Ecological site F231XY250AK
Boreal Woodland Gravelly Terraces

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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): 231X–Interior Alaska Highlands

The Interior Alaska Uplands (MLRA 231X) is in the Interior Region of Alaska and includes the extensive hills, mountains, and valleys between the Tanana River to the south and the Brooks Range to the north. These hills and mountains surround the Yukon Flats Lowlands (MLRA 232X). MLRA 231X makes up about 69,175 square miles. The hills and mountains of the area tend to be moderately steep to steep resulting in high-relief slopes. The mountains are generally rounded at lower elevations and sharp-ridged at higher elevations. Elevation ranges from about 400 feet in the west, along the boundary with the Interior Alaska Lowlands (MLRA 229X), to 6,583 feet at the summit of Mt. Harper, in the southeast. Major tributaries include large sections of the Yukon, Koyukuk, Kanuti, Charley, Coleen, and Chatanika Rivers. This area is traversed by several major roads, including the Taylor Highway in the east and the Steese, Elliott, and Dalton Highways north of Fairbanks. The area is mostly undeveloped wild land that is sparsely populated. The largest community along the road system is Fairbanks with smaller communities like Alatna, Allakaket, Chicken, Eagle, Eagle Village, Hughes, and Rampart occurring along the previously mentioned rivers and highways.

The vast majority of this MLRA was unglaciated during the Pleistocene epoch with the exceptions being the highest mountains and where glaciers extended into the area from the Brooks Range. For the most part, glacial moraines and drift are limited to the upper elevations of the highest mountains. Most of the landscape is mantled with bedrock colluvium originating from the underlying bedrock. Valley bottoms are filled with Holocene fluvial deposits and colluvium from the adjacent mountain slopes. Silty loess, which originated from unvegetated flood plains in and adjacent to this area, covers much of the surface. On hill and mountain slopes proximal to major river valleys (e.g., Tanana and Yukon Rivers), the loess is many feet thick. As elevation and distance from major river valleys increases, loess thickness decreases significantly. Bedrock is commonly exposed on the highest ridges.

This area is in the zone of discontinuous permafrost. Permafrost commonly is close to the surface in areas of the finer textured sediments throughout the MLRA. Isolated masses of ground ice occur in thick deposits of loess on terraces and the lower side slopes of hills. Solifluction lobes, frost boils, and circles and stripes are periglacial features common on mountain slopes in this area. Pingos, thermokarst pits and mounds, ice-wedge polygons, and earth hummocks are periglacial features common on terraces, lower slopes of hills and mountains, and in upland valleys in the area.

The dominant soil orders in this area are Gelisols, Inceptisols, Spodosols, and Entisols. The soils in the area have a subgelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Gelisols are common on north facing slopes, south facing footslopes, valley bottoms, and stream terraces. Gelisols are typically shallow or moderately deep to permafrost (10 to 40 inches) and are poorly or very poorly drained. Wildfires can disturb the insulating organic material at the surface, lowering the permafrost layer, eliminating perched water tables from Gelisols, and thus changing the soil classification. Inceptisols and Spodosols commonly form on south facing hill and mountain slopes. Entisols are common on flood plains and high elevation mountain slopes. Miscellaneous (non-soil) areas make up about 2 percent of this MLRA. The most common miscellaneous areas are rock outcrop and rubble land. In many valleys placer mine tailings are common.

Short, warm summers and long, cold winters characterize the subarctic continental climate of the area. The mean annual temperature of the area ranges from 22 to 27 degrees F. The mean annual temperature of the southern half of the area is approximately 3 degrees warmer compared to the northern half (PRISM 2018). The warmest months span June through August with mean monthly temperatures ranging from 50 to 56 degrees F. The coldest months span November through February with mean monthly temperatures ranging from -5 to 3 degrees F. When compared to the high-elevation alpine and subalpine life zones, the lower elevation boreal life zone tends to be 2-3 degrees F colder during the coldest months and 1-2 degrees F warmer during the warmest months (PRISM 2018). The freeze-free period at the lower elevations averages about 60 to 100 days, and the temperature usually remains above freezing from June through mid-September.

Precipitation is limited across this area, with the average annual precipitation ranging from 12 to 19 inches. The southern half of the areas receives approximately 2.5 inches more annual precipitation then the northern half (PRISM 2018). The lower elevation boreal life zone receives approximately 2.5 inches less annual precipitation than the high-elevation alpine and subalpine life zones (PRISM 2018). Approximately 3/5th of the annual precipitation occurs during the months of June through September with thunderstorms being common. The average annual snowfall ranges from about 45 to 100 inches. The ground is consistently covered with snow from November through March.

Most of this area is forested below an elevation of about 2500 feet. Dominant tree species on slopes are white spruce and black spruce. Black spruce stands are most common on north-facing slopes, stream terraces, and other sites with poor drainage and permafrost. White spruce stands are most common on warm slopes with dry soils. At lower elevations, lightning-caused wildfires are common, often burning many thousands of acres during a single fire. 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

This area supports three life zones 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 typically a narrow transitional band between the boreal and the alpine life zones, and is characterized by sparse, stunted trees. In the subalpine, certain types of birch and willow shrub species grow at ≥ 1 m 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 2500 feet elevation on average. The transition between boreal and alpine vegetation can occur within a range of elevations, and is highly dependent on slope, aspect, and shading from adjacent mountains.

Within each life zone, there are plant assemblages that are typically associated with cold slopes and warms 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 typically occur on southeast to west facing slopes that are moderate to very steep (>10% slope) and are not shaded by the surrounding landscape. Cold slopes typically 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 typically 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 – 7416041 – Western North American Boreal Mesic Black Spruce Forest - Boreal (Landfire 2009)

Ecological site concept

This boreal site occurs on stream terraces with dry and gravelly soils. The soils lack permafrost, do not have a seasonal water table, and are considered somewhat excessively drained. The soil profile has a thin layer of organic material over a thin layer of loess over sandy and gravelly alluvium.

Multiple plant communities occur within the reference state and the vegetation in each community differs in large part due to fire. When the reference state vegetation burns, the post-fire plant community is dominantly forbs, grasses, and weedy mosses. With time and lack of another fire event, the post-fire vegetation goes through multiple stages of succession. For this site, the reference plant community is the most stable with the longest time since the vegetation was burned. This community is characterized as needleleaf woodland (Viereck et al. 1992) with black spruce as the dominant tree. On occasion, white spruce occurs as a dominant species in the canopy. For this ecological site to progress from the earliest stages of post-fire succession to the oldest stages of succession, data suggest that 70-100 years or more must elapse without another fire event (Johnstone et al. 2010a).

The reference plant community understory commonly has kinnikinnick, lingonberry, crowberry, bog Labrador tea, Altai fescue, false toadflax, an assortment of reindeer lichen, curled snow lichen, cup lichen, and splendid feathermoss. Tree cover is split between the stunted tree (mature tree less than 15 feet in height) and medium tree strata (between 15 and 40 feet). The understory vegetative strata that characterize this community are dwarf shrubs (less than 8 inches in height), foliose and fruticose lichen, and mosses.

Associated sites

R231XY130AK	**Boreal Scrubland Gravelly Floodplain** Occurs on the low flood plain of small rivers in the area with shrubby vegetation.
F231XY131AK	**Boreal Forest Gravelly Floodplain** Occurs on the high flood plain of small rivers in the area with productive stands of white spruce.
F231XY171AK	**Boreal Woodland Loamy Frozen Terraces** Occurs on adjacent stream terraces with wet soils that have permafrost at depth.

Similar sites

XA232X01Y250	**Boreal Woodland Gravelly Terraces Dry** Occurs on stream terraces in the Yukon Flats Lowlands area. Soils formed in sandy and gravelly alluvium. These sites have similar plant communities and ecological dynamics.

Table 1. Dominant plant species

Tree	(1) *Picea mariana*
Shrub	(1) *Arctostaphylos uva-ursi* (2) *Vaccinium vitis-idaea*
Herbaceous	(1) *Cladina* (2) *Flavocetraria cucullata*

Physiographic features

This boreal site occurs on near level surfaces of stream terraces. Slope is negligible and occurs on all aspects. The boreal life zone typically occurs below 2500 feet with this site occasionally occurring as high as 2850 feet. Flooding and ponding do not occur. A seasonal water table does not occur in the soil profile.

Table 2. Representative physiographic features

Geomorphic position, terraces	(1) Tread

Landforms	(1) Stream terrace
Runoff class	Negligible
Flooding frequency	None
Ponding frequency	None
Elevation	107–762 m
Slope	0–2%
Water table depth	152 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 frequency	Not specified
Elevation	107–869 m
Slope	Not specified
Water table depth	Not specified

Climatic features

Short, warm summers and long, cold winters characterize the subarctic continental climate associated with this boreal site. The mean annual temperature of the site ranges from 22 to 27 degrees F. The warmest months span June through August with mean normal maximum monthly temperatures ranging from 60 to 66 degrees F. The coldest months span November through February with mean normal minimum temperatures ranging from -3 to -12 degrees F. The freeze-free period for the site ranges from 80 to 120 days, and the temperature usually remains above freezing from late May through mid-September.

The area receives minimal annual precipitation with the summer months being the wettest. Average annual precipitation across the area typically ranges between 12 to 18 inches. Approximately 3/5th of the annual precipitation occurs during the months of June through September with thunderstorms common. The average annual snowfall ranges from about 45 to 100 inches. The ground is consistently covered with snow from November through March.

Table 4. Representative climatic features

Frost-free period (characteristic range)	16-78 days
Freeze-free period (characteristic range)	76-114 days
Precipitation total (characteristic range)	305-457 mm
Frost-free period (actual range)	4-87 days
Freeze-free period (actual range)	48-120 days
Precipitation total (actual range)	229-508 mm
Frost-free period (average)	53 days
Freeze-free period (average)	90 days
Precipitation total (average)	381 mm

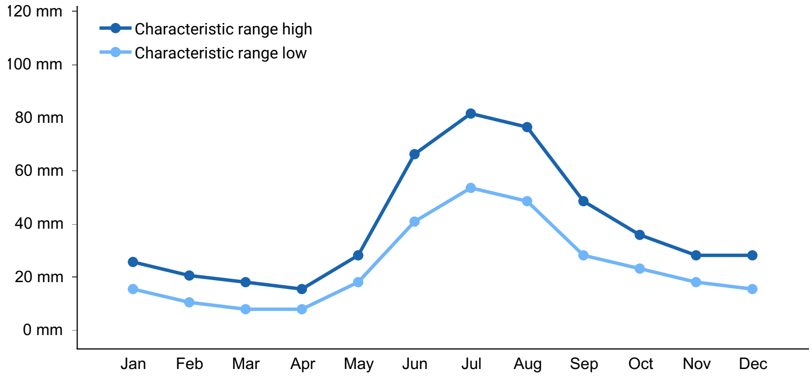


Figure 1. Monthly precipitation range

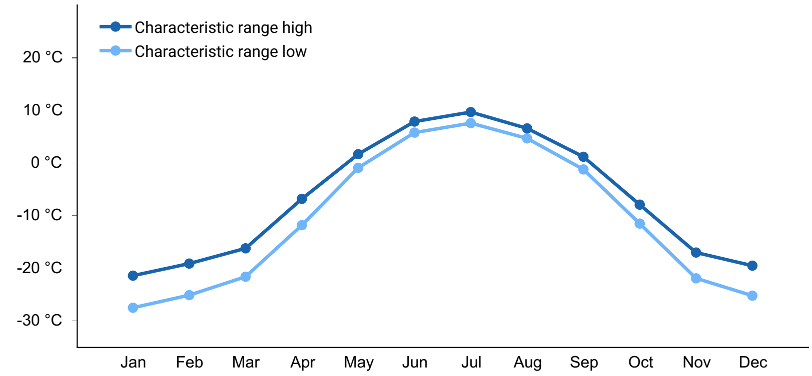


Figure 2. Monthly minimum temperature range

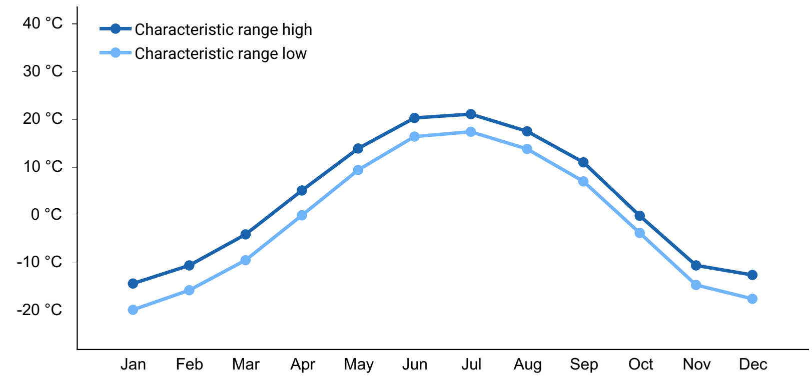


Figure 3. Monthly maximum temperature range

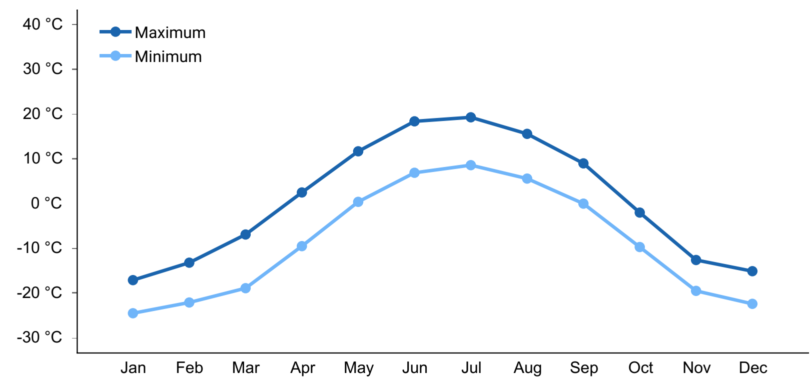


Figure 4. Monthly average minimum and maximum temperature

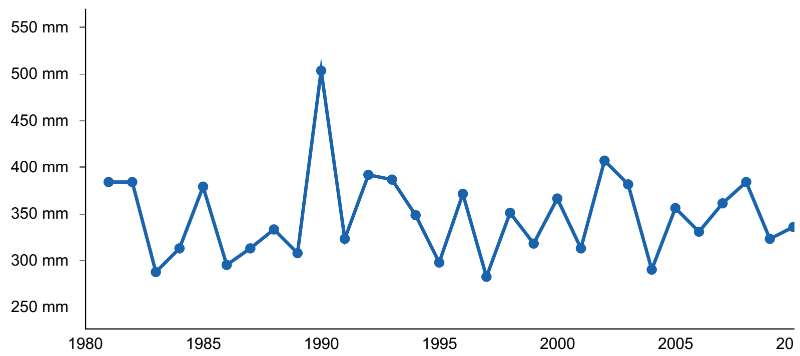


Figure 5. Annual precipitation pattern

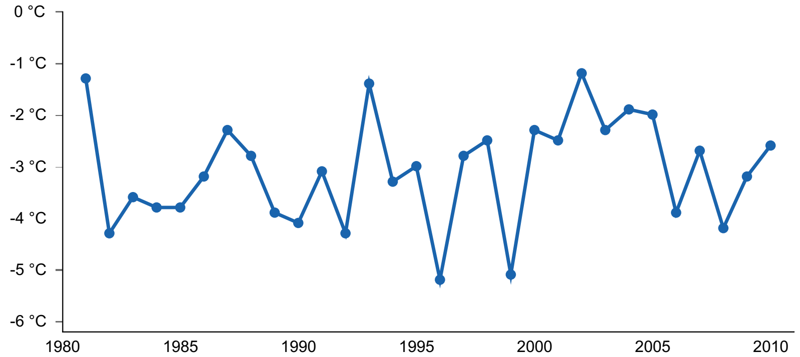


Figure 6. Annual average temperature pattern

Climate stations used

- (1) EAGLE AP [USW00026422], Tok, AK
- (2) CHICKEN [USC00501684], Tok, AK
- (3) MILE 42 STEESE [USC00505880], Fairbanks, AK
- (4) BETTLES AP [USW00026533], Bettles Field, AK
- (5) CIRCLE HOT SPRINGS [USC00501987], Central, AK
- (6) FT KNOX MINE [USC00503160], Fairbanks, AK
- (7) GILMORE CREEK [USC00503275], Fairbanks, AK
- (8) FOX 2SE [USC00503181], Fairbanks, AK
- (9) ESTER DOME [USC00502868], Fairbanks, AK
- (10) ESTER 5NE [USC00502871], Fairbanks, AK
- (11) COLLEGE 5 NW [USC00502112], Fairbanks, AK
- (12) COLLEGE OBSY [USC00502107], Fairbanks, AK
- (13) KEYSTONE RIDGE [USC00504621], Fairbanks, AK

Influencing water features

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

Wetland description

n/a

Soil features

Soils formed in windblown silts over sandy and gravelly alluvium and lack permafrost. These are mineral soils commonly capped with about 4 inches of organic material. Rock fragments are absent on the soil surface. The mineral soil below the organic material is a thin layer of silt loam formed from wind-blown loess, which lacks rock fragments and has high water holding capacity. The loess layer is up to 4 inches thick. Below the loess the soil parent material is sandy and gravelly alluvium with rock fragments ranging between 25 and 70 percent of the soil profile by volume. While these are very deep soils, at times there is an abrupt change between the loess and gravelly alluvium resulting in restrictions at very shallow to shallow depths (4 to 17 inches). Soils range from extremely acidic to strongly acidic. The soils are dry, lack a seasonal water table, and are considered excessively drained.

Figure 7. A typical soil profile associated with this site. Notice the layer of silty loess over the sandy and gravelly alluvium.

Table 5. Representative soil features

Parent material	(1) Loess (2) Eolian deposits (3) Alluvium
Surface texture	(1) Silt loam
Family particle size	(1) Sandy-skeletal
Drainage class	Excessively drained
Permeability class	Moderately rapid
Depth to restrictive layer	152 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.79–4.06 cm
Calcium carbonate equivalent (25.4-101.6cm)	0%
Clay content (0-50.8cm)	1–5%
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)	4.1–5.6
Subsurface fragment volume <=3" (0-152.4cm)	25–55%
Subsurface fragment volume >3" (0-152.4cm)	0–15%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	10 cm
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)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

Fire

In the Interior Alaska Uplands 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 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 black spruce woodlands, data suggest that 100 years or more must elapse without another fire event (Johnstone et al. 2010a).

Within this area, fire is considered a natural and common event that typically is unmanaged. Fire suppression is limited, and generally occurs adjacent to Fairbanks and the various 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, 596 known fire events occurred in the Interior Alaska Uplands area and the burn perimeter of the fires totaled about 13.8 million acres (AICC 2022). Fire-related disturbances are highly patchy and can leave undisturbed areas within the burn perimeter. During this time frame, 80% of the fire events were smaller than 20,000 acres but 18 fire events were greater than 200,000 acres in size (AICC 2022). These burn perimeters cover approximately 30% of the Interior Alaska Uplands area over a period of 20 years.

The fire regime within Interior Alaska follows two basic scenarios—low-severity burns and high-severity burns. It should be noted, however, that the fire regime in Interior Alaska is generally thought to be much 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 somewhat excessively 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 tends to cause overall soil temperatures to increase (Hinzman et al. 2006). These alterations to soil temperature may result in increased depths of seasonal frost in the soil profile and improve drainage. High-severity fire events also destroy a majority of the vascular and nonvascular biomass above ground.

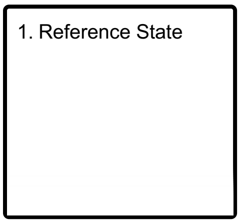
Field data from similar sites suggest that each of the forested communities will burn and that fire events will cause a transition to the pioneering stage of fire succession. This stage (community 1.4) is a mix of species that either regenerate in place (e.g., subterranean root crowns for willow and 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*]). Black spruce has semi-serotenous cones and a fire event typically results in a flush of black spruce seedlings at the burned location. 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 10 years post-fire. 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 1.3). This early stage of fire succession is thought to persist 10 to 30 years post-fire. In the absence of fire, tree species continue to become more dominant in the stand and eventually develop into forests.

The later stages of succession have an overstory that is a mix of broadleaf and immature needleleaf trees (community phase 1.2) or mature needleleaf trees (community phase 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 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).

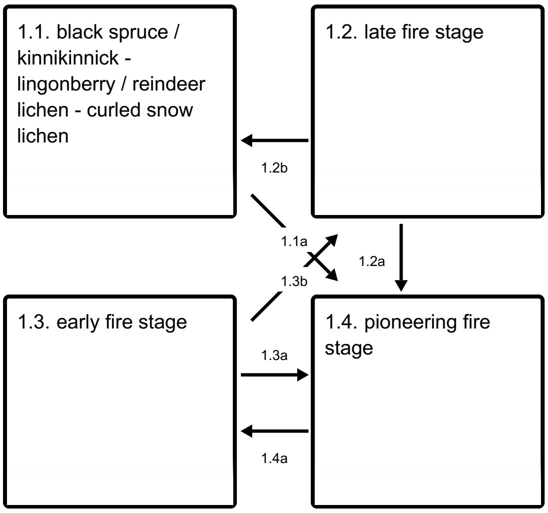
Lands associated with this site may be burning more frequently than in the past, which may result in alternative pathways of succession. The historic fire return interval for black spruce stands in Interior Alaska occurs approximately once per century. Due to global climate change, stands of spruce in certain portions of the Alaskan boreal forest are burning more frequently than these historic averages (Kelly et al. 2013). Increases to burn frequency favors forested stands dominated by quick growing deciduous trees (community 1.2). 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 burn frequency in the boreal forest may result in alternative pathways 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 high-severity fire sweeps through and incinerates much of the above ground vegetation.

1.2b - Time without fire.

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

1.3b - Time without fire.

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

1.4a - Time without fire.

State 1
Reference State

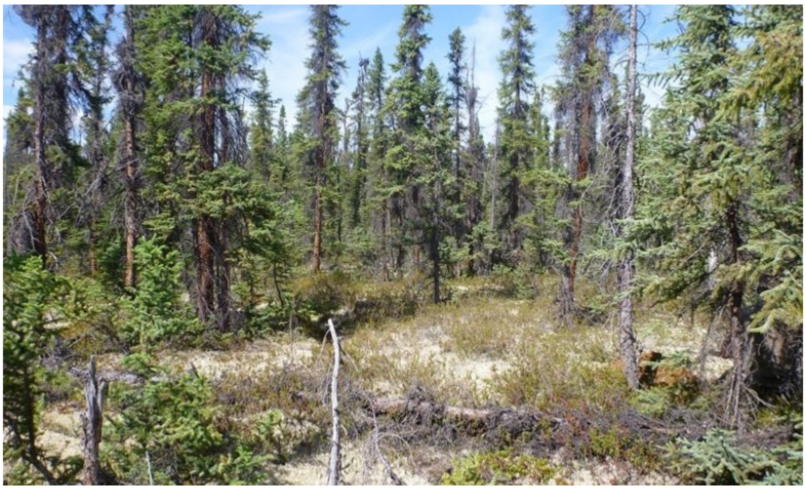


Figure 8. A dry gravelly stream terrace near Central, Alaska.

The reference plant community is needleleaf woodland (Viereck et al. 1992) with the dominant tree being black spruce. There are four plant communities within the reference state related to fire. While the reference plant community is supported with plot data, plant communities 1.2 , 1.3, and 1.4 have limited data and are considered provisional concepts.

Dominant plant species

- black spruce (*Picea mariana*), tree
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- reindeer lichen (*Cladina*), other herbaceous
- (*Flavocetraria cucullata*), other herbaceous

Community 1.1
black spruce / kinnikinnick - lingonberry / reindeer lichen - curled snow lichen

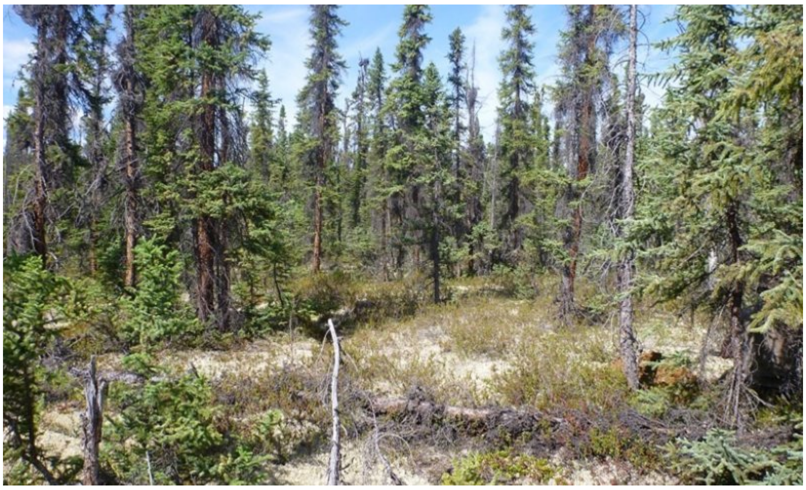


Figure 9. A typical plant community associated with community 1.1.

The reference plant community is characterized as a needleleaf woodland (less than 25 percent cover; Viereck et al. 1992) with black spruce as the dominant tree. On occasion, white spruce occurs as a dominant species in the canopy. Tree cover is split between the stunted tree (mature tree less than 15 feet in height) and medium tree strata (between 15 and 40 feet). Live deciduous trees, primarily quaking aspen, occasionally occur in the tree canopy, but most have been replaced by spruce. The soil surface is primarily covered with lichen and moss. Common and abundant understory species for this community include kinnikinnick, lingonberry, crowberry, bog Labrador tea, Altai fescue, false toadflax, an assortment of reindeer lichen, curled snow lichen (*Flavocetraria cucullata*), cup lichen, and splendid feathermoss. The understory vegetative strata that characterize this community phase are dwarf shrubs (less than 8 inches in height), foliose and fruticose lichen, and mosses.

Dominant plant species

- black spruce (*Picea mariana*), tree
- white spruce (*Picea glauca*), tree
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- Altai fescue (*Festuca altaica*), grass
- false toadflax (*Geocaulon lividum*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous
- (*Flavocetraria cucullata*), other herbaceous
- cup lichen (*Cladonia*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous

Community 1.2
late fire stage

Community 1.2 is in the late stage of fire-induced secondary succession for this ecological site. It is characterized as mixed woodland (Viereck et al. 1992) with quaking aspen and immature black spruce the dominant trees. Common and abundant understory species for this community likely include kinnikinnick, Labrador tea, reindeer lichen, and splendid feathermoss

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- black spruce (*Picea mariana*), tree
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- reindeer lichen (*Cladina*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous

Community 1.3
early fire stage

Community 1.3 is in the early stage of fire-induced secondary succession for this ecological site. It is characterized as open low scrubland (Viereck et al. 1992). Quacking aspen seedlings and saplings are common but are not a dominant overstory species. Common and abundant understory species for this community likely include kinnikinnick, Labrador tea, willow, bluejoint, and fireweed.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- willow (*Salix*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.4
pioneering fire stage

Community 1.4 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 quaking aspen and black spruce, are common throughout the community. 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 likely include bluejoint, fireweed, and weedy mosses.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- ceratodon moss (*Ceratodon purpureus*), other herbaceous
- juniper polytrichum moss (*Polytrichum juniperinum*), other herbaceous
- (*Marchantia polymorpha*), 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 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

Time without fire results in the continued growth and increased abundance of black spruce, which overtop and remove the shade intolerant deciduous tree species from the forest canopy.

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 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

Time without fire results in the continued development of a forest canopy dominated by quaking aspen and immature black spruce.

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 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

Time without fire results in the herbaceous community being overtopped by willow and deciduous tree seedlings.

Additional community tables

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
black spruce	PIMA	*Picea mariana*	Native	3.4–5.2	5–30	5.6–10.9	–
white spruce	PIGL	*Picea glauca*	Native	–	0–20	–	–

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Altai fescue	FEAL	*Festuca altaica*	Native	0.1–0.6	1–10
Forb/Herb					
false toadflax	GELI2	*Geocaulon lividum*	Native	0.1–0.6	3–7
tall bluebells	MEPA	*Mertensia paniculata*	Native	0.1–0.6	0–2
arctic lupine	LUAR2	*Lupinus arcticus*	Native	0.1–0.6	0–2
groundcedar	LYCO3	*Lycopodium complanatum*	Native	0–0.1	0–0.1
longstalk starwort	STLO2	*Stellaria longipes*	Native	0–0.9	0–0.1
Shrub/Subshrub					
kinnikinnick	ARUV	*Arctostaphylos uva-ursi*	Native	0–0.1	1–30
black crowberry	EMNI	*Empetrum nigrum*	Native	0–0.1	1–20
lingonberry	VAVI	*Vaccinium vitis-idaea*	Native	0–0.1	7–15
bog Labrador tea	LEGR	*Ledum groenlandicum*	Native	0.2–0.9	0–10
grayleaf willow	SAGL	*Salix glauca*	Native	1.8–3	0–4
bog blueberry	VAUL	*Vaccinium uliginosum*	Native	0.2–0.9	0–4
Bebb willow	SABE2	*Salix bebbiana*	Native	1.8–3	0.1–4
prickly rose	ROAC	*Rosa acicularis*	Native	0.9–1.5	0–3
twinflower	LIBO3	*Linnaea borealis*	Native	0–0.1	0–2
Nonvascular					
greygreen reindeer lichen	CLRA60	*Cladina rangiferina*	Native	0–0.1	0–50
splendid feather moss	HYSP70	*Hylocomium splendens*	Native	0–0.1	2–40
cup lichen	CLADO3	*Cladonia*	Native	0–0.1	0–25
	FLCU	*Flavocetraria cucullata*	Native	0–0.1	0–25
reindeer lichen	CLMI60	*Cladina mitis*	Native	0–0.1	7–20
	FLNI	*Flavocetraria nivalis*	Native	0–0.1	0–15
star reindeer lichen	CLST60	*Cladina stellaris*	Native	0–0.1	0–10
reindeer lichen	CLST5	*Cladina stygia*	Native	0–0.1	5
Schreber's big red stem moss	PLSC70	*Pleurozium schreberi*	Native	0–0.1	1–5

Animal community

n/a

Hydrological functions

n/a

Recreational uses

n/a

Wood products

n/a

Other products

n/a

Other information

n/a

Inventory data references

Tier 2 sampling plots used to develop the reference state. Plot numbers as recorded in NASIS with associated community phase.

Community 1.1
2016AK290589, 2017AK290552, 2017AK290557

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Approval

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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	08/17/2024
Approved by	Kirt Walstad
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:

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:

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17. **Perennial plant reproductive capability:**
