley Rivers National Preserve)



1B1E. Closed Quaking Aspen Forest (Photo Courtesy of the National Park Service)

Fuel models:

- FBFM40 – TU1
- FBFM13 - [8 - 9](#)
- CFFBPS - [M2D1/D2](#)

Primary carrier of fire:

- Leaf litter and sparse grass

Fire behavior comments:

- Use a dynamic fuel model, dependent on green up.
- Leaf litter and some grass in the understory.
- ~~Use M1 during shoulder seasons.~~
- [During drought, may get increased fire behavior. May have some spruce in understory that will increase fire behavior.](#)

Vegetation characteristics:

Paper birch, ~~balsam poplar, and/or~~ aspen, [or balsam poplar](#) dominate the overstory with greater than 60% cover. Leaf litter may be heavy. Stands may be associated with white and black spruce. A discontinuous, tall shrub layer several meters tall made up of alder and/or willow is present in most stands. A broken to nearly continuous shrub layer 1 – 2 m (3 - 7 ft) is present when alder is less abundant. Some open, low shrubs are present. Bluejoint and other herb species are common to scattered in the understory. Mosses and lichens are sparse to rare.

Viereck vegetation classes:

- 1B1D Closed Paper Birch Forest
- 1B1E Closed Quaking Aspen Forest
- 1B1F Closed Paper Birch-Quaking Aspen Forest
- 1B1G Closed Quaking Aspen-Balsam Poplar Forest

Similar fuel types:

- (15) Open Paper Birch Forest
- (16) Open Quaking Aspen Forest
- (17) Open Balsam Poplar (Black Cottonwood) Forest
- (19) Spruce-Paper Birch-Aspen
- (20) White Spruce-Paper Birch-Balsam Poplar

Fuel model guide to Alaska vegetation

- (23) Closed Tall Alder-Willow Shrub
- (26) Open Tall Alder-Willow Shrub

(15) Open Paper Birch Forest



1B2A. Open Paper Birch Forest (Photo Courtesy of Yukon - Charley Rivers National Preserve)



Open paper birch (Photo courtesy of Kanuti National Wildlife Refuge)



Open paper birch (Photo courtesy of Kanuti National Wildlife Refuge)



Open paper birch (Photo courtesy of Kanuti National Wildlife Refuge)

Fuel models:

- FBFM40 – TU1
- FBFM13 - [98](#)
- CFFBPS - [M2D1/D2](#)

Primary carrier of fire:

- Leaf litter and grass

Fire behavior comments:

- Use a dynamic fuel model, dependent on green up.
- Leaf litter and some grass in the understory.
- Use M1, [M2](#), or [TU3](#) during shoulder seasons if spruce component in understory nearing 25% or need to increase fire behavior due to understory characteristics

Vegetation characteristics:

These stands are dominated by paper birch with cover ranging from 25–60%. Scattered white or black spruce may be present. Birch, 1 – 2 m (3 – 7 ft) may be present between trees on moist sites. Alder and willows may be present. Ericaceous shrubs form an open dwarf shrub layer beneath taller shrubs. A nearly continuous layer of feathermosses are present. Drier sites may have some lichen between trees

instead of shrubs. Overmature birch stands, occurring on upland slopes, lack spruce understory to replace birch as they die. Understory is composed of low shrubs and herbs such as bluejoint and horsetail.

Viereck vegetation classes:

- 1B2A Open Paper Birch Forest

Similar fuel types:

- (14) Closed Paper Birch-Quaking Aspen Forest
- (18) Woodland Paper Birch-Balsam Poplar

(16) Open Quaking Aspen Forest



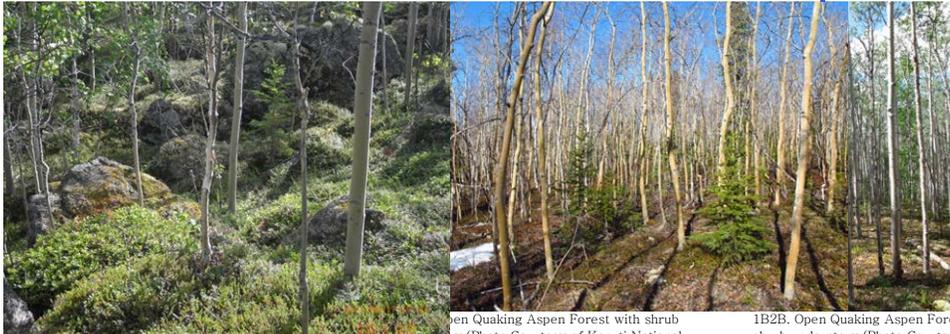
1B2B. Open Quaking Aspen Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



1B2B. Open Quaking Aspen Forest (Photo Courtesy of Gates of the Arctic National Park & Preserve)



B2B. Open Quaking Aspen Forest (Photo Courtesy of National Park Service. Silvery hue of aspen is caused by Aspen Leaf Miner)



1B2B. Open Quaking Aspen Forest with shrub understory.(Photo Courtesy of Kanuti National Wildlife Refuge)

Open Quaking Aspen Forest with shrub understory.(Photo Courtesy of Kanuti National Wildlife Refuge)

1B2B. Open Quaking Aspen Forest with shrub understory.(Photo Courtesy of Kanuti National Wildlife Refuge)

Fuel models:

- FBFM40 – [TL2TU1](#)
- FBFM13 - 8
- CFFBPS - D1/[D2](#)

Primary carrier of fire:

- Leaf litter, grass, shrub, & [slope](#)
-

Fire behavior comments:

- Sites ~~common~~ [often](#) very dry, steep, south-facing slopes along rivers in interior and south-central Alaska.
- [Slope may be important for significant spread.](#)
- [During drought, may get increased fire behavior. May have some spruce in understory that will increase fire behavior.](#)

Vegetation characteristics:

These stands are dominated by small aspen trees ranging from 10–60% cover. Prickly rose, 1 – 2 m (3 – 7 ft) may be present. Low buffaloberry shrubs may be present, with kinnikinnick as a ground cover. Herbs are present. Mosses and lichens are present but do not provide significant cover.

Viereck vegetation classes:

- 1B2B Open Quaking Aspen Forest

Similar fuel types:

- (14) Closed Paper Birch-Quaking Aspen Forest
- (19) Spruce-Paper Birch-Balsam Poplar

(17) Open Balsam Poplar (Black Cottonwood) Forest



[1B2C. Open Balsam Poplar Forest, Kincaid Park](#)



[1B2C. Open Balsam Poplar Forest, Chugach State Park](#)



[1B2C. Open Black Cottonwood Forest, Chugach National Forest](#)

Fuel models:

- FBFM40 – [TL2TU???](#)
- FBFM13 - 8
- CFFBPS - [M2D1/D2](#)

Primary carrier of fire:

- Leaf litter

Fire behavior comments:

- Uncommon, but when it occurs often found on flood plains and occasionally on slopes

Vegetation characteristics:

These open stands, ranging from 25–60% cover, are dominated by balsam poplar or black cottonwood. Other tree species are usually absent. Variable understory composition exists with a scattered, tall shrub layer of willow and alder. Low shrubs are present. Herbs and common bryophytes are present.

Viereck vegetation classes:

- 1B2C Open Balsam Poplar (Black Cottonwood) Forest

Similar fuel types:

- (14) Closed Black Cottonwood-Balsam Poplar Forest
- (18) Woodland Paper Birch-Balsam Poplar

(18) Woodland Paper Birch-Balsam Poplar



1B3A, Paper Birch Woodland (Photo Courtesy of Kobuk Valley National Preserve)



1B3A, Paper Birch Woodland (Photo Courtesy of Kanuti National Wildlife Refuge)



1B3A, Paper Birch Woodland (Photo Courtesy of Kanuti National Wildlife Refuge)

Fuel models:

- FBFM40 – GR1/[SH1](#) or [SH2?](#)
- FBFM13 - 1
- CFFBPS - OA1

Primary carrier of fire:

- Lichen or grass & leaf litter

Fire behavior comments:

- [Uncommon – reported only from Susitna Valley](#)

Comment [SL14]: I've seen areas with mostly lichens in the understory- these could probably stay GR. Other areas might have more shrubs. Original GR assignment probably based on what was assigned to lichen veg type. Need more information on how this actually burns

Vegetation characteristics:

These stands are composed of open grown paper birch and/or balsam poplar with 10–25% cover. Birch is often multi-stemmed and stunted. Alder and willow are tall shrubs in balsam poplar stands. Lichens or herbs (blue joint, fireweed, bluebells, & wintergreen) may be present, especially in the Balsam Poplar Woodland class.

Viereck vegetation classes:

- 1B3A Paper Birch Woodland
- 1B3B Balsam Poplar Woodland
- 1B3C Paper Birch-Balsam Poplar Woodland

Similar fuel types:

- (27) Open Tall Birch/Birch-Willow Shrub

(19) Spruce-Paper Birch-Aspen



1C1D. Closed Quaking Aspen - Spruce Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



1C2A. Open Spruce - Paper Birch Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



1C2B. Open Quaking Aspen - Spruce Forest (Photo Courtesy of Denali National Park & Preserve)



1C2B. Open Quaking Aspen - Spruce Forest (Photo Courtesy of Kanuti National Wildlife Refuge)

Fuel models:

- FBFM40 - ~~T~~L6TU5
- FBFM13 - 8
- CFFBPS - M2M2/50% conifer

Primary carrier of fire: Fire behavior comments:

- leaf litter

- Amount of spruce in stand increases rate of spread; understory spruce may not be detected from air. Can adjust herbaceous and live woody moistures to account for amount of spruce within TU5
- Use M1 during the shoulder seasons for leafless period
- M2 should be used during green period
- Occurs on flood-plain terraces; slopes; uplands; or warm, dry sites

Vegetation characteristics: Get photos from fuel photo guide

Includes open and closed stands (>25% tree cover). These stands are composed of paper birch and/or aspen with white or black spruce or a mixture thereof, with cover greater than 10%. Small quantities of balsam poplar may be present. Moderately dense to scattered tall shrubs of alder and willow along with an intermittent to closed low shrub layer is present. Herbs, mosses, lichens, ferns may be present depending upon dominant stand type. Cover of feathermosses range from dominant to patchy. Percentages need to be clarified

Viereck vegetation classes:

- 1C1A Closed Spruce-Paper Birch Forest
- 1C1C Closed Spruce-Paper Birch-Quaking Aspen Forest
- 1C1D Closed Quaking Aspen-Spruce Forest
- 1C2A Open Spruce-Paper Birch Forest
- 1C2B Open Quaking Aspen-Spruce Forest
- 1C3A Spruce-Paper Birch Woodland

Similar fuel types:

- (15) Open Paper Birch Forest
- (16) Open Quaking Aspen Forest
- (20) White Spruce-Paper Birch-Balsam Poplar
- (22) Dwarf Tree Black Spruce Scrub

(20) White Spruce- Balsam Poplar -Paper Birch-Balsam Poplar



1C1B. Closed White Spruce-Paper Birch-Balsam Poplar Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



1C1E. Closed Balsam Poplar-White Spruce Forest (Photo Courtesy of Lake Clark National Park & Preserve)



1C2D. Open Spruce-Balsam Poplar Forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)

Fuel models:

- FBFM40 – TU1
- FBFM13 - 8
- CFFBPS - M2/25% conifer

Primary carrier of fire:

- leaf litter & herbaceous plants

Fire behavior comments:

- Use M1 during the shoulder seasons/leafless period
- Occurs on flood-plains; creek bottoms; areas with low shrubs at tree line; or high elevation streams. Consider vegetation type 19 if more upland site

Vegetation characteristics: New photos- make it clear it's riparian.

Occurs on flood-plains; creek bottoms; areas with low shrubs at tree line; or high elevation streams
These stands are dominated by white spruce, paper birch, balsam poplar or black cottonwood, paper birch, or a mixture of these species, with tree cover greater than 25%. Tall shrubs like alder or willow, often greater than 2 m (7 ft) tall, are present along with lower shrubs. Herbs are present. Ferns and mosses may be present.

Viereck vegetation classes:

- 1C1B Closed White Spruce-Paper Birch-Balsam Poplar (Black Cottonwood) Forest
- 1C1E Closed Balsam Poplar-White Spruce Forest
- 1C2C Open Paper Birch-Balsam Poplar-Spruce Forest
- 1C2D Open Spruce-Balsam Poplar Forest

Similar fuel types:

- (17) Open Balsam Poplar (Black Cottonwood) Forest
- (19) Spruce-Paper Birch-Aspen

(21) Dwarf Tree Mountain Hemlock Scrub



2A1A. Closed Mountain Hemlock Dwarf Tree Scrub (Photo Courtesy of J. Koltun, GRS)

Fuel models:

- FBFM40 – SH1
- FBFM13 - [405](#)
- CFFBPS - [M2O1A](#)

Primary carrier of fire:

- Sparse moss & shrub

Fire behavior comments:

- [Fire unlikely, high foliar moisture, Low-low](#) rate of spread
- [Occurs in areas highly exposed to wind](#)
- [Use low curing for O1A](#)

Vegetation characteristics:

[Generally higher elevation sites.](#) These stands are dominated by mountain hemlock ~~or sub-alpine fir~~ less than 3 m (10 ft) tall at maturity. Dwarf stands may be only 15 - 30 cm (6 - 12 in) tall, with greater than 25% cover, where exposed to severe wind. Sitka spruce may be present. Tree cover is less than 10% for trees taller than 3 m (10 ft). A sparse low shrub cover along with a well developed dwarf shrub layer is present. Herb cover is low. Mosses are present.

Comment [UFS15]: Pretty darn rare - limited to southern portion of SE.

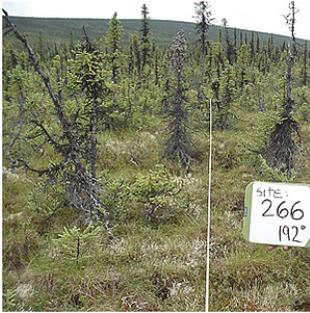
Viereck vegetation classes:

- 2A1A Closed Mountain Hemlock Dwarf Tree Scrub
- 2A1B Closed Subalpine Fir Dwarf Tree Scrub
- 2A2B Open Mountain Hemlock Dwarf Tree Scrub

Similar fuel types:

- (1) ~~Closed~~-Sitka Spruce-~~Western~~ Hemlock Forest
- (4) ~~Open Western Hemlock Sitka Spruce Forest~~
- (37) Dwarf Shrub Tundra

(22) Dwarf Tree Black Spruce Scrub



2A2A. Open Black Spruce Dwarf Tree Scrub
(Photo Courtesy of the Steese - White Mountains
Recreational Area - BLM)



2A3A. Black Spruce Dwarf Tree Woodland (Photo
Courtesy of Ducks Unlimited)



2A3A. Black Spruce Dwarf Tree Woodland (Photo
Courtesy of Kobuk Valley National Preserve)

Fuel models/types (*make this change throughout!):

- ~~FBFM40 - TU4GS1/GS2~~
- ~~FBFM13 - 9~~
- ~~CFFBPS - C2C1/C2~~

Primary carrier of fire:

- ~~Feathermoss & shrub~~

Fire behavior comments:

- Similar to open and woodland black spruce forests, difference is with tree height
- Change to C2/GS2 when canopy cover is in open canopy range (25-60%)
-

Vegetation characteristics:

Stands are dominated by black spruce, less than 3 m (10 ft), with cover ranging from 10–60% for dwarf trees and less than 10% for trees greater than 3 m (10 ft). Dwarf tamarack and paper birch may be present. A well-developed shrub layer, 1 – 2 m (3 - 7 ft) tall composed of birch, may be present in areas near the tree-line. Alder and willows may be present on moist sites. Low shrubs, nearly continuous in cover, 10 – 100 cm (4 – 39 in) tall, are present. The ground layer is dominated by feathermosses. Lichens may be present. Grasses and sedges may be common in younger stands. Herbs are scarce.

Viereck vegetation classes:

- 2A2A Open Black Spruce Dwarf Tree Scrub
- 2A3A Black Spruce Dwarf Tree Woodland

Similar fuel types:

- (6) Open Black Spruce Forest
- (11) Black Spruce Woodland with lichen-moss
- (30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog
- (32) Open Low Birch-Ericaceous Shrub/Bog

(23) Closed Tall Alder-Willow Shrub



2B1A. Closed Tall Willow Shrub (Photo Courtesy of Wrangell - St. Elias National Park & Preserve)



2B1A. Closed Tall Willow Shrub (Photo Courtesy of Yukon - Charley Rivers National Preserve)



2B1A. Closed Tall Alder Shrub (Photo Courtesy of M. Fleming, SAIC)

Fuel models:

- FBFM40 – [TU4SH2](#)
- FBFM13 - [65](#)
- CFFBPS - [M2D1/D2](#)

Primary carrier of fire:

- Leaf litter & woody debris

Fire behavior comments:

- [N/A High fuel moisture, most likely to burn in spring](#)

Vegetation characteristics:

Some taller alders and willows, scattered balsam poplar or black cottonwood are present in the overstory. Spruce, paper birch, and cottonwood may be present with cover less than 10%. Shrubs of willow or alder taller than 1.5m (5 ft) are present with 75% or greater cover. Spruce, paper birch, and cottonwood may be present with cover less than 10%. Low shrubs are restricted to openings or maybe be absent altogether. Mosses and some grass (in open stands) may be present.

Viereck vegetation classes:

- 2B1A Closed Tall Willow Shrub
- 2B1B Closed Tall Alder Shrub
- 2B1D Closed Tall Alder-Willow Shrub

Similar fuel types:

- (25) Tall Shrub Swamp
- (26) Open Tall Alder-Willow Shrub
- (29) Closed Low Willow/Alder-Willow Shrub

(25) Tall Shrub Swamp

Comment [UFS16]: A not likely to burn type?

Fuel models:

- FBFM40 – SH1
- FBFM13 - 1
- CFFBPS - O1A

Primary carrier of fire:

- Herbaceous, shrub, and leaf litter

Fire behavior comments:

- Standing water is common

Vegetation characteristics:

Scattered trees may be present with less than 10% cover. This type is dominated by alder or willows, 1.5 m (5 ft) or taller with 25-75% cover, in standing water. Some low shrubs may be present. Hydrophobic mosses or a dense herb layer may be present. Lichens are sparse. The substrate is usually hummocky with water in the depressions throughout much of the growing season.

Viereck vegetation classes:

- 2B1F Closed Tall Shrub Swamp
- 2B2F Open Tall Shrub Swamp

Similar fuel types:

- (23) Closed Tall Alder-Willow Shrub
- (34) Open Low Alder/Alder-Willow Shrub

(30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog



2C2A. Open Low Mixed Shrub-Sedge Tussock Tundra (Photo Courtesy of the National Park Service)



2C2B. Open Low Mixed Shrub-Sedge Tussock Bog (Photo Courtesy of the Arctic National Wildlife Refuge)



2C2B. Open Low Mixed Shrub-Sedge Tussock Bog (Photo Courtesy of Gates of the Arctic National Park & Preserve)

Fuel models:

- FBFM40 – [GR2GS2](#)
- FBFM13 - 1
- CFFBPS - O1

Primary carrier of fire:

- Tussocks, [low shrubs](#)

Fire behavior comments:

- [Shrub component dampens fire behavior](#)
- [Smoke visible from interior of fire indicates difficulty to control; no smoke- can generally be beaten out](#)
- [Consider GR2 if lower shrub component](#)

Vegetation characteristics:

Trees, if present, are usually stunted black spruce with less than 10% cover. These communities have 25% shrub cover and are dominated by tussock-forming sedges. Scattered alders and willows 1 m (3 ft) tall are sometimes present. Low shrubs may be present, with at least 25% cover. Mosses and dwarf shrubs [on tussocks and in intertussock spaces form a mat around the tussocks.](#) Mosses and lichens are scarce to common.

Viereck vegetation classes:

- 2C2A Open Low Mixed Shrub-Sedge Tussock Tundra
- 2C2B Open Low Mixed Shrub-Sedge Tussock Bog

Similar fuel types:

- (10) Black Spruce Woodland with tussock
- (22) Dwarf Tree Black Spruce Scrub
- (31) Open Low Birch-Ericaceous Shrub/Bog
- (43) Tussock Tundra

(31) Open Low Birch-Ericaceous Shrub/Bog



2C2C. Open Low Mesic Shrub Birch-Ericaceous Shrub (Courtesy of Bering Land Bridge National Preserve)



2C2C. Open Low Mesic Shrub Birch-Ericaceous Shrub (Courtesy of Yukon - Charley Rivers National Preserve)



2C2D. Open Low Shrub Birch-Ericaceous Shrub Bog (Courtesy of Gates of the Arctic National Park & Preserve)

Fuel models:

- FBFM40 – [GR3GS1](#)
- FBFM13 - 1
- CFFBPS - O1

Primary carrier of fire:

- [Grass and dwarf birch](#)
[Ericaceous shrub and birch](#)

Fire behavior comments:

- [N/A Low moisture of extinction.](#)

Vegetation characteristics:

Scattered white or black spruce trees provide less than 10% cover. These communities have 25–75% cover of shrubs at least 20 cm (8 in) tall. Tall shrubs provide less than 25% cover. Other ericaceous shrubs may be present. Shrub birch, 0.5 – 1.5 m (2 - 5 ft) tall, forms an overstory layer with the ericaceous shrubs. Herbs are present under or between the taller shrubs. A moss mat is usually present under the shrubs. Lichens are common to abundant. Tussocks and sedges may be present. [Serai type in interior: climax and more subalpine in western part of state](#)

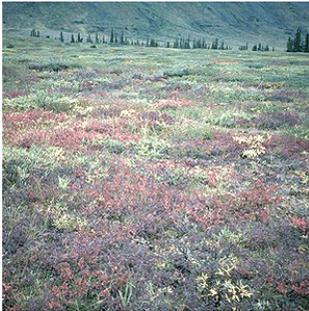
Viereck vegetation classes:

- 2C2C Open Low Mesic Shrub Birch-Ericaceous Shrub
- ~~2C2D Open Low Shrub Birch-Ericaceous Shrub Bog~~

Similar fuel types:

- (10) Black Spruce Woodland with tussock
- (11) Black Spruce Woodland with lichen-moss
- (22) Dwarf Tree Black Spruce Scrub
- (30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog
- (32) Open Low Birch-Willow/Ericaceous Shrub/Bog

(32) Open Low Birch-Willow/Ericaceous Shrub Bog



2C2E. Open Low Ericaceous Shrub Bog (Photo Courtesy of Kobuk Valley National Preserve)



2C2E. Open Low Ericaceous Shrub Bog (Photo Courtesy of Gates of the Arctic National Park & Preserve)



2C2F. Open Low Shrub Birch-Willow Shrub (Photo Courtesy of Gates of the Arctic National Park & Preserve)

Fuel models:

- FBFM40 – [GR2GR1](#)
- FBFM13 - 1
- CFFBPS - O1

Primary carrier of fire:

- Grass & shrub

Fire behavior comments:

- [Sphagnum and willow](#) dampens fire behavior, even with birch present
- [GS1 if higher fire behavior is observed.](#)

Vegetation characteristics:

Scattered lodgepole pine, Alaska-cedar, mountain hemlock, Sitka spruce, and western hemlock may be present with less than 10% cover. These communities are dominated by birch, willow, or ericaceous shrubs, forming a mat 20-50 cm (8-20 in) thick, with 25-75% cover. There may be an abundance of shrub birch, especially in Open Low Shrub Birch-Willow Shrub communities. Low shrubs are common beneath the taller shrub canopy. Sedges and feathermosses may be present. Lichens may be present on mounds.

Viereck vegetation classes:

- 2C2E Open Low Ericaceous Shrub Bog
- [2C2F Open Low Shrub Birch-Willow Shrub](#)
- [2C2D Open Low Shrub Birch-Ericaceous Shrub Bog](#)
-

Similar fuel types:

- (31) Open Low Birch-Ericaceous Shrub/Bog
- (32) Open Low Birch-Willow/Ericaceous Shrub/Bog
- (37) Dwarf Shrub Tundra

(37) Dwarf Shrub Tundra



2D1A. Dryas Dwarf Shrub Tundra (Photo Courtesy of Denali National Park & Preserve)



2D1B. Dryas-Sedge Dwarf Shrub Tundra



2D3A. Willow Dwarf Shrub Tundra (Photo Courtesy of the Arctic National Wildlife Refuge)



2D1A. Burned Dryas Dwarf Shrub Tundra (Photo Courtesy of Kanuti National Wildlife Refuge)



2D1A. Burned Dryas Dwarf Shrub Tundra (Photo Courtesy of Kanuti National Wildlife Refuge)

Fuel models:

- FBFM40 – [GR4GS1](#)
- FBFM13 - 1
- CFFBPS - O1A

Primary carrier of fire:

- Herbs & low shrubs

Fire behavior comments:

- [Low fire behavior](#)
- [Fires backing into wind tend to burn faster than headfires](#)
-

Vegetation characteristics:

Trees are absent or have less than 10% cover. This type is dominated by dryas, fruticose lichens, bearberry, *Vaccinium* species, crowberry, mountain heath, cassiope, or dwarf willows, which form mats a few centimeters (1 in) thick. Other dwarf or ericaceous shrubs may be present. Shrubs taller than 20 cm (8 in) range from 0-25% cover. Patterns, commonly steps or stripes, may be present. Forbs, mosses, and lichens are usually present. Sedges and other herbs, if present, may grow 10 – 30 cm (4 – 12 in) above the mat. Cover ranges from 2–100%. Mosses are commonly intertwined in the mat of ericaceous shrubs, if present. This type occurs primarily in the northern two thirds of Alaska.

Comment [UFS17]: Maybe those low krumholz spruce fir in here better. I'm thinking of alpine spruce – never more than 4 ft tall, but very spread out. I would imagine their presence could alter fire behavior... See photo of Rob, below...

Viereck vegetation classes:

- 2D1A Dryas Dwarf Shrub Tundra
- 2D1B Dryas-Sedge Dwarf Shrub Tundra
- 2D1C Dryas-Lichen Dwarf Shrub Tundra
- 2D2A Bearberry Dwarf Shrub Tundra

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- 2D2B Vaccinium Dwarf Shrub Tundra
- 2D2C Crowberry Dwarf Shrub Tundra
- 2D2D Mountain Heath Dwarf Shrub Tundra
- 2D2E Cassiope Dwarf Shrub Tundra
- 2D3A Willow Dwarf Shrub Tundra

Similar fuel types:

- (30) Open Low Mixed Shrub-Sedge Tussock Tundra/Bog
- (31) Open Low Birch-Ericaceous Shrub/Bog
- (32) Open Low Birch-Willow/Ericaceous Shrub/Bog



(41) Bluejoint (Calamagrostis) Meadow



3A2A. Bluejoint Meadow (Photo Courtesy of Bering Land Bridge National Preserve)



3A2A. Bluejoint Meadow (Photo Courtesy of BLM Alaska Fire Service)

Fuel models:

- FBFM40 – GR4/[GR5](#)
- FBFM13 - 3
- CFFBPS - O1

Primary carrier of fire:

- grass

Fire behavior comments:

- This type includes *Calamagrostis* species (reed grass); and post-fire, human disturbance, [and beetle kill sites](#).
- [GR5 used for heavier fuel loads](#).

Vegetation characteristics:

Woody plants are rare or absent, but a mosaic pattern of bluejoint meadow and tall shrubs like alder may be present. These communities are dominated by bluejoint reedgrass (0.8 - 1.4 m; 32 – 55 in) tall. Cover is usually complete with very dense vegetation. Other grasses and herbs may be present. Mosses are often absent, but feathermosses may be present in more open stands. Wetter sites may have hummocks.

[Add discussion on seasonality/curing.](#)

[***Pictures showing different fuel loads, phenology.](#)

Viereck vegetation classes:

- 3A2A Bluejoint Meadow

Similar fuel types:

- (40) Grass-Herb
- (42) Bluejoint-Shrub/Herb

Standing Dead Beetle-Kill Spruce Forest



White Spruce Forest Killed by Bark Beetles (Photo Courtesy of Alaska State Forestry) **(SURFACE VIEW PHOTO)**



White Spruce Forest impacted by bark beetle infestation (Photo Courtesy of Kenai Peninsula Borough) **(AERIAL VIEW PHOTO)**



1A1J. Torching/Crown fire in closed white spruce forest (Photo Courtesy of Wrangell - St. Elias National Park & Preserve) **(FIRE PHOTO)**



Torching Beetle-Kill Spruce in Background with Dead Canopy Structure in Foreground (Photo Courtesy of Alaska State Forestry) **(SURFACE VIEW PHOTO)**



Close up view of hairy species lichen growing on limbs of beetle kill spruce (Photo Courtesy of the Kenai Peninsula Borough)



Close up view of a fruticose species lichen mixed with foliose lichen on dead spruce (Photo Courtesy of the Kenai Peninsula Borough)

Suggested Fuel models:

- FBFM40 – SB2/SB3
- FBFM13 - 12
- CFFBPS - M3

Primary carrier of fire:

- Blue joint (*Calamagrostis*) grass, feathermoss, lichen

Fire behavior comments:

- Surface flames of one/two feet will initiate canopy fire involvement
- Active crown fire can occur in moderate wind and fire danger conditions
- Flame length of active crown fire involvement is typically 1 ½ times tree height
- Probability of spot fire ignition is very high in this fuel complex with spot fires of 1 mile distance common.

Vegetation characteristics:

Spruce forest with tree mortality ranging from 60% to 95% of stand structure as a result of bark beetle epidemic (*dendroctonus rufipennis*). Forest composition is predominately spruce conifer with less than 33% hardwood species; typically closed canopy. Beetle impacted spruce have a “red needle” stage as the last phase before tree mortality. Dead trees retain fine limbs for many years and often serve as host structure to an abundance of lichen species material. Depending on moisture/climatic conditions of beetle infestation area, standing dead spruce forests begin to experience stem decay and breakage within 5 to 10 years after bark beetle infestation. Most stands start to fully unravel by 20 years after beetle attack.

Viereck vegetation classes:

- 1A1J Closed White Spruce Forest

Similar fuel types:

- (3) Closed Black Spruce Forest
- (5) Open White Spruce Forest

Notes about burn patterns and post-fire vegetative succession:

- Early and mid-season fires in this fuel complex can generate high intensity canopy fires that are spectacular to observe which consume almost all above ground 1hr, 10hr and 100hr fuel loading.
- As contrast, depth of surface/duff layer fuel consumption is often “light” in early to mid-season fires. Later season fires with slow rates of spread and higher duff moisture code values (drought) can generate greater duff consumption patterns.
- Duff layer consumption is a pivotal factor for determining expected post-fire vegetation results.
- Canopy fire intensity in this type of fuel complex typically kills most remnant live spruce not affected by beetles along with many hardwood trees. The end result is far less tree seed production and seed dispersal density when compared to forest fires not influenced by bark beetle mortality.

Landfire Related Comments?

Heavy Stem Breakage/Downed & Jack-Straw Spruce

Aged Post Mortality Beetle-Kill Forest



Spruce Forest 13 years after bark beetle infestation
(Photo Courtesy of Alaska Division of Forestry)



Spruce Forest along salmon stream 16 years
after extensive beetle attack (Photo Courtesy of
Alaska Division of Forestry)



Spruce Forest with beetle kill at unmanaged cabin site
(Photo Courtesy of Kenai Peninsula Borough)



Spruce forest 11 years after bark beetle epidemic
(Photo Courtesy of Alaska Division of Forestry)



Close up view of Foliose lichen growing on
downed beetle kill spruce (Photo Courtesy of
the Kenai Peninsula Borough)



Aerial view of beetle impacted spruce forest 15 years
after infestation (Photo Courtesy of Kenai Peninsula
Borough)

Suggested Fuel models:

- FBFM40 – SB3
- FBFM13 - 13
- CFFBPS - C3

Primary carrier of fire:

- Grass fine fuels
- Lichen attached tree limb structure
- 10 hour dead tree material

Fire behavior comments:

- 10-hour and 100-hour fuel components are normally below expected fuel moisture content levels in early to middle fire season periods.

Fuel model guide to Alaska vegetation

- Passive to active fire involvement of remnant canopy layers, both dead and green trees, are almost always included in the fire front spread.
- Down-wind fuel beds are highly receptive to spot fire development.
- Crew mobility and rates of travel through this fuel complex are greatly compromised. Well planned safety zones and locations for safe egress are paramount to crew safety in this fuel type.
- Use of aerial fire retardant is generally not effective because the retardant material does not fully penetrate through the fuel layer.
- Fires that occur after grass (calamagrostis) has reached seasonal "green-up" will diminish rates of fire spread and intensity although prolific spot fire occurrence can still be expected.

Vegetation characteristics:

Spruce forests heavily impacted by bark beetle infestation usually begin to experience stem breakage about 8 to 15 years after mortality. More moist climatic areas with greater fungal growth activity cause more rapid stem breakage and timber stand unraveling. Significant windstorms also can accelerate stem breakage patterns.

Closed spruce forests accumulate a heavy fuel layer of downed and jackstraw trees as stem breakage becomes advanced. The forest floor layer of vegetation is commonly composed of blue joint (Calamagrostis) grass which adds a volume of 3 to 5 tons/acre of fine fuel component during early season fires.

Viereck vegetation classes:

- 1A1J Closed White Spruce Forest

Similar fuel types:

- (3) Closed Black Spruce Forest
- (5) Open White Spruce Forest

Notes about burn patterns and post-fire vegetative succession:

- Early and mid-season fires in this fuel complex can generate significant BTU combustion intensity at the surface level. Nevertheless, they commonly yield limited duff consumption because of frozen ground or high duff moisture content soon after snow melt.
- Herbaceous vegetation response after spring/early summer fires exhibits robust growth with warming soils associated with blackened surfaces and increased nutrient mineral availability in fire ash content.
- Fires in remnant forest sites composed with a mix of grass (calamagrostis) and fireweed tend to accelerate a flush of fireweed growth/dominance after a burn.
- Late summer/fall season fires in this fuel complex have greater probability of occurring with lower duff moisture content/drought conditions. These fires tend to have less initial fire intensity but longer burn residence time. This pattern causes less impact to live trees and typically generates more shrub and forest species sprouting response.

Landfire Related Comments:

Closed Spruce Forest with Moderate Downed Beetle Kill/ Mixed Spruce & Hardwood Forest with Moderate Beetle Kill



Spruce forest with about 50% beetle kill mortality and stem breakage (Photo Courtesy of the Kenai Peninsula Borough)



Open mixed birch and spruce forest with most spruce dead (Photo Courtesy of the Kenai National Wildlife Refuge)



Open spruce forest about 15 years after beetle infestation (Photo Courtesy of the Alaska Division of Forestry)



Open spruce stand about 12 years after beetle attack after grass seasonal "green-up" (Photo



Downed spruce after grass seasonal "green-up" (Photo Courtesy of the Alaska Division of Forestry)



Example of fire energy release from a single downed spruce tree canopy structure (Photo Courtesy of the Alaska Division of Forestry)



Aerial view of downed beetle kill trees in a mixed spruce and birch timber stand (Photo Courtesy of the Kenai Peninsula Borough)

Suggested Fuel models:

- FBFM40 – TU5
- FBFM13 - 10
- CFFBPS - M-3

Primary carrier of fire:

- Grass fine fuels
- Feathermoss, forest litter, duff
- Lichen attached to tree limb structure

Fire behavior comments:

- 10-hour and 100-hour fuels of downed and jackstraw dead spruce tree material are usually well below fuel moisture content levels expected in early to mid-season periods.
- Fires occurring at lower/mid-level hazard conditions will be fuels driven; expanding at 5 to 20 ch/hr in dead jackstraw fuel pockets with occasional passive torching in neighboring forest canopy.
- Slow moving fires with +/- 1 foot flames will generate 4' to 10' flames in a quick time frame after reaching downed beetle-kill spruce.
- Fires occurring at high level/extreme fire conditions will likely involve active crown fire because of ladder fuel loading

Vegetation characteristics:

This type of forest structure is associated with closed or open spruce forests, or mature stands with mixed spruce and deciduous tree composition, that have experienced moderate levels of bark beetle mortality in times past with subsequent dead tree breakage/unraveling. The forest canopy structure will be open with possible larger pockets of decadent jackstraw/downed spruce trees. Open canopy areas/expanses will usually have surface vegetation dominated by blue joint reed grass (*calamagrostis*). Portions of remnant healthy forest canopy will have concurrent surface vegetation normal to older dominant stands; principally, moss cover and numerous herbaceous berry species. Intermediate brush layers of rusty *menziesia*, devils club or sitka alder are found on some vegetative sites.

Viereck vegetation classes:

- 1C1A Closed Spruce-Paper Birch Forest
- 1C1C Closed Spruce-Paper Birch-Quacking Aspen Forest
- 1C2A Open Spruce-Paper Birch Forest

Similar fuel types:

- (3) Closed Black Spruce Forest
- (5) Open White Spruce Forest

Landfire Related Comments:

Post-Timber Harvest Areas with Bluejoint Grass and Logging Slash Fuel Beds



Mixed grass and fireweed fuels about 8 years after salvage timber harvest (Photo Courtesy of the Kenai Peninsula Borough)



Fall season grass fuels about 6 years after salvage logging (Photo Courtesy of the Kenai Peninsula Borough)

Suggested Fuel models:

- FBFM40 – GR-7
- FBFM13 - 3
- CFFBPS - O1

Primary carrier of fire:

- grass
- 1hr & 10hr logging slash debris

Fire behavior comments:

- Logging slash 1hr and 10hr fuel loading of one to three tons/ac is typical volume range in post-timber harvest sites
- Logging slash component adds a longer burn residence time compared to grass fires
- When grass is dead/dormant, logging slash does not add significant change for Rate of Spread outputs but does increase flame length intensity compared to grass fuel models
- Logging slash fuels can generate significant fire intensity well into the grass “green-up” season when high fuel moistures normally diminish fire production
- Logging slash also affects resistance to fire control and mop-up time compared to grass fuel models

Vegetation characteristics:

Blue Joint grass (*Calamagrostis canadensis*) is a minor vegetative component in most mature upland timber stands. If sites are disturbed and canopy opens because of logging or insect infestation, *Calamagrostis* often becomes the principal surface vegetation on these sites. Once established, *Calamagrostis* can dominant site vegetation for 30 years or longer duration. Fires on grass dominated sites do not normally have adverse impact rhizome layers. To the contrary, ash mineralization actually serves to produce a flourish of new grass production.

Viereck vegetation classes:

- 3a2a Bluejoint meadow grass

Similar fuel types:

- Grass composition riparian zones

Landfire Related Comments:

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