

LANDFIRE Biophysical Setting Model

Biophysical Setting 6816901

Alaska Arctic Dwarf-Shrubland - Frequent Fire

☒ This BPS is lumped with: see below

☒ This BPS is split into multiple models: Alaska Arctic Acidic Dwarf-Shrub Lichen Tundra (1691) and Alaska Arctic Non-Acidic Dwarf-Shrub Lichen Tundra (1692) were lumped into Alaska Arctic Dwarf-Shrubland (1690), but then the lumped system was split into a frequent and an infrequent fire model.

General Information

Contributors (also see the Comments field)

Date 10/17/2008

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Reviewer Janet Jorgenson

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Reviewer

Modeler 3

Reviewer

Vegetation Type

Upland Shrubland

Map Zone

68

Model Zone

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

Dominant Species*

CATE11 ARAL2
EMNI BENA
VAUL CABI5
SALIX CAMI4

General Model Sources

- ☒ Literature
☐ Local Data
☒ Expert Estimate

Geographic Range

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

Biophysical Site Description

This is a common system on acidic and non-acidic substrates in the hills and mountains of arctic Alaska. Common slope positions include valleys, sideslopes, late-lying snowbeds, summits and ridges. Sites are typically dry to mesic. Sites with >25% lichen cover tend to be exposed to the wind and accumulate little winter snow (Viereck et al. 1992). Non-acidic sites are more common near floodplains, on carbonate substrates and loess deposition areas. This system does not occur on flat thaw-lake plains.

Vegetation Description

Dwarf-shrub cover is >25%, dominated by dwarf-shrubs other than *Dryas* spp. and lichen cover may exceed 25% particularly on exposed sites. Herbaceous cover varies from a trace to 75%. Dwarf -shrubs that dominate or codominate the system are *Cassiope tetragona*, *Empetrum nigrum*, *Vaccinium uliginosum*, *Salix reticulata*, *Salix arctica*, *Salix rotundifolia* and *Arctostaphylos alpina*. *Cassiope tetragona* is more common on non-acidic sites, and *Empetrum nigrum* dominates this system in its southern range. Other shrubs include *Betula nana*, *Dryas octopetala*, *Dryas integrifolia*, *Ledum palustre* ssp. *decumbens*, *Loiseleuria procumbens*, *Vaccinium vitis-idaea*, *Salix phlebophylla*, *Saxifraga oppositifolia*, *Rhododendron lapponicum* and *Arctostaphylos rubra*. Common herbaceous species include

*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 severity

Hierochloe alpina, Boykinia richardsonii, Carex microchaeta, Carex scirpoidea, Geum glaciale, Pedicularis lanata, Eriophorum angustifolium ssp. triste, Equisetum spp., Antennaria alpine and Festuca altaica. Mosses such as Rhytidium rugosum, Aulacomnium turgidum, Distichium capillaceum, Racomitrium lanuginosum, Dicranum elongatum and Polytrichum sp. may be common. On non-acidic sites common lichens include Flavocetraria cucullata, Flavocetraria spp., Stereocaulon spp., Alectoria nigricans and Thamnolia vermicularis but Cladonia and Cladina species are uncommon. On acidic sites dominant lichens are Cladina rangiferina and/or Cladina stellaris.

Disturbance Description

Pre and post fire monitoring data in a dwarf shrubland on Seward Peninsula offers one possible successional trajectory for this community (Racine et al. 2004). On a site burned in 1977 plot data indicated that during the first three years after fire, bryophytes (Ceratodon purpureus and Marchantia polymorpha) dominated the site. Carex bigelowii, Chamerion angustifolium (= Epilobium angustifolium) and Calamagrostis canadensis also increased. By 10yrs, the site was graminoid dominated. Shrubs, including Ledum palustre, Vaccinium vitis-idaea, Empetrum nigrum and Betula nana, were slow to recover or had not recovered on the sites within 24yrs. Cover of Salix pulchra increased after the fire from 1% on the control site to 4-22% on various burned plots. It is unclear how well this successional sequence represents a “reference” condition for Arctic Dwarf-Shrubland. The authors note that the 1977 fire on their study site “accelerated the predicted effects of climate warming on arctic tundra by increasing the percent cover of deciduous shrubs (Racine et al. 2004, p. 9).”

The fire return interval for this type is estimated to be similar to that of the Alaska Arctic Tussock Tundra - frequent fire model.

Adjacency or Identification Concerns

Native Uncharacteristic Conditions

Scale Description

Small to large patch.

Issues/Problems

Comments

This model was created by Kori Blankenship and Keith Boggs based on the draft Arctic Ecological Systems description (Boggs et al. 2008) and a successional sequence documented by Racine et al. (2004).

Vegetation Classes

*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 severity

Class A 5 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☒ Herbaceous
☐ Shrub
☐ Tree

Indicator Species* and**Canopy Position**

CABI5 Upper
 CAMI4 Upper
 CHANA2 Upper
 CACA4 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

0-19yrs

Immediately post-fire bryophytes (e.g. Polytrichum sp., Ceratodon purpureus and Marchantia polymorpha) and sedges dominate the site (Racine et al. 2004).

Succession to class B. Replacement fire (MFRI = 250yrs) will reset the age of this class.

Class B 95 %

Late Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
☒ Shrub
☐ Tree

Indicator Species* and**Canopy Position**

CATE11 Upper
 EMNI Upper
 VAUL Upper
 SALIX Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Open Shrub (25-74% shrub cover)	Closed Shrub (> 75% shrub cover)
Height	Dwarf Shrub (< 20cm)	Low Shrub (20cm to 1.5m)
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

20yrs+

Dwarf shrubs recapture the site within 24yrs (Racine et al. 2004). Low shrubs can occur but with <25% cover. Vaccinium, Salix, Arctostaphylos and Ledum spp. tend to recover more quickly than Empetrum nigrum which has shallow rhizomes that are more susceptible to moderate and high severity fire.

This class will persist in the absence of disturbance. Replacement fire (MFRI = 250yrs) will cause a transition to class A.

Class C 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

*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 severity

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	249.3			0.00401	100
Mixed					
Surface					
All Fires	249			0.00403	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse 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

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

Racine, C., R. Jandt, C. Meyers and J. Dennis. 2004. Tundra fire and vegetation change along a hillslope on the Seward Peninsula, Alaska, U.S.A. Arctic, Antarctic, and Alpine Research. 36(1): 1-10.

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.

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**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 severity

LANDFIRE Biophysical Setting Model

Biophysical Setting 6816902

Alaska Arctic Dwarf-Shrubland - Infrequent Fire

☒ This BPS is lumped with: see below

☒ This BPS is split into multiple models: Alaska Arctic Acidic Dwarf-Shrub Lichen Tundra (1691) and Alaska Arctic Non-Acidic Dwarf-Shrub Lichen Tundra (1692) were lumped into Alaska Arctic Dwarf-Shrubland (1690), but then the lumped system was split into a frequent and an infrequent fire model.

General Information

Contributors (also see the Comments field)

Date 11/26/2008

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Reviewer

Modeler 3

Reviewer

Vegetation Type

Upland Shrubland

Map Zone

68

Model Zone

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

Dominant Species*

CATE11 ARAL2
EMNI BENA
VAUL CABI5
SALIX CAMI4

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).

Biophysical Site Description

This is a common system on acidic and non-acidic substrates in the hills and mountains of arctic Alaska. Common slope positions include valleys, sideslopes, late-lying snowbeds, summits and ridges. Sites are typically dry to mesic. Sites with >25% lichen cover tend to be exposed to the wind and accumulate little winter snow (Viereck et al. 1992). Non-acidic sites are more common near floodplains, on carbonate substrates and loess deposition areas. This system does not occur on flat thaw-lake plains.

Vegetation Description

Dwarf-shrub cover is >25%, dominated by dwarf-shrubs other than *Dryas* spp. and lichen cover may exceed 25% particularly on exposed sites. Herbaceous cover varies from a trace to 75%. Dwarf -shrubs that dominate or codominate the system are *Cassiope tetragona*, *Empetrum nigrum*, *Vaccinium uliginosum*, *Salix reticulata*, *Salix arctica*, *Salix rotundifolia* and *Arctostaphylos alpina*. *Cassiope tetragona* is more common on non-acidic sites, and *Empetrum nigrum* dominates this system in its southern range. Other shrubs include *Betula nana*, *Dryas octopetala*, *Dryas integrifolia*, *Ledum palustre* ssp. *decumbens*, *Loiseleuria procumbens*, *Vaccinium vitis-idaea*, *Salix phlebophylla*, *Saxifraga oppositifolia*, *Rhododendron lapponicum* and *Arctostaphylos rubra*. Common herbaceous species include *Hierochloa alpina*, *Boykinia richardsonii*, *Carex microchaeta*, *Carex scirpoidea*, *Geum glaciale*,

*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 severity

Pedicularis lanata, Eriophorum angustifolium ssp. triste, Equisetum spp., Antennaria alpine and Festuca altaica. Mosses such as Rhytidium rugosum, Aulacomnium turgidum, Distichium capillaceum, Racomitrium lanuginosum, Dicranum elongatum and Polytrichum sp. may be common. On non-acidic sites common lichens include Flavocetraria cucullata, Flavocetraria spp., Stereocaulon spp., Alectoria nigricans and Thamnia vermicularis but Cladonia and Cladina species are uncommon. On acidic sites dominant lichens are Cladonia rangiferina and/or Cladina stellaris.

Disturbance Description

There is little information about fire regimes in the arctic region of Alaska (Viereck and Schandelmeier 1980). The fire return interval for this type is estimated to be similar to that of the Alaska Arctic Tussock Tundra - infrequent fire model although there is no data to support this choice.

Adjacency or Identification Concerns

Native Uncharacteristic Conditions

Scale Description

Small to large patch.

Issues/Problems

The MFRI for this type is unclear and should be reassessed for future modeling efforts.

Comments

This model was created by Kori Blankenship and Keith Boggs based on the draft Arctic Ecological Systems description (Boggs et al. 2008) and the Alaska Arctic Dwarf-Shrubland-frequent fire (16901) model. The seral stages from the frequent fire model were used for this model but the fire frequency was increased to be similar to that of the Alaska Arctic Tussock Tundra - infrequent fire model (16942).

Vegetation Classes

Class A 5%

Early Development 1 All Structures

Upper Layer Lifeform

- ☒ Herbaceous
☐ Shrub
☐ Tree

Indicator Species* and

Canopy Position

CABI5 Upper
 CAMI4 Upper
 CHANA2 Upper
 CACA4 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

0-19yrs

Immediately post-fire bryophytes (e.g. Polytrichum sp., Ceratodon purpureus and Marchantia polymorpha) and sedges dominate the site (Racine et al. 2004).

Succession to class B. Replacement fire (MFRI = 1000yrs) will reset the age of this class.

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**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 severity

Class B 95 %

Late Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
☒ Shrub
☐ Tree

Indicator Species* and Canopy Position

CATE11 Upper
EMNI Upper
VAUL Upper
SALIX Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	Open Shrub (25-74% shrub cover)	Closed Shrub (> 75% shrub cover)
Height	Dwarf Shrub (< 20cm)	Low Shrub (20cm to 1.5m)
Tree Size Class	None	

- ☐ Upper layer lifeform differs from dominant lifeform.

Description

20yrs+

Dwarf shrubs recapture the site within 24yrs (Racine et al. 2004). Low shrubs can occur but with <25% cover. Vaccinium, Salix, Arctostaphylos and Ledum spp. tend to recover more quickly than Empetrum nigrum which has shallow rhizomes that are more susceptible to moderate and high severity fire.

This class will persist in the absence of disturbance. Replacement fire (MFRI = 1000yrs) will cause a transition to class A.

Class C 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 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

*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 severity

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	1002			0.001	98
Mixed					
Surface					
All Fires	1000			0.00102	

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse 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

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

Racine, C., R. Jandt, C. Meyers and J. Dennis. 2004. Tundra fire and vegetation change along a hillslope on the Seward Peninsula, Alaska, U.S.A. Arctic, Antarctic, and Alpine Research. 36(1): 1-10.

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.

Viereck, L.A., and L.A. Schandelmeier. 1980. Effects of fire in Alaska and adjacent Canada--a literature review. BLM-Alaska Tech. Rep. No. 6. Anchorage, Alaska: U.S. Department of the Interior, Bureau of Land Management. 124 p.

*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 severity