

DRAFT

Fire Regime Condition Class (FRCC) Interagency Guidebook Reference Conditions

Author/Modeler(s): Evie Witten
Lead Author Phone: (907) 276-3133 (#107) **E-mail:** akfrcc@alaska.net
First Draft Date: March 3, 2004 **Most Recent Edit:** August 5, 2004
Status: In development **PNV Code:** BSPS

Potential Natural Vegetation (PNV) Name: Black Spruce Southcentral

Fire regime group: IV

Geographic Area: Southcentral Alaska, including the Kenai Peninsula, Matanuska and Susitna Valleys, and Copper River Basin.

Physical Stetting Description:

Black Spruce Southcentral PNV sites are widespread and common throughout southcentral Alaska on cold, mostly poorly-drained terrain. Soils range from poorly drained Cryaquepts, to Cryochrepts to well-drained alluvial gravels. Upland black spruce sites occupy north-facing slopes and ridge tops. Lowland black spruce sites occupy old river terraces, small valley bottoms, lake margins and lower north-facing slopes (Viereck and Little 1972). Open treeline forests occur up to approximately 750 meters in elevation (Viereck et al 1986).

Biophysical Classification:

The Black Spruce Southcentral PNV type occurs in the following ecoregions described by Nowacki et al (2001):

- Alaska Range Transition: Cook Inlet Basin (B5), Copper River Basin (B8)

The following community types described by Viereck et al (1992) are included in the Black Spruce Southcentral PNV group:

- IA1k – Closed Black Spruce Forest
- IA2f – Open Black Spruce Forest
- IA2h – Open Black Spruce-Tamarack Forest
- IA3d – Black Spruce Woodland
- IB1d – Closed Paper Birch forest (black spruce understory & sites)
- IB1e – Closed Quaking Aspen Forest (severely burned black spruce sites)
- IB1f – Closed Paper Birch-Quaking Aspen Forest (black spruce sites)
- IC1a – Closed Spruce-Paper Birch Forest (black spruce sites)
- IC1c – Closed Spruce-Paper Birch-Quaking Aspen Forest
- IC1d – Closed Quaking Aspen-Spruce Forest (black spruce sites)
- IC2a – Open Spruce-Paper Birch Forest (black spruce sites)
- IC2c – Open Paper Birch-Balsam Poplar-Spruce Forest
- IC3a – Spruce Paper Birch Woodland (black spruce sites)

The following community types (Viereck et al 1992) may be included in the Black Spruce Southcentral PNV group depending on site variables:

- IA1l – Closed Black Spruce-White Spruce Forest
- IA2g – Open Black Spruce-White Spruce Forest
- IA3e – Black Spruce-White Spruce Woodland

Identification of Key Characteristics of the PNV and Confuser PNVs:

Site indicator species include black spruce (*Picea mariana*) and *Sphagnum* spp.. Low shrubs usually limited to black spruce sites and treeline sites include Labrador tea (*Ledum groenlandicum*, *L. decumbens*), bog cranberry (*Vaccinium oxycoccos*), bog blueberry (*V. uliginosum*) and mountain cranberry (*V. vitis-idaea*) (Dyrness et al 1983). Woodland horsetail (*Equisetum sylvaticum*) and cloudberry (*Rubus chamaemorus*) are commonly found in black spruce and mixed white and black spruce stands (Dyrness et al 1983). Note that ericaceous species (i.e. *V. uliginosum*, *V. vitis-idaea*) are frequently found on both white spruce and black spruce sites, and thus are not ideal site indicators.

This PNV is similar to the Black Spruce Interior PNV that occurs north of the Alaska Range and has a shorter fire return interval and slightly different successional pathways. In some locations, this PNV can be confused with the White Spruce PNV because black and white spruce often mix, especially on sites with transitional moisture and thermal conditions.

Natural Fire Regime Description:

Most fires in Black Spruce Southcentral PNV are either crown or ground fires of enough intensity to kill overstory trees. Usually some of the organic layer remains. (Vioreck 1983). Fires tend to be large – 50,000 hectares or larger. During most fire years a small number of large fires account for most of the total area burned (Gabriel and Tande 1983). Ecologically significant fires usually occur during the exceptional fire years and cover 200,000 + hectares (Vioreck 1983). Mean fire return interval estimates for black spruce include:

- 170 yrs (personal communication; Expert's group consultation June 2004)
- 80 years (DeVolder 1999) (Kenai Peninsula – includes post-settlement, human-caused fires)
- 25-40 years (Yarie 1983) (for the Porcupine River area)
- 50-100 years (Heinselman 1978, Vioreck 1983) (for interior Alaska),
- 130 years (Heinselman 1981) (open spruce-lichen – Alaska taiga)
- 100 years (Heinselman 1981) (closed black spruce – Alaska taiga)
- 80-90 years (Rowe et al 1974) (for the MacKenzie Valley)
- 50-70 years (Vioreck et al 1986) (for interior Alaska)
- 70-100 years (Christiansen 1988) (for spruce-lichen woodland)

Post fire regeneration is characteristically rapid and dominated by revegetation via rhizomes, root and stump sprouts of species that survive the fire (Schaefer 1993, Vioreck 1975, Van Cleve and Vioreck 1981). Regeneration of black spruce tends to occur over one to two decades after a fire event (Black and Bliss 1980, Sirois and Payette 1989). Where the organic layer is mostly consumed by fire vegetative reproduction is much reduced and sites are captured more by light-seeded 'invader' species (Heinselman 1981).

Other Natural Disturbance Description:

The thaw pond cycle (disturbance leads to thawing of permafrost and ponding) and paludification (*Sphagnum* layer buildup and saturation) are important disturbances on black spruce sites (Vioreck et al 1986, Foote 1983, Vioreck 1975).

Natural Landscape Vegetation-Fuel Class Composition:

The natural vegetation structure is a mosaic of the seral stages described in the table below, with open spruce forests being the dominant late-development type. Black spruce is the climax indicator species.

Natural Scale of Landscape Vegetation-Fuel Class Composition and Fire Regime:

Typical landscapes in this PNV exist in a mosaic with relatively warmer and drier white spruce and riparian white spruce sites, non-forested wetlands and at the altitudinal limits of the PNV, shrub and tundra sites.

Uncharacteristic Vegetation-Fuel Classes and Disturbance :

In recent decades black spruce began encroaching into drying sphagnum bogs, creating “islands” of spruce where spruce were not previously present (Ed Berg, personal communication, March 4, 2004). This drying and resultant encroachment is attributed to the warming climate.

PNV Model Classes and Descriptions:

Class	Modeled Percent of Landscape	Description
A: 0-30 years Early Seral moss, grass, herb, shrub and sapling	12%	Moss, herbs, seedlings of trees and shrubs establish 3 months to 3 years post fire (Foote 1983). Shrubs and saplings 1.4 to 7 m tall typically begin capturing sites 4-5 years post fire. Tall shrub and sapling layer characterized by 60-100% canopy closure. Tree saplings may include spruce, hardwoods or both. <i>Calamagrostis canadensis</i> may capture large percentages of sites following a light burn.
B: 30-90 years Mid-development, closed hardwood and spruce mixed forest	11%	Hardwoods or hardwoods and spruce overtop shrubs and gain dominance. Early in this age class, trees are at least 2.5 cm DBH and 4-8 m tall (Foote 1983). Spruce may occur as an understory, subdominant, co-dominant component. Tree density is > 60%. Beneath trees, shrubs, herbs and mosses exist. As the stage advances spruce and moss become more important
C: 30-90 years Mid-development, <i>Calamagrostis Canadensis</i> succeeding to open spruce	14%	If <i>Calamagrostis canadensis</i> captures site following a, Spruce forms an overstory in this age class, with canopy cover <60%.
D: 90-300 years Late-development, open spruce	52%	Spruce gains dominance over hardwoods (if previously present) or matures after growing through <i>Calamagrostis</i> dominated site. Tree density is < 60% and maybe < 25% (woodland) depending on site conditions. Occasional hardwoods may remain. The understory may include various combinations of tall shrubs, low shrubs, herbs, mosses and lichens. If fire absent for long periods paludification may occur.
E: 90-300 years Late-development, closed spruce	11%	Site is dominated by mature black spruce with > 60% canopy closure. The understory may include various combinations of tall shrubs, low shrubs, herbs, mosses and lichens. Some mature hardwoods may persist.
Total:	100%	

Deleted: C

Deleted: m

Deleted: C

Deleted: light burn will succeed to this open class

Modeled Fire Frequency and Severity:

	Mean Probability	Mean Fire Frequency (years) (inverse of probability)	Description
Replacement fire	0.56	180	Based on literature and expert input
Mosaic fire	0.05	2000 yrs	Based on literature and expert input
All Fire	0.61	165 yrs	Based on literature and expert input
Other disturbances			

Modeled Fire Severity Composition:

	Percent All Fires	Description
Replacement fire	90	Based on literature and expert input
Non-replacement fire	10	Based on literature and expert input
All Fire	100	

Further Analysis:**References**

- Black, R.A. and L.C. Bliss. 1980. Reproductive ecology of *Picea mariana* (Mill.) B.S.P. at tree line near Inuvik, NWT, Canada. *Ecological monographs*, 50:331-354.
- Christiansen, J.A. 1988. A spruce-lichen woodland in northern Alaska: post-fire regeneration and community dynamics. MS Thesis, U. of Washington, College of Forest Resources.
- DeVolder, A. 1999. Fire and climate history of lowland black spruce forests, Kenai National Wildlife Refuge, Alaska. M.S. thesis. Northern Arizona University. 128 p.
- Dyrness, C.T., K. Van Cleve, and M.J Foote. 1983. Vegetation, soils, and forest productivity in selected forest types in interior Alaska. *Can J For Res.* Vol 13: 703-720.
- Foote, J. M. 1983. Classification, description, and dynamics of plant communities after fire in the taiga of interior Alaska. Res. Pap. PNW-307. Portland, OR. U.S. Department of Agriculture, Forest Service. Pacific Northwest Research Station. 108 p.
- Gabriel, H.W. and G.F. Tande. 1983. A regional approach to fire history in Alaska. BLM Alaska TR-83-9.
- Heinselman, M.L. 1981. Fire and succession in the conifer forests of northern North America. In: West, D.C., H.H. Shugart, and D.B. Botkin. *Forest succession: concepts and application.* Springer-Verlag, New York. Chapter 23.
- Nowacki, G., Spencer, P., Brock, T., Fleming, M., and R. Jorgenson, R. 2001. Narrative

descriptions for the ecoregions of Alaska and neighboring territories. National Park Service. Anchorage, Alaska. 17 p.

Personal communication experts' workshop, March 2-4 2004. Fire Regime Condition Class (FRCC) interagency experts' workshop to develop and review Potential Natural Vegetation (PNV) groups for Alaska. Anchorage, Alaska.

Personal communication Ed Berg March 4 2004. Fire Regime Condition Class (FRCC) interagency experts' workshop to develop and review Potential Natural Vegetation (PNV) groups for Alaska. Anchorage, Alaska.

Rowe, J.S., J.L. Bergsteinsson, G.A. Padbury, and R. Hermesh. 1974. Fire Studies in the Mackenzie Valley. ALUR Report 73-74-61. Arctic Land Use Research Program, Department of Indian Affairs and Human Development, Ottawa, Canada. 123 pp.

Schaefer, J.A. 1993. Spatial patterns in taiga plant communities following fire. *Can J. Bot* 71:1568-1573

Sirois, L. and S. Payette 1989. Postfire black spruce establishment in subarctic and boreal Quebec. *Can. J. For. Res.*, 19: 1571-1580.

Van Cleve, K.; Chapin, F.S., III; Flanagan, P.W. [and others]. 1986. Forest ecosystems in the Alaska taiga: a synthesis of structure and function. New York: Springer-Verlag. 230 p.

Van Cleve, K. and L.A. Viereck. 1981. Forest succession in relation to nutrient cycling in Boreal Forest of Alaska. In: D.C. West, H.H. Shugart and D.B. Botkin eds. *Forest succession: concepts and application*. Springer-Verlag. New York.

Viereck L. A. 1983. The effects of fire in black spruce ecosystems of Alaska and northern Canada. In: Wein, R.W.; D.A MacLean, (eds.) *The role of fire in northern circumpolar ecosystems*. New York: John Wiley & Sons Ltd.: 201-220. Chapter 11.

Viereck, L.A. 1975. Forest ecology of the Alaska Taiga. In: *Proceedings of the circumpolar conference on northern ecology; 1975 September; Ottawa, ON*. National Research Council of Canada: I-1 to I-22.

Viereck, L.A., Dyrness, C.T., Batten, A.R., and Wenzlick, K.J. 1992. The Alaska Vegetation Classification. Gen. Tech. Rep. PNW-GTR-286. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 278 p.

Viereck L. A., K. Van Cleve, and C.T. Dyrness, 1986. Forest ecosystem distribution in the taiga environment. In: Van Cleve, K.; Chapin, F.S., III; Flanagan, P.W. [and others], eds. *Forest ecosystems in the Alaska taiga: a synthesis of structure and function*. New York: Springer Verlag: 22-43. Chapter 3.

Viereck L. A. and E.L. Little, Jr.. 1972. *Alaska Trees and Shrubs*. USDA Forest Service, Agriculture Handbook No. 410. Washington, D.C. 265 p.

Yarie J. 1983. Forest community classification of the Porcupine River drainage, interior Alaska, and its application to forest management. USDA Forest Service GTR PNW-154.

Deleted: Leslie . Linda AF

VDDT Model Diagrams:



