USDA Natural Resources Conservation Service

Ecological site F233XY055AK
Boreal Woodland Gravelly Calcareous Slopes

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General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 233X–Upper Kobuk and Koyukuk Hills and Valleys

The Upper Kobuk and Koyukuk Hills and Valleys MLRA (herein called area) occurs in Interior Alaska. This area makes up 8,405 square miles. The largest tributaries are the Kobuk and the Koyukuk Rivers. Major tributaries of the Kobuk are the Reed, Beaver, Mauneluk, and Pau Rivers. Major tributaries of the Koyukuk River are the Alatna, John, and Kanuti Rivers. This area is primarily undeveloped wildland and sparsely populated. The communities within or near this area are Bettles, Kobuk, and Shungnak.

The terrain of this area consists of broad, nearly level river valleys and basins and rolling uplands separated by isolated hills and low rounded mountains. In the river valleys, nearly level flood plains and stream terraces gradually transition to gently sloping to moderately steep slopes leading to the hills and mountains. Basins are on the Pau River Flats between the eastern Zane and Lockwood Hills, on the Kanuti Flats between the Kanuti and Koyukuk Rivers, and along the middle reaches of the Hogatza River. Basins and stream terraces are dotted with hundreds of lakes and interconnecting wetlands. Elevation ranges from about 150 feet in the western part of the area, at the confluence of the Kobuk and Mauneluk Rivers, to 4,765 feet at the summit of Fritts Mountain, in the Angaycuham Mountains.

Geology and Soils

The northern part of the area was covered repeatedly by Pleistocene glaciers originating in the Brooks Range to the north. Slightly modified to highly modified moraines and drift cover many of the rolling uplands. Glacial ice flowed over most of the hills and low mountains, removing existing deposits and leaving a thin layer of glacial deposits. Today,

the lower mountain slopes, hills, and valley bottoms are covered with a variety of material, including glacial drift, colluvium, slope alluvium, fluvial deposits, and silty loess. In the southern part of the area, basins and valleys are filled with Quaternary glaciofluvial and fluvial deposits. Hills and upland slopes are covered with bedrock colluvium and slope alluvium, which are mantled with loess in places. The bedrock geology underlying much of the area consists dominantly of Permian through Lower Cretaceous stratified sedimentary and volcanic rocks.

This area is in the zone of discontinuous permafrost. Permafrost is close to the surface in lands with finer textured sediments throughout the area. Isolated masses of ground ice occur on terraces and the lower side slopes of hills. Permafrost does not occur on flood plains, on steep south-facing slopes, or other lands with very gravelly soils. Periglacial features, such as thermokarst pits, peat plateaus, and earth hummocks, are on the lower hill and mountain slopes and in upland valleys.

The dominant soil orders in this area are Gelisols, Inceptisols, and Entisols. The Gelisols are shallow or moderately deep to permafrost, occur on finer textured sediments, and are poorly drained or very poorly drained. Common Gelisol suborders are Histels, Orthels, and Turbels. The Histels have thick accumulations of surface organic material and occur in depressions, lake margins, and peat plateau. The Orthels and Turbels have comparably thinner surface organic material and occur on stream terraces and hill and upland slopes. The Inceptisols and Entisols are typically associated with gravelly soils that do not have permafrost within their profile, are deep, and are somewhat poorly drained to well drained. The common Inceptisol suborders are Cryepts and Gelepts both of which occur on upland and mountain slopes. Cryepts occur under forested soils at lower elevations and Gelepts on alpine tundra at higher elevations. Common Entisol suborders are Cryofluvents and Cryorthents both of which occur on alluvium on flood plains. Miscellaneous (non-soil) areas make up about 8 percent of this MLRA. The most common are rock outcrop, rubble land, and water.

Wildfires disturb the insulating organic material at the soil surface and can change the presence and/or depth of permafrost in the soil profile. These fire related changes to permafrost can also change the depth and presence of perched water tables. Gelisols that burn in this area can change soil taxonomic classification. For instance, depending on fire-severity, Histels may change to Orthels and Orthels may change to Inceptisols. Depending on the frequency and intensity of fires, landform position, and soil texture, the soils may or may not revert back to their original taxonomic classification.

Climate

Short, warm summers and long, cold winters characterize the continental subarctic climate of the area. The average annual precipitation ranges from 15 to 19 inches on valley bottoms and basins and from 19 to 26 inches at the higher elevations in the hills and mountains (PRISM 2018). Most of the precipitation falls as rain between May and September. The average annual snowfall ranges from 65 to 80 inches. The average

annual temperature is 22 to 24 degrees Fahrenheit (PRISM 2018). The temperature normally remains above freezing from mid-June through August in river valleys and basins with a freeze-free period ranging from 109 to 125 days. The free-free period is significantly shorter on higher elevation mountain slopes.

Vegetation

Most of this area is forested below an elevation of 1600 feet. Dominant tree species on slopes are white spruce and black spruce. Black spruce stands dominate on north-facing slopes, stream terraces, and other sites with poor drainage and permafrost. White spruce stands dominate on steep, south-facing slopes with dry soils. At lower elevations, lightning-caused wildfires are common, often burning many thousands of acres during a single fire event. Following wildfires, forbs, grasses, willow, ericaceous shrubs, paper birch, and quacking aspen communities are common until they are eventually replaced by stands of spruce. Tall willow and alder scrub is extensive on low flood plains. White spruce and balsam poplar are common on high flood plains.

With increasing elevation, the forests and woodlands give way to subalpine communities dominated by krummholz spruce, shrub birch, willow, and ericaceous shrubs. At even higher elevations, alpine communities prevail which are characterized by diverse forbs, dwarf ericaceous shrubs, and eightpetal mountain-avens. Many of these high elevation communities have a considerable amount of lichen cover and bare ground.

LRU notes

In this area, we refer to three life zones that are defined by the physiological limits of plant communities along an elevational gradient: boreal, subalpine, and alpine. The boreal life zone is the elevational band where forest communities dominate. Not all areas in the boreal life zone are forest communities, however, particularly in places with too wet or dry soil to support tree growth (e.g., bogs or river bluffs). Above the boreal band of elevation, subalpine and alpine vegetation dominate. The subalpine zone is a narrow transitional band between the boreal and the alpine life zones, and is characterized by sparse, stunted trees that can be considered tree line. In the subalpine, certain types of birch and willow shrub species grow at greater than or equal to one meter in height (commonly *Betula glandulosa* and Salix pulchra). In the alpine, trees no longer occur, and all shrubs are dwarf or lay prostrate on the ground. In this area, the boreal life zone occurs below 1600 feet elevation on average. The transition between boreal and subalpine vegetation can occur within a range of approximately 350 feet of elevation, and is highly dependent on slope, aspect, and shading from adjacent mountains.

Within each life zone, there are plant assemblages that are associated with cold slopes and warm slopes. Cold slopes and warm slopes are created by the combination of the steepness of the slope, the aspect, and shading from surrounding ridges and mountains. Warm slope positions occur on southeast to west facing slopes that are moderate to very steep (greater than 10 percent slope) and are not shaded by the surrounding landscape.

Cold slopes occur on northwest to east facing slopes, occur in shaded slope positions, or occur in low-lying areas that are cold air sinks. Examples of shaded positions include head slopes, low relief backslopes of hills, and the base of hills and mountains shaded by adjacent mountain peaks. Warm boreal slope soils have a cryic soil temperature regime and lack permafrost. In this area, white spruce forests are an indicator of warm boreal slopes. Cold boreal slope soils have a gelic soil temperature regime and commonly have permafrost. In this area, black spruce forests and woodlands are an indicator of cold boreal slopes. The boreal life zone can occur at higher elevations on warm slopes, and lower elevations on cold slopes.

Classification relationships

Landfire BPS – 7416030 – Western North American Boreal White Spruce-Hardwood Forest (Landfire 2009)
Landfire BPS – 7416050 – Western North American Boreal Mesic Birch-Aspen Forest (Landfire 2009)

Ecological site concept

- Occurs in the boreal life zone on warm summits and backslopes of hills.
- Ponding and flooding do not occur. These well drained soil lack a growing season water table.
- Soils formed in gravelly colluvium derived from limestone or marble and are alkaline.
- Soils are moderately deep to very deep with soil depth controlled by bedrock. Permafrost does not occur in the soil profile.
- The reference plant community is characterized as needleleaf woodland (Viereck et al. 1992) with white spruce the dominant tree. High pH soils result in a diverse assemblage of understory vegetation. Multiple plant communities occur within the reference state related to wildfire.

Associated sites

F233XY131AK	**Boreal Forest Gravelly Floodplain** Occurs downslope on flood plains with productive stands of white spruce and balsam poplar.
R243XY404AK	**Alpine dwarf scrub gravelly limestone slopes** Occurs upslope in the alpine with dwarf scrub the dominant vegetation.

Similar sites

F233XY182AK	**Boreal Forest Gravelly Slopes** Both sites occur on boreal slopes with dry and gravelly soils. Ecological site 182 has acidic soils resulting in different kinds and amounts of vegetation.

F231XY055AK	**Boreal Woodland Gravelly Alkaline Slopes** Occurs in an adjacent area (MLRA 231X) on similar soils and is provisionally thought to have similar vegetation and disturbance dynamics.

Table 1. Dominant plant species

Tree	(1) *Picea glauca*
Shrub	(1) *Ledum groenlandicum* (2) *Dryas octopetala ssp. octopetala*
Herbaceous	(1) *Festuca altaica* (2) *Carex scirpoidea*

Physiographic features

- Occurs on the summits and backslopes of hills.
- Associated with the boreal life zone. Elevation is most commonly between 150 and 1600 feet but at times can range up to 1750 feet on south-facing slopes.
- Associated with warm slopes. Slopes are gentle to moderately steep and are southeast to west facing.
- Ponding and flooding do not occur.
- These are dry soils without a seasonal water table.
- Associated with very low to low amounts of runoff to adjacent, downslope ecological sites.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Backslope
Landforms	(1) Hills > Hill
Runoff class	Very low to low
Flooding frequency	None
Ponding frequency	None
Elevation	46–488 m
Slope	2–20%
Aspect	W, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified

Elevation	46–533 m
Slope	Not specified

Climatic features

Short, warm summers and long, cold winters characterize the subarctic continental climate associated with this boreal forest gravelly slopes ecological site. The mean annual temperature for MLRA 233X ranges from 22 to 24 degrees Fahrenheit (PRISM 2008). The warmest months span May through August with mean normal maximum monthly temperatures ranging from 51 to 64 degrees Fahrenheit. The coldest months span December through March with mean normal minimum temperatures ranging from -2 to 3 degrees Fahrenheit. The freeze-free period for this boreal ecological site ranges from 105 to 129 days, and the temperature generally remains above freezing from late May through early-September.

The area receives minimal annual precipitation with July through September being the wettest. Average annual precipitation across MLRA 233X ranges between 17 to 21 inches (PRISM 2008). Approximately half of the annual precipitation occurs during the months of July through September with seasonal thunderstorms. The average annual snowfall ranges from 65 to 80 inches (USDA 2022). The ground is consistently covered with snow from November through March.

Table 4. Representative climatic features

Frost-free period (characteristic range)	73-105 days
Freeze-free period (characteristic range)	105-129 days
Precipitation total (characteristic range)	432-533 mm
Frost-free period (actual range)	26-111 days
Freeze-free period (actual range)	98-133 days
Precipitation total (actual range)	356-610 mm
Frost-free period (average)	90 days
Freeze-free period (average)	115 days
Precipitation total (average)	457 mm

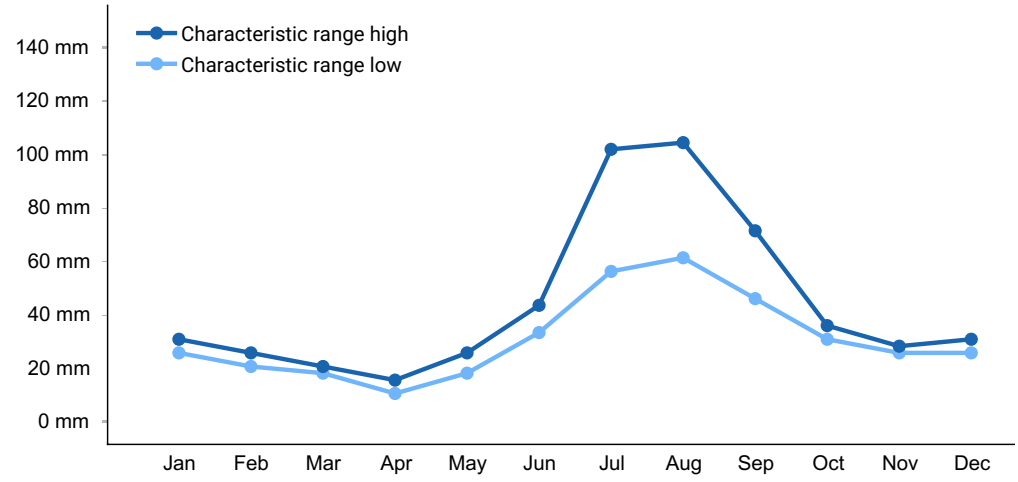


Figure 1. Monthly precipitation range

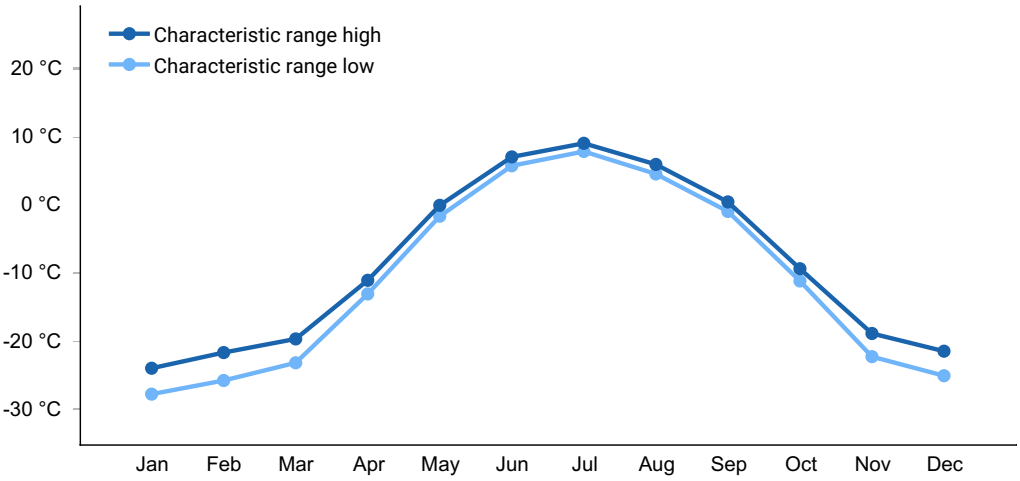


Figure 2. Monthly minimum temperature range

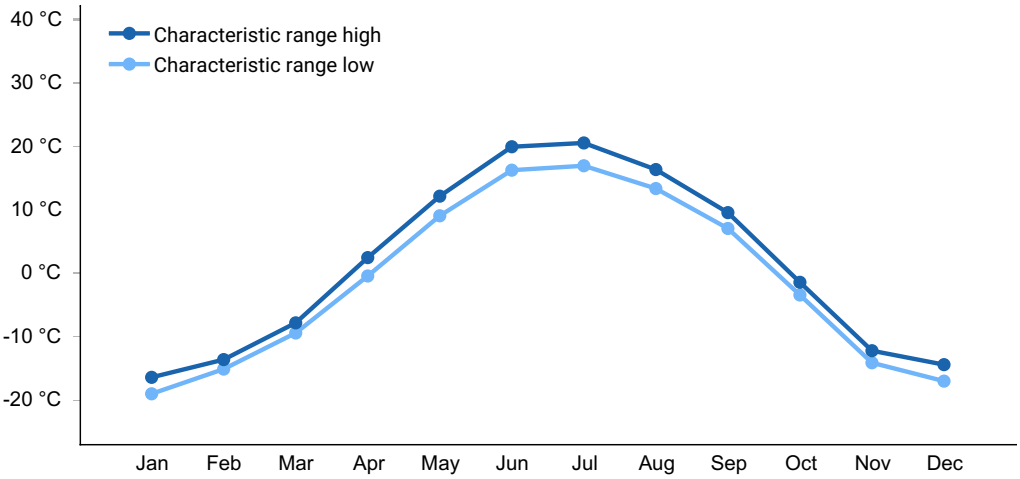


Figure 3. Monthly maximum temperature range

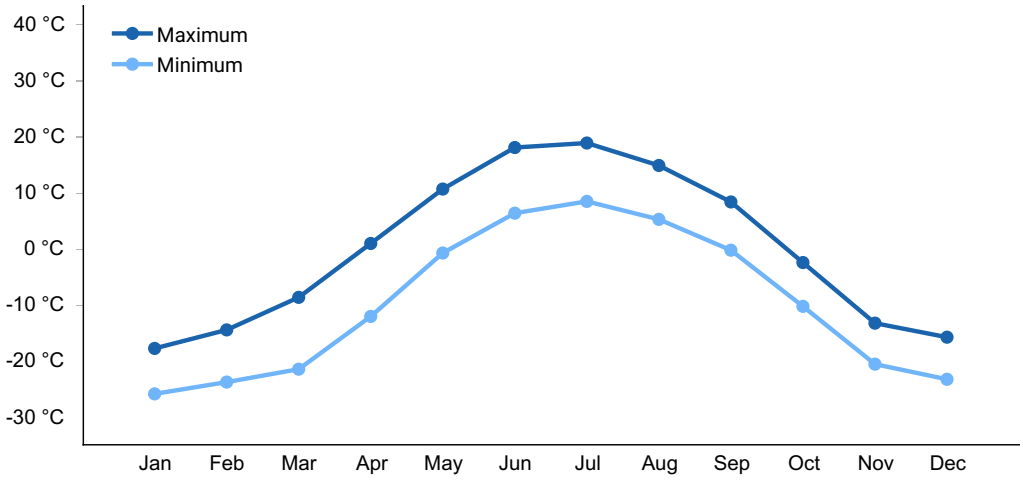


Figure 4. Monthly average minimum and maximum temperature

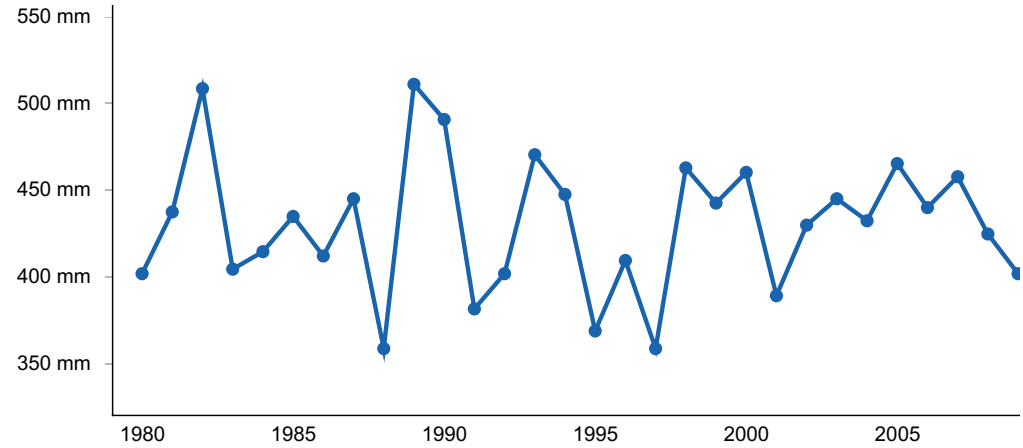


Figure 5. Annual precipitation pattern

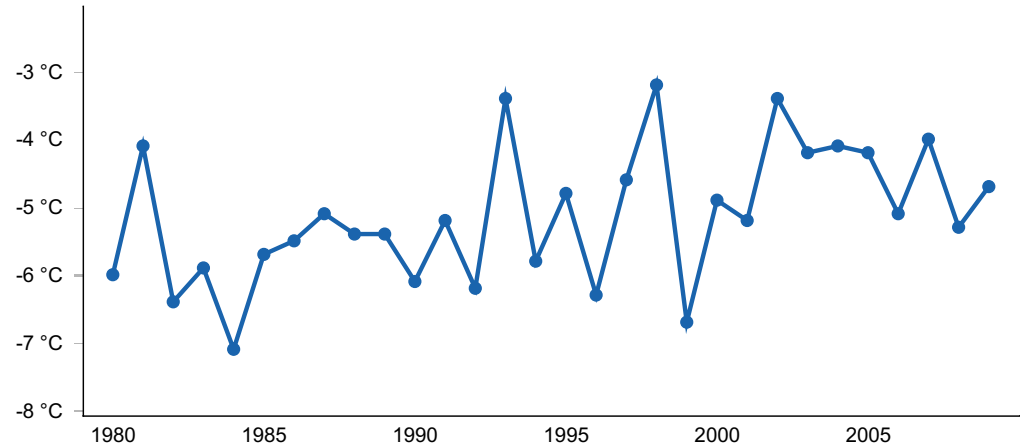


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BETTLES AP [USW00026533], Bettles Field, AK

Influencing water features

Due to its landscape position, this ecological site is neither associated with or influenced by streams or wetlands. Precipitation and throughflow are the main source of water for this ecological site. Surface runoff and throughflow contribute water to downslope ecological sites.

Wetland description

Not a wetland.

Soil features

- Soils formed in gravelly colluvium derived from limestone or marble.
- Rock fragments are not present on the soil surface.
- Capped with up to two inches of organic material.
- The surface mineral horizon is a very channery silt loam that is very dark in color.
- These gravelly soils have subsurface rock fragments ranging between 30 and 45 percent of the soil profile by volume.
- Soils are moderately deep to very deep with soil depth controlled by bedrock contact.
- The pH of the soil profile ranges from very slightly alkaline to moderately alkaline.
- Soils are considered well drained.
- Soils are classified as Mollisols in the great group Gelolls.

Table 5. Representative soil features

Parent material	(1) Colluvium–limestone and dolomite (2) Colluvium–marble
Surface texture	(1) Very channery loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	61–152 cm
Soil depth	61–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	11.94–13.97 cm
Calcium carbonate equivalent (25.4-101.6cm)	0–4%
Clay content (0-50.8cm)	8–10%

Electrical conductivity (25.4-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0–2
Soil reaction (1:1 water) (25.4-101.6cm)	7.6–8.2
Subsurface fragment volume <=3" (0-152.4cm)	5–10%
Subsurface fragment volume >3" (0-152.4cm)	25–35%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified
Calcium carbonate equivalent (25.4-101.6cm)	Not specified
Clay content (0-50.8cm)	Not specified
Electrical conductivity (25.4-101.6cm)	Not specified
Sodium adsorption ratio (25.4-101.6cm)	Not specified
Soil reaction (1:1 water) (25.4-101.6cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	0–50%
Subsurface fragment volume >3" (0-152.4cm)	0–35%

Ecological dynamics

In the Upper Kobuk and Koyukuk Hills and Valleys MLRA (herein called area), fire is a common and natural event that has a significant control on the vegetation dynamics

across the landscape. A typical fire event in the lands associated with this boreal woodland gravelly calcareous slope ecological site will reset plant succession and alter dynamic soil properties (e.g., thickness of the organic material). For this ecological site to progress from the earliest stages of post-fire succession dominated by grasses and forbs to the oldest stages of succession dominated by white spruce forests, data suggest that 130 to 150 years or more must elapse without another fire event (Foot 1982; Chapin et al. 2006; Landfire 2009).

Within this area, wildfire is considered a natural and common event that typically goes unmanaged. Fire suppression is limited and occurs adjacent to the small villages spread throughout the area or on allotments with known structures, all of which have a relatively limited acre footprint. Most fires are caused by lightning strikes. From 2000 to 2020, 124 known fire events occurred in this area and the burn perimeter of the fires totaled approximately one million acres (AICC 2022). Fire-related disturbances are highly patchy and can leave undisturbed areas within the burn perimeter. During this time frame, 90 percent of the fire events were smaller than 20,000 acres but three fire events were greater than 100,000 acres in size (AICC 2022). Over this period of 20 years, these burn perimeters cover approximately 20 percent of this area.

The fire regime within Interior Alaska follows two general scenarios—low-severity burns, and high-severity burns. It should be noted, however, that the fire regime in Interior Alaska can be considered more complex (Johnstone et al. 2008). Burn severity refers to the proportion of the vegetative canopy and organic material consumed in a fire event (Chapin et al. 2006). Fires in cool and moist habitat tend to result in low-severity burns, while fires in warm and dry habitat tend to result in high-severity burns. Because the soils have a thin organic cap and are well drained, the typical fire scenario for this ecological site is considered to result in a high severity burn.

Large portions of the organic mat are consumed during a high-severity fire event, commonly exposing pockets of mineral soil. The loss of this organic mat, which insulates the mineral soil, and the decrease in site albedo results in higher summertime temperatures and overall soil temperatures to increase (Hinzman et al. 2006). These alterations to soil temperature may result in increased depths to seasonally frozen soil where it persists into the growing season, better soil drainage earlier in the season, and dryer overall conditions. High-severity fire events also destroy a majority of the vascular and nonvascular biomass above ground.

Field data suggest that each of the forested communities burn and that fire events will cause a transition to the pioneering stage of fire succession. This stage (community 1.5) is a mix of species that either regenerate in place (e.g., subterranean root crowns for willow and rhizomes for graminoids) and/or from wind-dispersed seed or spores that colonize exposed mineral soil (e.g., quaking aspen [*Populus tremuloides*] and Ceratodon moss [*Ceratodon purpureus*]). The pioneering stage of fire succession is primarily composed of tree seedlings, forbs, grasses, and weedy bryophytes. This stage of succession is thought to persist for up to 4 years post-fire (Landfire 2009). Willow (Salix spp.) and quick growing

deciduous tree seedlings continue to colonize and grow in stature on recently burned sites until they become dominant in the overstory, which marks the transition to the early stage of fire succession (community 1.4). This early stage of fire succession is thought to persist 25 to 45 years post-fire (Landfire 2009). In the absence of fire, tree species continue to become more dominant in the stand and eventually develop into forests.

The latter stages of succession have an overstory that is dominantly deciduous trees (community 1.3), a mix of broadleaf and needleleaf trees (community 1.2), or needleleaf trees (community 1.1). The recruitment of trees species during the pioneering and early stages of post-fire succession largely controls the composition of the stand of trees in the later stages of post-fire succession (Johnstone et al. 2010a). During these later stages of succession, the slower growing white spruce seedlings mature and eventually replace the shade-intolerant broadleaf tree species. The typical fire return interval for white spruce stands in Interior Alaska is 150 years (Landfire 2009; Abrahamson 2014).

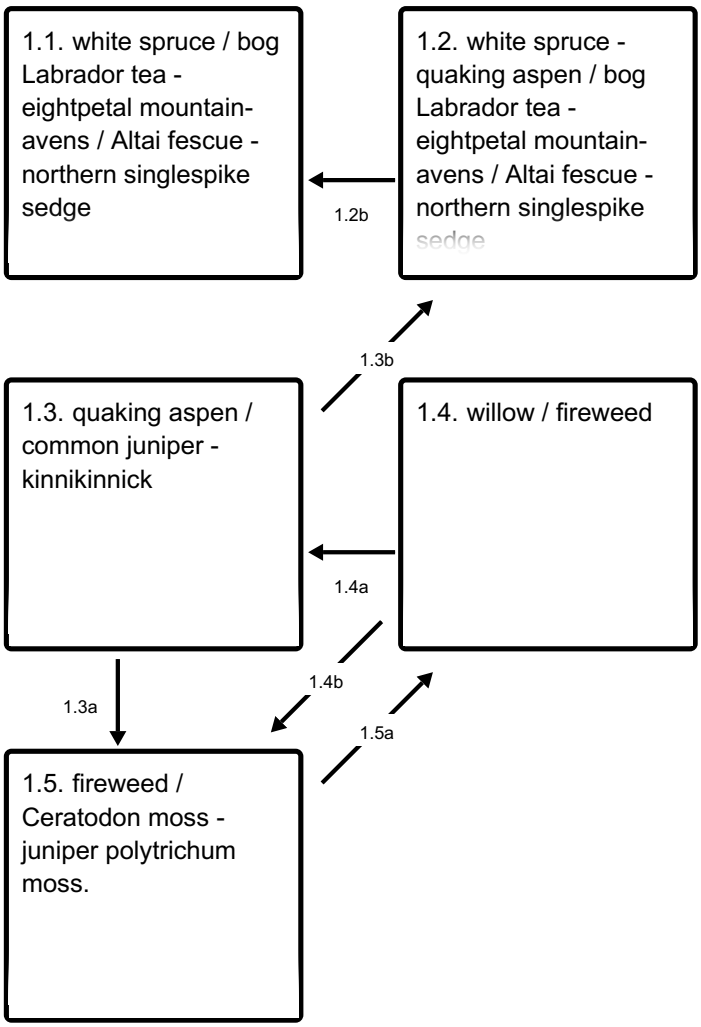
Lands in Interior Alaska are burning more frequently than in the past, which may result in alternative states of succession. The historic fire return interval for white spruce stands in Interior Alaska occurs approximately once every 150 years (Landfire 2009; Abrahamson 2014). Global climate change is warming the boreal forest and causing a longer growing season. As a result, stands of spruce in the Alaskan boreal forest are burning more frequently and intensely than their historic averages (Kelly et al. 2013). Increases to burn frequency favors forested stands dominated by quick growing deciduous trees (community 1.3). A major reason being that increased fire frequency decreases the presence and abundance of mature, cone-bearing trees. Less mature trees result in less spruce seedlings post-fire and an overall decreased abundance of spruce in the developing forest canopy. Increased fire frequency paired with decreased spruce propagules lowers the chances for the site to progress to post-fire successional communities 1.2 and 1.1. Increased burn frequency in the boreal forest may result in alternative states of post-fire succession with stands of deciduous trees persisting for longer than normal durations of time (Johnstone et al. 2010b).

State and transition model

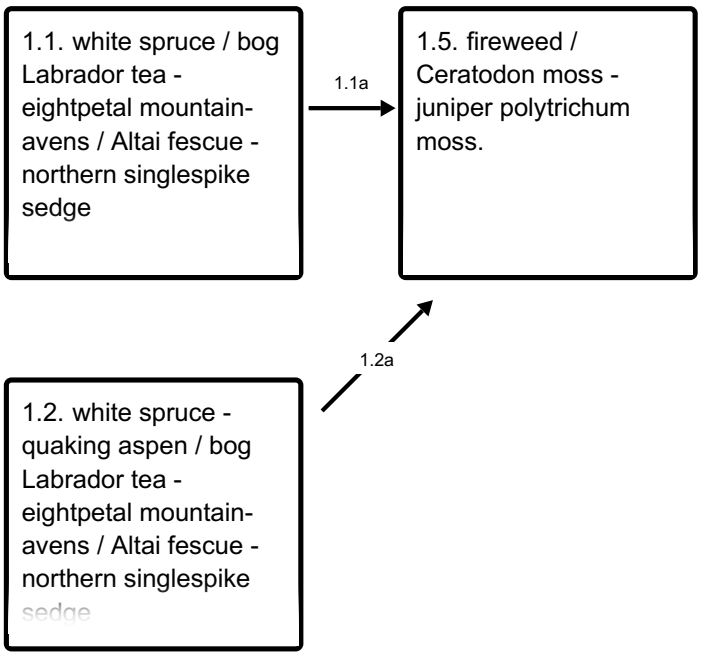
Ecosystem states

1. Reference State

State 1 submodel, plant communities



Communities 1, 5 and 2 (additional pathways)



1.1a - A high-severity fire sweeps through and incinerates much of the above ground vegetation.

1.2b - 130 to 150 years after wildfire disturbance

1.2a - A high-severity fire sweeps through and incinerates much of the above ground vegetation.

1.3b - 80 to 100 years after wildfire disturbance

1.3a - A high-severity fire sweeps through and incinerates much of the above ground vegetation.

1.4a - 30 to 50 years without wildfire disturbance

1.4b - A high-severity fire sweeps through and incinerates much of the above ground vegetation.

1.5a - 4 to 6 years without wildfire

State 1
Reference State

The reference plant community is needleleaf woodland (Viereck et al. 1992) with the dominant tree being white spruce. There are five plant communities within the reference state related to fire. The state and transition model has limited data at this time and is considered provisional.

Dominant plant species

- white spruce (*Picea glauca*), tree
- bog Labrador tea (*Ledum groenlandicum*), shrub
- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- Altai fescue (*Festuca altaica*), grass
- northern singlespike sedge (*Carex scirpoidea*), grass

Community 1.1
white spruce / bog Labrador tea - eightpetal mountain-avens / Altai fescue - northern singlespike sedge

The reference plant community is characterized as needleleaf woodland (Viereck et al. 1992) with white spruce as the dominant tree. White spruce tree cover primarily occurs in the medium stratum (between 15 and 40 feet). Live deciduous trees, primarily resin birch and quaking aspen, occasionally occur in the tree canopy but with limited cover. The soil surface is primarily covered with herbaceous litter, moss, and lichen. This is a highly diverse plant community. Common understory species include Richardson's willow, scrub birch (*Betula glandulosa*), eightpetal mountain-avens, bog Labrador tea, red fruit bearberry, white arctic mountain heather, bog blueberry, crowberry, common juniper, netleaf willow, lingonberry, Altai fescue, northern singlespike sedge, various reindeer lichen, splendid feathermoss, and Schreber's big red stem moss. The understory vegetative strata that characterize this community are medium shrubs (between 3 and 10 feet), low shrubs (between 8 and 36 inches), dwarf shrubs (less than 8 inches), mosses, and foliose and fruticose lichens.

Dominant plant species

- white spruce (*Picea glauca*), tree
- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- resin birch (*Betula glandulosa*), shrub
- red fruit bearberry (*Arctostaphylos rubra*), shrub

- white arctic mountain heather (*Cassiope tetragona*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- common juniper (*Juniperus communis*), shrub
- netleaf willow (*Salix reticulata*), shrub
- Richardson's willow (*Salix richardsonii*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- Altai fescue (*Festuca altaica*), grass
- northern singlespike sedge (*Carex scirpoidea*), grass
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- greygreen reindeer lichen (*Cladina rangiferina*), other herbaceous
- star reindeer lichen (*Cladina stellaris*), other herbaceous

Community 1.2
white spruce - quaking aspen / bog Labrador tea - eightpetal mountain-avens / Altai fescue - northern singlespike sedge

Community 1.2 is in the late stage of fire-induced secondary succession for this ecological site. It is characterized as open mixed forest (Viereck et al. 1992) with mature resin birch or aspen and a mixture of immature and mature white spruce as the dominant trees. Tree cover primarily occurs in the medium tree stratum (between 15 and 40 feet). The soil surface is primarily covered with herbaceous litter and mosses. Common understory species include prickly rose, common juniper, kinnikinnick, russet buffaloberry, twinflower, Altai fescue, Pumpelly's brome, splendid feathermoss, and Schreber's big red stem moss. The understory vegetative strata that characterize this community are low shrubs (between 8 and 36 inches), dwarf shrubs (less than 8 inches), tall graminoids (greater than 2 feet), and mosses.

Dominant plant species

- white spruce (*Picea glauca*), tree
- quaking aspen (*Populus tremuloides*), tree
- resin birch (*Betula neoalaskana*), tree
- common juniper (*Juniperus communis*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- russet buffaloberry (*Shepherdia canadensis*), shrub
- prickly rose (*Rosa acicularis*), shrub
- twinflower (*Linnaea borealis*), shrub
- Altai fescue (*Festuca altaica*), grass
- Pumpelly's brome (*Bromus inermis ssp. pumpellianus var. pumpellianus*), grass
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous

Community 1.3

quaking aspen / common juniper - kinnikinnick

Community 1.3 is in the middle stage of fire-induced secondary succession for this ecological site. It is characterized as open deciduous forest (Viereck et al. 1992) with a mixture of mature and immature resin birch or quaking aspen as the dominant trees. White spruce seedlings are common but have limited cover. Tree cover primarily occurs in the medium tree stratum (between 15 and 40 feet). The soil surface is primarily covered with herbaceous litter. Common understory species include common juniper, prickly rose, squashberry, shrubby cinquefoil, kinnikinnick, grayleaf willow, Altai fescue, Pumpelly's brome, northern bedstraw, and alpine sweetvetch. The understory vegetative strata that characterize this community are medium shrubs (between 3 and 10 feet), low shrubs (between 8 and 36 inches), and tall graminoids (greater than 2 feet).

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- resin birch (*Betula neoalaskana*), tree
- common juniper (*Juniperus communis*), shrub
- prickly rose (*Rosa acicularis*), shrub
- squashberry (*Viburnum edule*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- grayleaf willow (*Salix glauca*), shrub
- Altai fescue (*Festuca altaica*), grass
- Pumpelly's brome (*Bromus inermis ssp. pumpellianus var. pumpellianus*), grass
- northern bedstraw (*Galium boreale*), other herbaceous
- alpine sweetvetch (*Hedysarum alpinum*), other herbaceous

Community 1.4
willow / fireweed

Community 1.4 is in the early stage of fire-induced secondary succession for this ecological site. It is characterized as open tall scrubland (Viereck et al. 1992). The overstory canopy is primarily composed of willow and broadleaf tree species, commonly resin birch and quaking aspen. White spruce seedlings are common in the understory but have limited cover. Tree cover is primarily in the regenerative tree stratum (less than 15 feet in height).

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- resin birch (*Betula neoalaskana*), tree
- willow (*Salix*), shrub
- Altai fescue (*Festuca altaica*), grass
- Pumpelly's brome (*Bromus inermis ssp. pumpellianus var. pumpellianus*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.5
fireweed / Ceratodon moss - juniper polytrichum moss.

Community 1.5 is in the pioneering stage of fire-induced secondary succession for this ecological site. It is characterized as a mesic forb herbaceous community (Viereck et al. 1992). Tree seedlings, primarily resin birch and quaking aspen, are common throughout the community but have limited cover. Although small areas of exposed bare soil are common, the soil surface is primarily covered with a mixture of weedy bryophyte species, woody debris, and herbaceous litter. Commonly observed species include grayleaf willow, bog blueberry, fireweed, Altai fescue, Pumpelly's brome, purple reedgrass, fireweed, Ceratodon moss, and juniper polytrichum moss.

Dominant plant species

- grayleaf willow (*Salix glauca*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- Altai fescue (*Festuca altaica*), grass
- Pumpelly's brome (*Bromus inermis ssp. pumpellianus var. pumpellianus*), grass
- purple reedgrass (*Calamagrostis purpurascens*), grass
- ceratodon moss (*Ceratodon purpureus*), other herbaceous
- juniper polytrichum moss (*Polytrichum juniperinum*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.5

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated dry soils, this site commonly experiences high-severity fires. A significant proportion of organic matter is consumed, leaving exposed mineral soil. Vegetation usually resprouts from surviving individuals or is recruited from nearby areas via seed or seedbank.

Pathway 1.2b
Community 1.2 to 1.1

Community pathway 1.2b occurs 130 to 150 years after wildfire disturbance (Foot 1982; Landfire 2009). Time without fire results in the continued growth and increased abundance of white spruce, which overtop and remove the shade intolerant deciduous tree species from the forest canopy.

Pathway 1.2a
Community 1.2 to 1.5

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated dry soils, this site commonly experiences high-severity fires. A significant proportion of organic matter is consumed, leaving exposed mineral soil. Vegetation

usually resprouts from surviving individuals or is recruited from nearby areas via seed or seedbank.

Pathway 1.3b
Community 1.3 to 1.2

Community pathway 1.3b is thought to occur 80 to 100 years after wildfire disturbance. Time without fire results in the continued growth and increased abundance of white spruce, which overtop and remove the shade intolerant deciduous tree species from the forest canopy.

Pathway 1.3a
Community 1.3 to 1.5

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated dry soils, this site commonly experiences high-severity fires. A significant proportion of organic matter is consumed, leaving exposed mineral soil. Vegetation usually resprouts from surviving individuals or is recruited from nearby areas via seed or seedbank.

Pathway 1.4a
Community 1.4 to 1.3

Community pathway 1.4a is thought to occur 30 to 50 years after wildfire disturbance. Time without fire results in the continued development of a forest canopy dominated by resin birch or quaking aspen.

Pathway 1.4b
Community 1.4 to 1.5

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated dry soils, this site commonly experiences high-severity fires. A significant proportion of organic matter is consumed, leaving exposed mineral soil. Vegetation usually resprouts from surviving individuals or is recruited from nearby areas via seed or seedbank.

Pathway 1.5a
Community 1.5 to 1.4

Community pathway 1.5a is thought to occur 4 to 6 years after disturbance. Time without fire results in the herbaceous community being overtopped by willow and deciduous tree seedlings.

Additional community tables

Animal community

not available

Hydrological functions

not available

Recreational uses

not available

Wood products

not available

Other products

not available

Other information

not available

Inventory data references

The vegetation modeled for this site has limited data and is considered provisional. The associated model was largely developed from NRCS staff with working knowledge of the area and literature review.

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Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	03/31/2026
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

   _____

2. **Presence of water flow patterns:**

   _____

3. **Number and height of erosional pedestals or terracettes:**

   _____

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):**

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5. **Number of gullies and erosion associated with gullies:**

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

---

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**