Ecological site F233XY160AK
Boreal Forest Gravelly Frozen 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 - 7416220 - Western North American Boreal Black Spruce Wet-Mesic Slope Woodland

Ecological site concept

- Occurs in the boreal life zone on cold slopes of hills, plains, and low-elevation mountains.
- Soils formed in a thin layer of windblown silts over gravelly colluvium and/or gravelly till.
- Soils are very deep but have permafrost at shallow to moderate depths.
- Ponding occurs frequently to occasionally. Flooding does not occur.
- These wet soils are considered very poorly to poorly drained.
- The reference plant community is open needleleaf forest (Viereck et al. 1992) with black spruce the dominant tree. Multiple plant communities occur within the reference state related to wildfire.

Associated sites

F233XY111AK	**Boreal Forest Loamy Frozen Slopes** Both ecological sites occur on the same cold slopes but ecological site 111 has siltier soils supporting stands of black spruce.
F233XY182AK	**Boreal Forest Gravelly Slopes** Both ecological sites occur on the same hills, plains, and mountains but ecological site 182 occurs on warm slopes supporting stands of white spruce.
F233XY183AK	**Boreal Forest Gravelly Moist Slopes** Both ecological sites occur on the same hills, plains, and mountains but ecological site 182 occurs on warm slopes supporting stands of white spruce.
R233XY148AK	**Subalpine Scrub Gravelly Moist Slopes** Occurs upslope of ecological site 160 in the subalpine life zone with shrubby communities.

Similar sites

F233XY111AK	**Boreal Forest Loamy Frozen Slopes** Similar plant communities on the same boreal slopes. Ecological site 111 has significantly less subsurface rock fragments, which results in differing post-fire recovery of vegetation and permafrost.
F231XY160AK	**Boreal Forest Loamy Frozen 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 mariana*
Shrub	(1) *Vaccinium uliginosum* (2) *Ledum groenlandicum*
Herbaceous	(1) *Sphagnum* (2) *Cladina*

Physiographic features

- Occurs on the tops and base of low elevation rounded mountains and on the slopes of glaciated hills and plains.
- Associated with the boreal life zone. The representative elevation ranges between 150 and 1600 feet. On occasion, elevation ranges up to 2000 feet.
- Associated with cold slopes. Slopes are nearly level to strongly sloping and can occur on all slope aspects.
- Flooding does not occur.
- Ponding occurs frequently for long durations on nearly level slopes and ponding occurs occasionally for brief durations on steeper slopes. Ponding depth ranges up to 12 inches above the soil surface.
- These are wet soils with a seasonal water table occurring between 0 and 10 inches.
- Associated with negligible to limited amounts of runoff to adjacent, downslope ecological sites.

Table 2. Representative physiographic features

Geomorphic position, mountains	(1) Mountaintop (2) Mountainbase
Hillslope profile	(1) Summit (2) Footslope (3) Toeslope
Landforms	(1) Mountains > Mountain (2) Mountains > Mountain > Turf hummock (3) Plains > Hill (4) Plains > Till plain (5) Plains > Plain

Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to long (7 to 30 days)
Ponding frequency	Frequent to occasional
Elevation	46–488 m
Slope	0–10%
Ponding depth	0–30 cm
Water table depth	0–25 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	6–610 m
Slope	0–16%
Ponding depth	0–61 cm
Water table depth	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

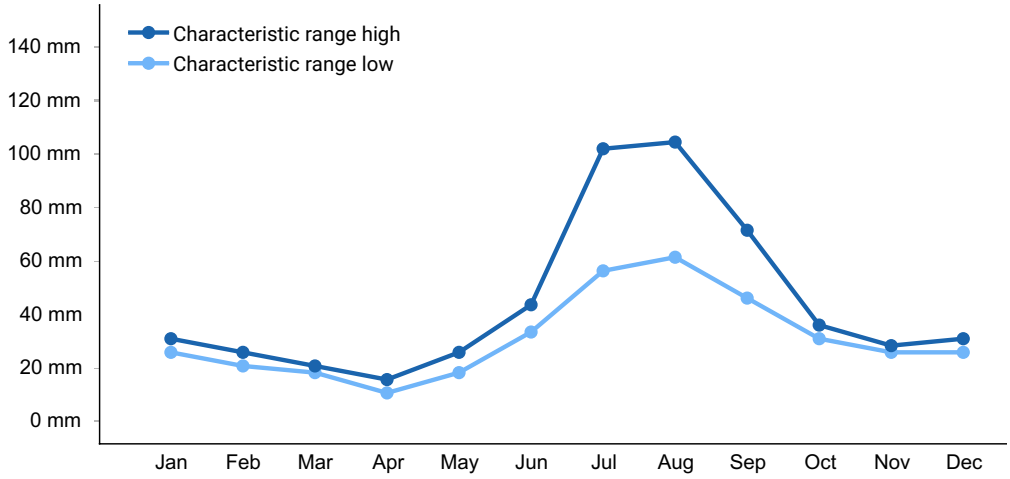


Figure 1. Monthly precipitation range

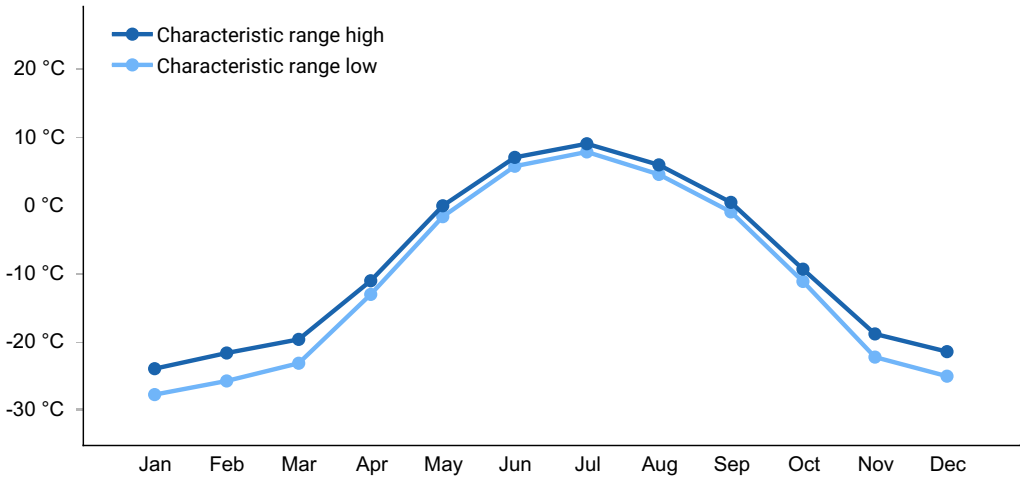


Figure 2. Monthly minimum temperature range

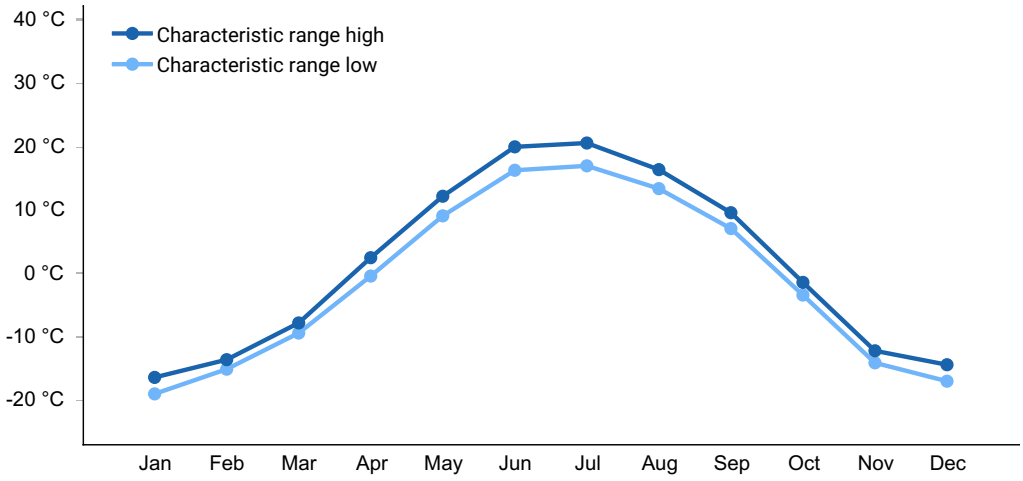


Figure 3. Monthly maximum temperature range

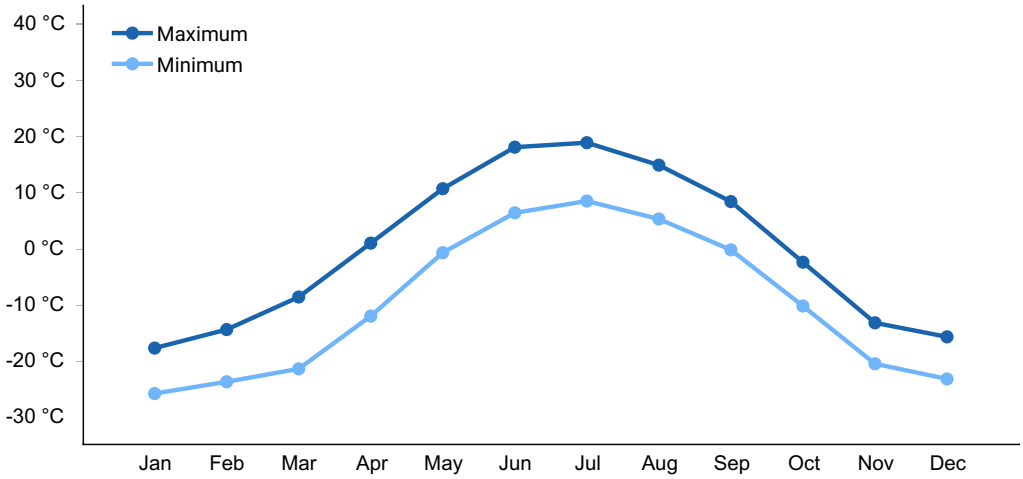


Figure 4. Monthly average minimum and maximum temperature

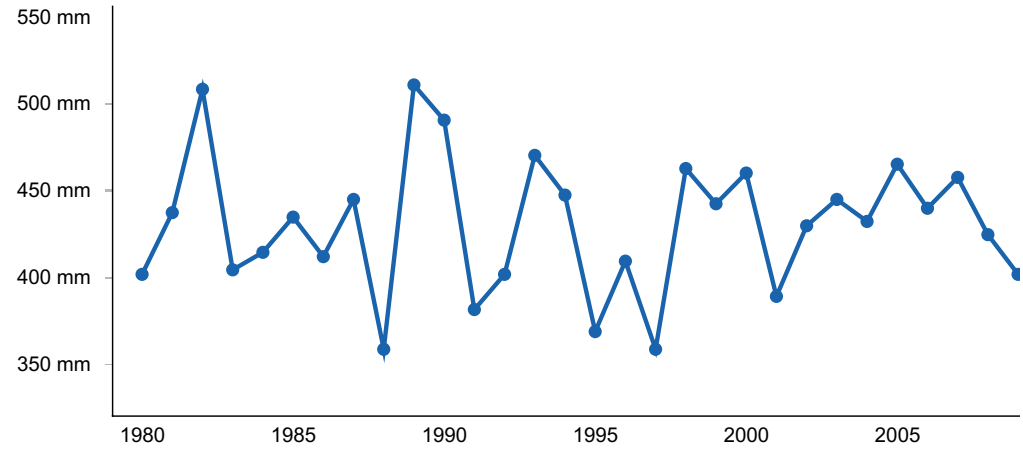


Figure 5. Annual precipitation pattern

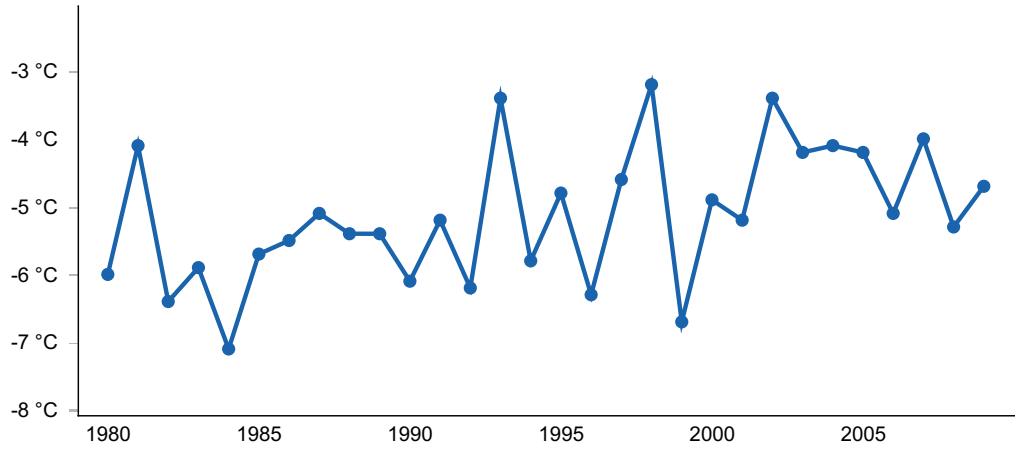


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

Precipitation and ground water are the main sources of water (Smith et al. 1995).

Depth to the water table may decrease following summer storm events or spring snowmelt and increase during extended dry periods.

Wetland description

This site is classified as a slope wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

- Soils formed in loess over gravelly colluvium and/or gravelly till.
- Rock fragments do not occur on the soil surface.
- Capped with up to 13 inches of peat.
- The surface mineral horizon is a mucky silt loam formed from loess or silty colluvium that lacks rock fragments. This silty soil horizon is thin.
- These gravelly soils have subsurface rock fragments ranging between 25 and 50 percent or more of the soil profile by volume.
- While soils are very deep, permafrost occurs at shallow to moderate depths (14 to 27 inches).
- The pH of the soil profile ranges from strongly acidic to slightly acidic.
- These are wet soils that are considered very poorly to poorly drained.
- Soils are classified as Gelisols in the great groups Historthels and Histoturbels.

Table 5. Representative soil features

Parent material	(1) Loess (2) Colluvium (3) Till
Surface texture	(1) Peat
Family particle size	(1) Loamy-skeletal
Drainage class	Very poorly drained to poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	36–69 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.06–13.72 cm
Calcium carbonate equivalent (25.4-101.6cm)	0%
Clay content (0-50.8cm)	8–12%
Electrical conductivity (25.4-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0
Soil reaction (1:1 water) (25.4-101.6cm)	5.3–6.5
Subsurface fragment volume <=3" (0-152.4cm)	25–50%
Subsurface fragment volume >3" (0-152.4cm)	2–20%

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)	0–2 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0–3
Soil reaction (1:1 water) (25.4-101.6cm)	4.6–6.8
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

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 forest gravelly frozen slopes ecological site will reset plant succession and alter dynamic soil properties (e.g., soil organic matter and depth of permafrost). For this ecological site to progress from the earliest stages of post-fire succession to the oldest stages of succession, data suggest that 70-130 years or more must elapse without another fire event (Johnstone et al. 2010a).

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 thick organic cap and are poorly drained, the typical fire scenario for this ecological site is considered to result in a low-severity burn.

Field data for a similar ecological site (F231XY160AK) show half of the organic mat is commonly consumed during a fire. This change in organic depth increases active layer depth causing the permafrost to occur deeper in the soil profile. Increased depth of permafrost improves soil drainage. If more significant amounts of organic material are consumed by the fire, then these gravelly soils are prone to a complete loss of permafrost in the soil profile.

In areas prone to low-severity fire events, the pre-fire vegetative community generally reestablishes quickly and there is minimal long-term alteration to community composition (Johnstone et al. 2010; Bernhardt et al. 2011). When minimal proportions of the organic mat are consumed, many species regenerate asexually using below ground root systems and rhizomes. Species known to regenerate after low-severity fire events include various graminoids (e.g., Carex spp. and Eriophorum spp.), forbs (e.g., Equisetum sp.), and shrubs (e.g., *Ledum groenlandicum*, *Vaccinium uliginosum*, Salix sp.) (Johnstone et al. 2010). Black spruce is the Interior Alaska tree species best adapted to a low-severity fire regime. Black spruce have semi-serotenous cones and a low-severity fire often results in a flush of black spruce seedlings at the burned location.

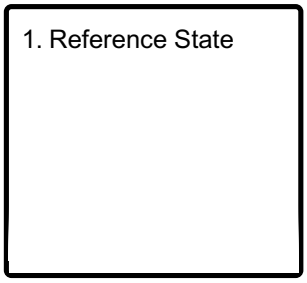
The later stages of succession have an overstory that is a mix of broadleaf and immature needleleaf trees (community 1.2) or mature needleleaf trees (community 1.1). The recruitment of trees species during the early stages of post-fire succession largely controls the composition of the stand of trees in the later stages of post-fire succession (Johnstone et al. 2010a). During these later stages of succession, the slower growing black spruce seedlings mature and eventually replace the shade-intolerant broadleaf tree species. The typical fire return interval for black spruce stands in the boreal forest is 70-130 years (Johnstone et al. 2010a).

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

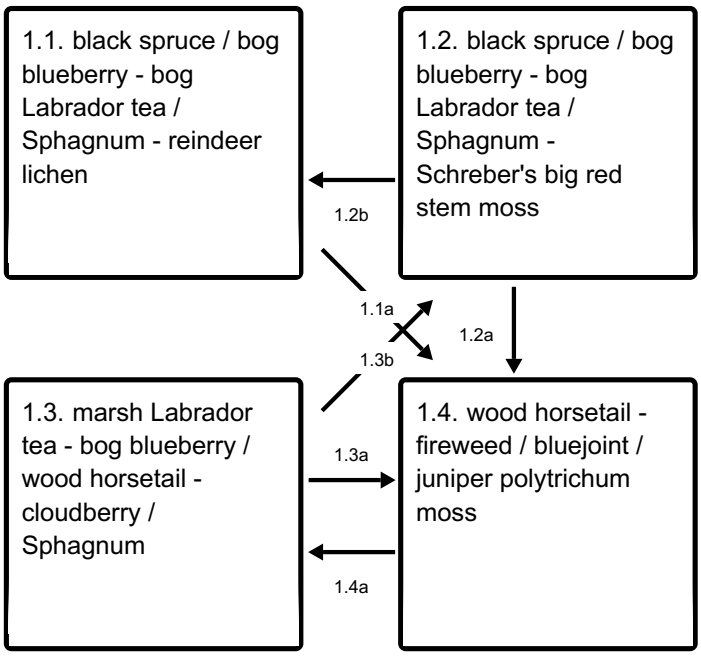
succession with stands of deciduous trees persisting for longer than normal durations of time (Johnstone et al. 2010b).

State and transition model

Ecosystem states



State 1 submodel, plant communities



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

1.2b - Occurs 40 years after wildfire

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

1.3b - Occurs 20 years after wildfire

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

1.4a - Occurs 4 to 10 years after wildfire

State 1
Reference State

The reference plant community is open needleleaf forest (Viereck et al. 1992) with the dominant tree being black spruce. There are four plant communities within the reference state related to fire. The vegetation modeled for this site has limited data and is considered provisional.

Dominant plant species

- black spruce (*Picea mariana*), tree
- bog blueberry (*Vaccinium uliginosum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- sphagnum (*Sphagnum*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous
- woodland horsetail (*Equisetum sylvaticum*), other herbaceous

Community 1.1
black spruce / bog blueberry - bog Labrador tea / Sphagnum - reindeer lichen

The reference plant community is characterized as open needleleaf forest (Viereck et al. 1992) with black spruce as the dominant tree. Black spruce tree cover is split between the stunted tree (greater than 50 years of age and less than 15 feet) and medium tree strata (between 15 and 40 feet). Live deciduous trees, primarily resin birch, occasionally occur in the tree canopy but with limited cover. The soil surface is primarily covered with moss and lichen. Common understory species include Siberian alder, scrub birch (*Betula glandulosa*), bog blueberry, lingonberry, crowberry, bog Labrador tea, Bigelow's sedge, woodland horsetail, cloudberry, various reindeer lichen, and various Sphagnum moss. The understory vegetative strata that characterize this community are low shrubs (between 8 and 36 inches), dwarf shrubs (less than 8 inches), mosses, and foliose and fruticose lichens.

Dominant plant species

- black spruce (*Picea mariana*), tree
- resin birch (*Betula neoalaskana*), tree
- bog blueberry (*Vaccinium uliginosum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- Siberian alder (*Alnus viridis ssp. fruticosa*), shrub
- resin birch (*Betula glandulosa*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous
- cloudberry (*Rubus chamaemorus*), other herbaceous

Community 1.2
black spruce / bog blueberry - bog Labrador tea / Sphagnum - Schreber's big red stem moss

Community 1.2. is in the late stage of fire-induced secondary succession for this ecological site. It is characterized as open needleleaf forest (Viereck et al. 1992). Black spruce seedlings are abundant and tree cover primarily occurs in regenerative tree stratum. Deciduous tree seedlings, primarily resin birch, occasionally occur but with limited cover. The soil surface is primarily covered with herbaceous litter, mosses, and lichen. Common understory species include bog blueberry, bog Labrador tea, lingonberry, marsh Labrador tea, dwarf birch, bluejoint, wood horsetail, Alaska wild rhubarb, various reindeer lichen, various Sphagnum, Schreber's big red stem moss, and juniper polytrichum moss. The understory vegetative strata that characterize this community are tree regeneration, low shrubs (between 8 and 36 inches), and mosses.

Dominant plant species

- black spruce (*Picea mariana*), tree
- resin birch (*Betula neoalaskana*), tree
- bog blueberry (*Vaccinium uliginosum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- Siberian alder (*Alnus viridis ssp. fruticosa*), shrub
- beauverd spirea (*Spiraea stevenii*), shrub
- small cranberry (*Vaccinium oxycoccos*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- sphagnum (*Sphagnum*), other herbaceous
- woodland horsetail (*Equisetum sylvaticum*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- juniper polytrichum moss (*Polytrichum juniperinum*), other herbaceous
- reindeer lichen (*Cladina mitis*), other herbaceous
- Alaska wild rhubarb (*Polygonum alpinum*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- felt lichen (*Peltigera aphthosa*), other herbaceous

Community 1.3
marsh Labrador tea - bog blueberry / wood horsetail - cloudberry / Sphagnum

Community 1.3 is in the early stage of fire-induced secondary succession for this ecological site. This community is characterized as closed low scrub (Viereck et al. 1992). Seedlings of black spruce and resin birch are commonly observed but have limited cover. Common species include tealeaf willow, marsh Labrador tea, bog blueberry, lingonberry, bog Labrador tea, dwarf birch, bluejoint, Bigelow's sedge, cloudberry, wood horsetail,

fireweed, Alaska wild rhubarb, various Sphagnum, juniper polytrichum moss, and ceratodon moss. The strata that characterize this community are low shrubs (between 8 and 36 inches), dwarf shrubs (less than 8 inches), medium forbs (between 4 and 24 inches), and mosses.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- dwarf birch (*Betula nana*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- sphagnum (*Sphagnum*), other herbaceous
- cloudberry (*Rubus chamaemorus*), other herbaceous
- woodland horsetail (*Equisetum sylvaticum*), other herbaceous
- ceratodon moss (*Ceratodon purpureus*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- Alaska wild rhubarb (*Polygonum alpinum*), other herbaceous
- field horsetail (*Equisetum arvense*), other herbaceous
- arctic sweet coltsfoot (*Petasites frigidus*), other herbaceous

Community 1.4
wood horsetail - fireweed / bluejoint / juniper polytrichum moss

Community 1.4 is in the pioneering stage of fire-induced secondary succession for this ecological site. This community is characterized as open low scrub or mesic forb herbaceous (Viereck et al. 1992). Seedlings of black spruce and resin birch are commonly observed but have limited cover. Common species include bog blueberry, dwarf birch, bog Labrador tea, tealeaf willow, bluejoint, wood horsetail, fireweed, Alaska wild rhubarb, and juniper polytrichum moss. The strata that characterize this community are low shrubs (between 8 and 36 inches), medium forbs (between 4 and 24 inches), medium graminoids (between 4 and 24 inches), and mosses.

Dominant plant species

- bog blueberry (*Vaccinium uliginosum*), shrub
- dwarf birch (*Betula nana*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- Siberian alder (*Alnus viridis ssp. fruticosa*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bluejoint (*Calamagrostis canadensis*), grass

- Bigelow's sedge (*Carex bigelowii*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- woodland horsetail (*Equisetum sylvaticum*), other herbaceous
- juniper polytrichum moss (*Polytrichum juniperinum*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- Alaska wild rhubarb (*Polygonum alpinum*), other herbaceous
- cloudberry (*Rubus chamaemorus*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.4

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated cold and wet soils, this site commonly experiences low-severity fires. Minimal proportions of the organic mat are typically removed. The pre-fire vegetation generally reestablishes quickly from below ground root systems and rhizomes.

Pathway 1.2b
Community 1.2 to 1.1

Community pathway 1.2b is thought to occur 40 years after fire. Black spruce seedlings and saplings mature into a open needleleaf forest.

Pathway 1.2a
Community 1.2 to 1.4

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated cold and wet soils, this site commonly experiences low-severity fires. Minimal proportions of the organic mat are typically removed. The pre-fire vegetation generally reestablishes quickly from below ground root systems and rhizomes.

Pathway 1.3b
Community 1.3 to 1.2

Community pathway 1.3b is thought to occur 20 years after fire (Landfire 2009). Black spruce seedlings and sapling start to become a characteristic component of the plant community.

Pathway 1.3a
Community 1.3 to 1.4

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated cold and wet soils, this site commonly experiences low-severity fires. Minimal proportions of the organic mat are typically removed. The pre-fire vegetation generally reestablishes quickly from below ground root systems and rhizomes.

Pathway 1.4a
Community 1.4 to 1.3

Community pathway 1.4a is thought to occur 4 to 10 years after wildfire. Shrub cover increases and forb and graminoid cover decreases.

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	03/18/2026
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):**

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

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

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:**

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:

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

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

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

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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:**

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17. **Perennial plant reproductive capability:**
