LANDFIRE Biophysical Setting Model

Biophysical Setting 7616821 Alaska Arctic Scrub Birch-Ericaceous Shrubland - Infrequent Fire

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models: The Alaska Arctic Scrub Birch-Ericaceous Shrubland system was split into a frequent and an infrequent fire model.*

General Information

Contributors (also see the Comments field **Date** 10/6/2008

Modeler 1	Colleen Ryan	colleen_ryan@tnc.org	**Reviewer**	Janet Jorgenson	Janet_Jorgenson@fws.gov
Modeler 2	Kori Blankenship	kblankenship@tnc.org	**Reviewer**		
Modeler 3	Keith Boggs	Ankwb@uaa.alaska.edu	**Reviewer**		

Vegetation Type

Upland Shrubland

Map Zone

76

Model Zone

☑ Alaska ☐ N-Cent.Rockies
☐ California ☐ Pacific Northwest
☐ Great Basin ☐ South Central
☐ Great Lakes ☐ Southeast
☐ Northeast ☐ S. Appalachians
☐ Northern Plains ☐ Southwest

Dominant Species*

BENA	SABA3
VAUL	EMNIN
LEPAD	VAVI
SAPU15	HYSP70

General Model Sources

☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This BpS is found in arctic AK except within ecoregions 4, 5, 7 and south of the Brooks Range in ecoregion 3 (Nowakii et al. 2001). It is also found in MZ76.

Biophysical Site Description

This system is found on mesic mountain and hill slopes and flats predominantly above treeline. The soils are mesic and generally mineral with a well-decomposed organic layer (Viereck et al. 1992, II.C.2.c). Permafrost is normally present (Viereck et al. 1992, II.C.2.c).

Vegetation Description

The following information was slightly modified from the draft Arctic Ecological Systems description (Boggs et al. 2008):

The total low- and tall-shrub cover is >25%, and Betula nana, Vaccinium uliginosum or Ledum palustre ssp. decumbens typically dominate or codominate. Salix spp. (such as Salix pulchra) do not dominate but may codominate. This system does not include tussock-dominated (>35% tussocks) sites. Dwarf-shrubs such as Empetrum nigrum and Vaccinium vitis-idaea may be common under the low-shrub layer. Herbaceous species are sparse but may include Arctagrostis latifolia, Poa arctica, Senecio congestus and Carex bigelowii. Feathermosses (Hylocomium splendens and Pleurozium schreberi) and lichens may be common.

Disturbance Description

Expert input at the Arctic Modeling meeting (April 08) estimated a MFRI for this type of about 1000yrs.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement seve

Racine et al. (1983) found a MFRI of 612yrs for Noatak River watershed (all vegetation types). Racine et al (1985) found a 611yr fire rotation for Noatak River watershed (all vegetation below 600m which is predominantly tundra).

Viereck et al. (1992) indicated that this community appears to be stable over time (Viereck et al. 1992, II.C.2.c) but this model includes successional dynamics related to infrequent fire.

Adjacency or Identification Concerns

This type tends to grade into tussock shrub communities as moisture increases or dwarf shrub fellfields as moisture decreases with wind exposure (Viereck et al. 1992, II.C.2.c).

Native Uncharacteristic Conditions

The current conditions should be similar to the reference condition.

Scale Description

Large patch or matrix

Issues/Problems

Experts at the Arctic meeting agreed on the model classes, but they noted that there is no solid data to support either fire frequencies or the frequency of open vs. closed classes. In this draft model, alternate succession probabilities were set to create a ratio of open to closed classes that approximately matched Torre Jorgenson's estimate that this type would be 20% closed in the Seward/Yukon-Kuskokwim Delta regions (frequent fire model) and 5% closed on the North Slope (infrequent fire model).

To attain the landscape percentages desired, modelers had to use a very low alternate succession probability. A better solution would have been to restrict the age at which alternate succession can occur to around age 25, since it is expected that most sites will close in at that age or not at all. But this solution violates LANDFIRE modeling rules, so modelers used a very low probability of alternate succession instead.

Comments

This system was created for the AK Arctic region and did not receive review for other regions in the state.

This model was based on input from the experts who attended the LANDFIRE Fairbanks Arctic (April 08) modeling meeting and refined by Colleen Ryan, Kori Blankenship and Keith Boggs.

Vegetation Classes

Class A **5%**

Early Development 1 All Structures

Upper Layer Lifeform

- ☑ Herbaceous
- ☐ Shrub
- ☐ Tree

Indicator Species* and Canopy Position

FEAL	Upper
HIAL3	Upper
CACA4	Upper
CHAN9	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	Herbaceous	Herbaceous
Height	Herbaceous	Herbaceous
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

0-4yrs

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement seve

After fire, herbaceous species such as Festuca altaica and Hierochloe alpina typically dominate. This class may persist for more than 5yrs (up to 25yrs) on some sites, but this possibility was not included in this draft of the model.

Succession to class B. Replacement fire (MFRI = 1000yrs) resets age to 0.

Class B 90 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Indicator Species* and Canopy Position

BENA	Upper
VAUL	Upper
LEPAD	Upper
SALIX	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Open Shrub (25-74% shrub cover)	Open Shrub (25-74% shrub cover)
Height	Low Shrub (20 cm to 1.5 m)	Low Shrub (20 cm to 1.5 m)
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Five years plus

This class represents an open shrub class. Under appropriate conditions, the canopy can close around age 25, causing a transition to class C, but most sites will remain open indefinitely. This class is dominated by shrubs, often Betula nana. Vaccinium uliginosum, Ledum decumbens, Salix pulchra, S. barclayi or other Salix spp. may also be common (Viereck 1979, Viereck et al. 1992). Dwarf shrubs such as Empetrum nigrum and Vaccinium vitis-idaea may be common under the low shrub layer.

This class can persist in the absence of disturbance or follow an alternate succession pathway to class C (probability = 0.0001). Replacement MFRI = 1000yrs causes a transition to A.

Class C 5 %

Late Development 2 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Indicator Species* and Canopy Position

BENA	Upper
VAUL	Upper
LEPAD	Upper
SALIX	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Closed Shrub (> 75% shrub cover)	Closed Shrub (> 75% shrub cover)
Height	Low Shrub (20 cm to 1.5 m)	Low Shrub (20 cm to 1.5 m)
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

25yrs+

This class represents a mature closed canopy shrub stage that may occur on a minority of sites where conditions are appropriate. The canopy will close in around age 25. This class is dominated by shrubs, often Betula nana. Vaccinium uliginosum, Ledum decumbens, Salix pulchra, S. barclayi or other Salix spp. may also be common (Viereck 1979, Viereck et al. 1992). Dwarf shrubs such as Empetrum nigrum and Vaccinium vitis-idaea may be common under the low shrub layer.

This class persists in the absence of disturbance. Replacement MFRI = 500yrs cause a transition to A.

---

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement seve

Class D **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Indicator Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover		
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Indicator Species* and Canopy Position

Structure Data (for upper layer lifeform)

	Min	Max
Cover		
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

Fire Regime Group:** **V**

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Sources of Fire Regime Data

☐ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	904.8			0.00111	98
Mixed					
Surface					
All Fires	903			0.00113	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fir combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inver of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

Additional Disturbances Modeled

☐ Insects/Disease ☐ Native Grazing ☐ Other (optional 1)
☐ Wind/Weather/Stress ☐ Competition ☐ Other (optional 2)

References

Anderson, J.H. 1974. Plants, Soils, Phytocenology and Primary Production of the Eagle Summit Tundra Biome Site. US Tundra Biome Data Report 74-42. Ecosystem Analysis Studies, US International Biological Program, US Arctic Research Program. 142 p.

Batten, A.R. 1977. The vascular floristics, major vegetation units, and phytogeography of the Lake Peters area, northeastern Alaska. M.S. thesis. University of Alaska, Fairbanks, AK. 330 p.

Batten, A.R., Murray, D.F., Dawe, J.C. 1979. Threatened and Endangered Plants in selected areas of the

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement seve

BLM Fortymile Planning Unit.. File Report for Contract No. YA-512-CT8-162. USDI BLM AK State Office 701 C street, Anchorage, AK 99513. 127 p.

Boggs et al. 2008. International Ecological Classification Standard: Terrestrial Ecological Classifications. Draft Ecological Systems Description for the Alaska Arctic Region.

Hanson, H.C. 1951. Characteristics of some grassland, marsh, and other plant communities in western Alaska. Ecol. Monogr. 21 (4):317-378.

Hanson, H.C. 1953. Vegetation types in northwestern Alaska and comparisons with communities in other arctic regions. Ecology 34(1): 11 1-140.

Hettinger, L.R. and A.J. Janz. 1974. Vegetation and soils of northeastern Alaska. Arct. Gas Biol. Rep. Ser. 21, 206 p. North. Eng. Serv., Co., Ltd., Edmonton, Can.

Hulten, E. 1966. Contributions to the knowledge of flora and vegetation of the southwestern Alaskan mainland. Sven. Bot. Tidskr. 60(1): 175-1 89.

Jorgenson, M.T. 1984. The response of vegetation to landscape evolution on glacial till near Toolik Lake, Alaska. Pages 134-142 in Inventorying forest and other vegetation of the high latitude and high altitude regions: Proceedings of an International Symposium, Society of American Foresters Regional Technical Conference. Fairbanks, AK. Society of American Foresters, Bethesda, MD.

Nowacki, G., P. Spencer, M. Fleming, T. Brock and T. Jorgenson. 2001. Unified ecoregions of Alaska. U.S. Department of the Interior, U.S. Geological Survey. Open file-report 02-297. 2 page map.

Pegau, R.E. 1968. Reindeer range appraisal in Alaska. M.S. thesis. University of Alaska, Fairbanks, AK. 130 p.

Pegau, R.E. 1972. Caribou investigations-analysis of range. In: Pegau, R.E. and J.E. Hemming (ed.). Caribou report. Volume 12. Progress report. Federal Aid in Wildlife Restoration, Projects W-17-2 and W-17-3, Job 3.3R. Alaska Dept. of Fish and Game, Juneau, AK: 1-216.

Racine. 1979. Climate of the Chucki-Imuruk area. Pages 32-37 in H. R. Melchior, ed., Biological Survey of the Bering Land Bridge National Monument. Alaska Cooperative Park Studies Unit, University of Alaska Fairbanks, Fairbanks, AK.

Racine, C.H., Dennis, J.G., and W.A. Patterson. 1983. An analysis of the tundra fire regime in the Noatak River Watershed, Alaska. USDOI BLM Report.

Racine, C.H.; J.G. Dennis and W.A. Patterson III. 1985. Tundra fire regimes in the Noatak River Watershed, Alaska: 1956-83. Arctic 38:194-200.

Steigers, W.D., D. Helm, J.G. MacCracken, [and others]. 1983. Alaska Power Authority, Susitna Hydroelectirc Authority, environmental studies--subtask 7.12: 1982 plant ecology studies. Final Report. University of Alaska, Agricultural Experiment Station, Palmer. 288 pp.

Viereck, L.A. 1962. Range survey: Sheep and goat investigations. Job completion report: Federal aid in

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement seve

wildlife restoration. W-6-R-3. Department of Fish and Game, Alaska work plan E, Job 2a. 21 pp.

Viereck, L.A. 1963. Sheep investigations: survey of range ecology. Project W-6-R-4, Work plan E. Job 2-A. Alaska Department of Fish and Game, Juneau, AK.

Viereck, L.A. 1979. Characteristics of treeline plant communities in Alaska. Holarctic Ecology. 2: 228-238.

Viereck, L.A. and E.L. Little. 1972. Alaska Trees and Shrubs. USDA Forest Service Ag. Handbook 410. University of Alaska Press, Fairbanks, Alaska. 265 p.

Viereck, L.A., C.T. Dyrness, A.R. Batten, K.J. Wenzlick. 1992. The Alaska vegetation classification. Pacific Northwest Research Station, USDA Forest Service, Portland, OR. Gen. Tech. Rep. PNW-GTR286. 278 p.

Webber, P.J., Komarkova, V., Walker, D.A. and E. Werbe. 1978. Vegetation mapping and response to disturbance along the Yukon River-Prudhoe Bay Haul Road. In: Brown, J. (principal investigator). Ecological baseline investigations along the Yukon River-Prudhoe Bay Haul Road, Alaska. Hanover, NH: Corps of Engineers, U.S. Army Cold Region Research and Engineering Laboratory: 25-87.

Young, S.B. and C.H. Racine. 1978. Ecosystems or the proposed Katmai western extension, Bristol Bay Lowlands, Alaska. Final report. Contributions from the Center for Northern Studies, Wolcott, VT. 94 pp.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100-year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement seve