USDA Natural Resources
Conservation Service

Ecological site R231XY128AK
Boreal Tussock Peat Frozen Slopes

Last updated: 2/13/2024
Accessed: 07/17/2024

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 – 7416280 – Western North American Boreal Low Shrub-Tussock Tundra

Ecological site concept

This boreal site occurs on cold and nearly level slopes with wet, peaty, and frozen soils. The most common hillslope positions are summits, shoulders, and toeslopes of hills, plains, and low-elevation mountains. Associated soils pond frequently, have a water table at very shallow depth throughout the growing season, and are considered very poorly drained. Soils not recently burned typically have permafrost at moderate depth (between 20 and 32 inches). Field data indicates that permafrost occurs under all reference vegetation and that fire often has negligible impacts to the depth and presence of permafrost. Mineral soil horizons have minimal to no rock fragments and are commonly cryoturbated. The soil profile has a thick layer of saturated organic material over a thick layer of silty loess or colluvium. These gentle slopes with very wet and cold soils limit the potential for forested stands. The dominant vegetation is sedge tussock communities.

Two 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 ericaceous shrubs, sedges, and mosses. With time and lack of another fire event, the post-fire vegetation goes an additional stage 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 typically characterized as open low mixed shrub-sedge tussock bog (Viereck et al. 1992) with the dominant plant being tussock cottongrass. For this ecological site to progress from the earliest stages of post-fire succession to the oldest stages of succession, data suggest that 20-40 years or more must elapse without another fire event.

Other common species associated with the reference plant community are marsh Labrador tea, bog blueberry, dwarf birch, lingonberry, Bigelow's sedge, cloudberry, various Sphagnum, curled snow lichen, and various reindeer lichen. The strata that characterize this community are low shrubs (between 8 and 36 inches), medium graminoids (between 4 and 24 inches), and mosses.

Associated sites

F231XY111AK	**Boreal Forest Loamy Frozen Slopes** Occurs on the same boreal hill and mountain slopes as site 128 but on steeper slopes with stands of black spruce.
F231XY118AK	**Boreal Woodland Organic Frozen Slopes** Occurs on the same boreal hill and mountain slopes but on steeper footslopes and toeslopes that support stands of black spruce.
F231XY160AK	**Boreal Forest Loamy Frozen Slopes** Occurs on the same boreal hill and mountain slopes as site 128 but on steeper slopes with stands of black spruce.

Similar sites

F231XY118AK	**Boreal Woodland Organic Frozen Slopes** Both sites occur on toeslopes in the boreal life zone. Site 118 supports stunted black spruce woodlands and site 128 supports sedge tussock communities.
R231XY115AK	**Alpine sedge silty frozen slopes** Occurs on the same landform positions but in the alpine life zone at high-elevation.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Eriophorum vaginatum* (2) *Sphagnum*

Physiographic features

This boreal site occurs on nearly level slopes of hills, plains, and low-elevation mountains. The associated hillslope positions are summits, shoulders, and toeslopes. These gentle slopes occasionally have turf hummocks which are small mounds consisting of vegetation and organic matter. This site is associated with the boreal life zone which typically occurs below 2500 feet in this area. At times, elevation can range up to 2850 feet on warmer mountain slopes. Slopes commonly range from 0 percent on summits and toeslopes to 3 percent or more on shoulders and this site is associated with all aspects. This site does not flood. This site ponds frequently for long durations of time. A high-water table occurs at very shallow depths throughout the growing season. This site generates very low runoff to adjacent, downslope ecological sites.

Table 2. Representative physiographic features

Hillslope profile	(1) Summit (2) Shoulder (3) Toeslope
Landforms	(1) Mountains > Mountain slope (2) Mountains > Hill (3) Upland > Plain (4) Mountains > Mountain slope > Turf hummock (5) Upland > Plain > Turf hummock
Runoff class	Negligible to very low
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	79–762 m
Slope	0–4%
Ponding depth	5–20 cm
Water table depth	0 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	Occasional to frequent
Elevation	67–869 m
Slope	0–8%
Ponding depth	0–30 cm
Water table depth	0–25 cm

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

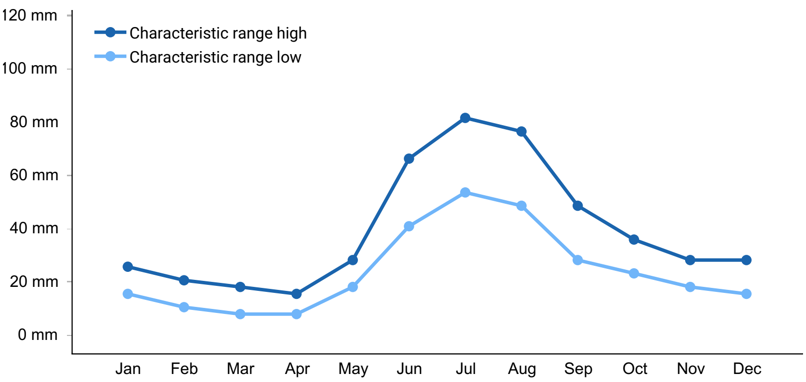


Figure 1. Monthly precipitation range

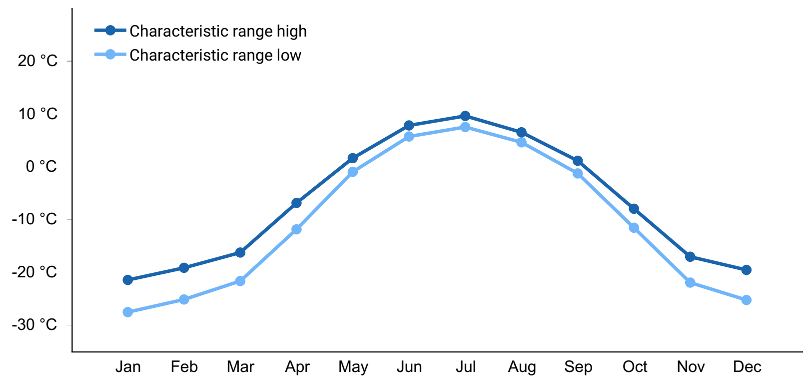


Figure 2. Monthly minimum temperature range

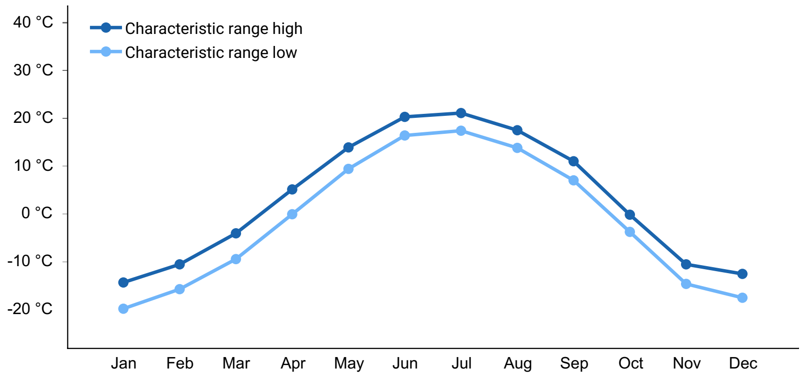


Figure 3. Monthly maximum temperature range

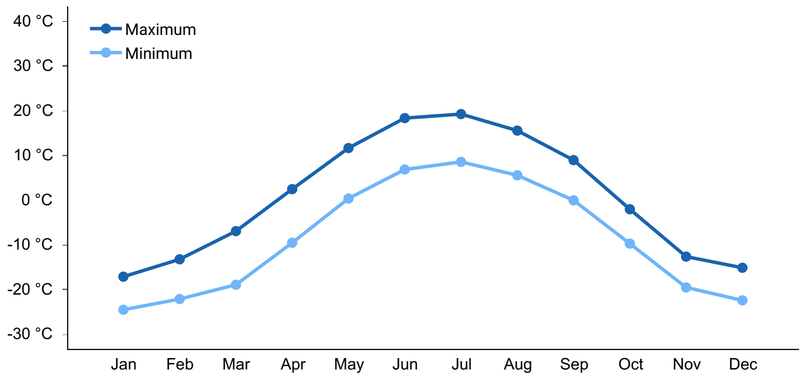


Figure 4. Monthly average minimum and maximum temperature

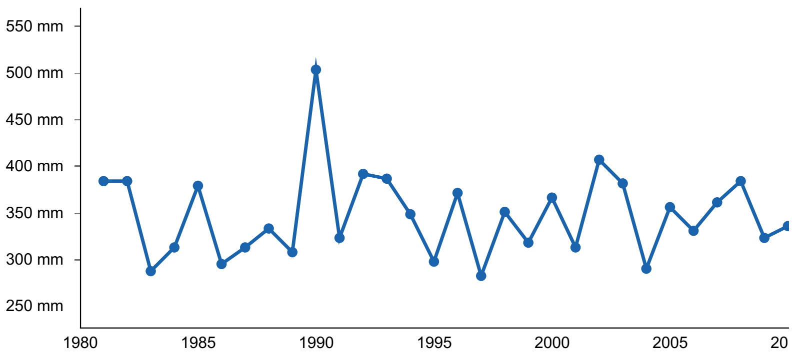


Figure 5. Annual precipitation pattern

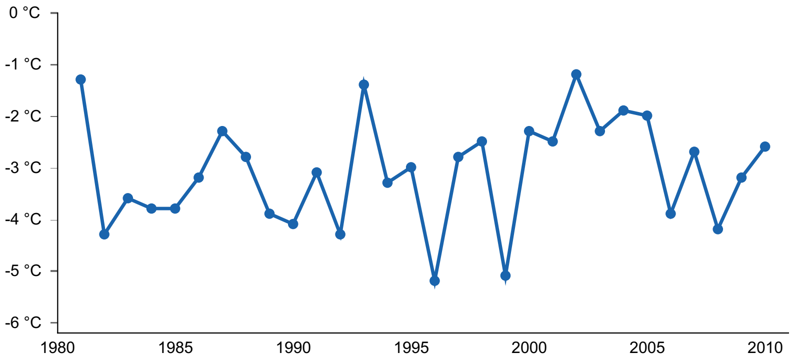


Figure 6. Annual average temperature pattern

Climate stations used

- (1) MILE 42 STEESE [USC00505880], Fairbanks, AK
- (2) BETTLES AP [USW00026533], Bettles Field, AK
- (3) CIRCLE HOT SPRINGS [USC00501987], Central, AK

- (4) FT KNOX MINE [USC00503160], Fairbanks, AK
- (5) GILMORE CREEK [USC00503275], Fairbanks, AK
- (6) FOX 2SE [USC00503181], Fairbanks, AK
- (7) ESTER DOME [USC00502868], Fairbanks, AK
- (8) ESTER 5NE [USC00502871], Fairbanks, AK
- (9) COLLEGE 5 NW [USC00502112], Fairbanks, AK
- (10) COLLEGE OBSY [USC00502107], Fairbanks, AK
- (11) KEYSTONE RIDGE [USC00504621], Fairbanks, AK
- (12) EAGLE AP [USW00026422], Tok, AK
- (13) CHICKEN [USC00501684], Tok, AK

Influencing water features

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

n/a

Soil features

Soils formed in a thick layer of windblown silts or silty colluvium and have permafrost. Rock fragments do not occur on the soil surface. These are mineral soils capped with 13 to 16 inches of saturated organic material. The mineral soil below the organic material is a silt loam derived from wind-blown loess and/or colluvium, which lacks rock fragments and has high water holding capacity. While considered very deep, soils are commonly cryoturbated and have permafrost at moderate depth (20 to 32 inches). The pH of the soil profile ranges from very strongly acidic to moderately acidic. The soils are wet for long portions of the growing season and are considered very poorly drained.

Figure 7. Typical soil profile associated with this site.

Table 5. Representative soil features

Parent material	(1) Loess (2) Eolian deposits (3) Colluvium
Surface texture	(1) Peat (2) Muck
Family particle size	(1) Coarse-silty (2) Loamy

Drainage class	Very poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	51–81 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	20.57–40.89 cm
Calcium carbonate equivalent (25.4-101.6cm)	0%
Clay content (0-50.8cm)	0–12%
Electrical conductivity (25.4-101.6cm)	0–3 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0
Soil reaction (1:1 water) (25.4-101.6cm)	4.5–5.6
Subsurface fragment volume <=3" (0-152.4cm)	0%
Subsurface fragment volume >3" (0-152.4cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Very poorly drained to poorly drained
Permeability class	Not specified
Depth to restrictive layer	43–94 cm
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	9.4–40.89 cm
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)	3.3–6.5
Subsurface fragment volume <=3" (0-152.4cm)	0–7%
Subsurface fragment volume >3" (0-152.4cm)	0–3%

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., depth of permafrost or thickness of organic matter). For this ecological site to progress from the earliest stages of post-fire succession to the oldest stages of succession, data suggest that 20 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 general 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 thick organic cap and are poorly to very poorly drained, the typical fire scenario for this ecological site is considered to result in a low-severity burn.

While low-severity fires have a range of impacts to vegetation and soils for this site, permafrost generally remains in the soil profile. While a low-severity fire can consume the bulk of above ground vegetation, minimal proportions of the organic mat are removed. Organic matter continues to insulate these cold soils. Field data support that each plant community has permafrost and that the associated low-severity fire event had a negligible impact on the depth of permafrost. If permafrost remains at similar depths after a fire event, then soil drainage is unlikely to improve post-fire.

When minimal proportions of the organic mat are consumed, many species regenerate asexually from belowground root systems or 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; Bernhardt et al. 2011).

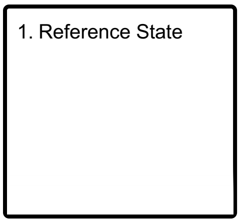
Because the dominant vegetation (sedges, ericaceous shrubs, and shrub birch) grows quickly and commonly regenerate after a fire event, minimal time is needed for postfire recovery back to the reference plant community (as compared to adjacent forested ecological sites). Based on the data reported above and the dominant vegetation associated with this site, full recovery of vegetation is thought to take between 20 to 40 years. In comparison, it typically takes 100 to 150 years for a white spruce stand in Interior Alaska to mature (Chapin et al. 2006).

Field Observations and Dynamic Soil Properties

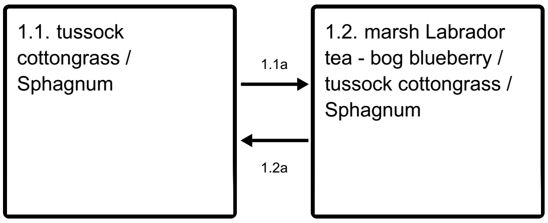
Field data indicate the low severity fires associated with this site have minimal impacts to soil organic matter, depth to permafrost, and drainage. During 2015 and 2016, six field observations were collected in areas that burned 10 to 29 years ago (AICC 2022) and resemble the earliest stage of fire-related succession for this ecological site (community 1.2). When comparing soils between the more recently burned plots and plots not recently burned, there were negligible differences in soil mean organic matter thickness (14 inches [burned] vs. 14 inches [not burned]) and mean depth of permafrost (21 inches vs. 24 inches). Since this site is associated with a perched water table and permafrost remained at similar depths, soil drainage is not likely improved in recently burned plots. From these data and for this site, it appears that low-severity fire events typically have minimal impacts to the soil organic matter thickness, depth of permafrost, and soil drainage. For this site, additional plots and environmental co-variate data will help clarify the variability in fire severity (e.g., timing of fire, soil organic matter moisture content, and pre-fire vegetation) and its effects to soil organic thickness, depth to permafrost, and drainage.

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.

1.2a - Time without fire.

State 1
Reference State

Figure 8. Turf hummocks on a hill summit in the area.

The reference plant community is open low mixed shrub-sedge tussock bog (Viereck et al. 1992) with the dominant plant being tussock cottongrass. There are two plant communities within the reference state related to fire.

Dominant plant species

- tussock cottongrass (*Eriophorum vaginatum*), grass
- sphagnum (*Sphagnum*), other herbaceous

Community 1.1
tussock cottongrass / Sphagnum

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

The reference plant community is characterized as open low mixed shrub-sedge tussock bog (Viereck et al. 1992) with the dominant plant being tussock cottongrass. Seedlings of black spruce occasionally occur but have limited cover. Common species include marsh Labrador tea, bog blueberry, dwarf birch, lingonberry, Bigelow's sedge, cloudberry, various Sphagnum, curled snow lichen (*Flavocetraria cucullata*), and various reindeer lichen. The strata that characterize this community are low shrubs (between 8 and 36 inches), medium graminoids (between 4 and 24 inches), and mosses.

Forest overstory. Cover from seedlings and saplings (tree regeneration) were not included in the overstory canopy cover values but are included in the cover percent values for individual tree species.

Forest understory. Sphagnum was typically identified to genus. Sphagnum angustifolium, S. fuscum , and S. magellanicum were species occasionally identified in plots.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- dwarf birch (*Betula nana*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- tussock cottongrass (*Eriophorum vaginatum*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- cloudberry (*Rubus chamaemorus*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous
- (*Flavocetraria cucullata*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous

Community 1.2
marsh Labrador tea - bog blueberry / tussock cottongrass / Sphagnum

Figure 10. A typical plant community associated with community 1.2.

Community 1.2 is in the early stage of fire-induced secondary succession for this ecological site. This community is characterized as open low mixed shrub-sedge tussock bog (Viereck et al. 1992). Seedlings of black spruce occasionally occur but have limited cover. Common species include marsh Labrador tea, lingonberry, dwarf birch, bog blueberry, tussock cottongrass, Bigelow's sedge, cloudberry, various Sphagnum, and juniper polytrichum moss. The strata that characterize this community are low shrubs (between 8 and 36 inches), dwarf shrubs (less than 8 inches), medium graminoids (between 4 and 24 inches), and mosses.

Dominant plant species

- sphagnum (*Sphagnum*), other herbaceous
- juniper polytrichum moss (*Polytrichum juniperinum*), other herbaceous
- cloudberry (*Rubus chamaemorus*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

tussock cottongrass / Sphagnum

marsh Labrador tea - bog blueberry / tussock cottongrass / Sphagnum

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 1.2a
Community 1.2 to 1.1

marsh Labrador tea - bog blueberry / tussock cottongrass / Sphagnum

tussock cottongrass / Sphagnum

Time without fire. Tussock cottongrass cover increases and shrub cover decreases.

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	2.7–3.7	0–5	3.8–6.1	–

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
tussock cottongrass	ERVA4	*Eriophorum vaginatum*	Native	0.1–0.6	40–75
Bigelow's sedge	CABI5	*Carex bigelowii*	Native	0.1–0.6	0–35
Forb/Herb					
cloudberry	RUCH	*Rubus chamaemorus*	Native	0–0.1	1–10
Shrub/Subshrub					
bog blueberry	VAUL	*Vaccinium uliginosum*	Native	0.2–0.9	1–30
marsh Labrador tea	LEPAD	*Ledum palustre ssp. decumbens*	Native	0.2–0.9	0–20
dwarf birch	BENA	*Betula nana*	Native	0.2–0.9	0–10
lingonberry	VAVI	*Vaccinium vitis-idaea*	Native	0–0.1	1–10
black crowberry	EMNI	*Empetrum nigrum*	Native	0–0.1	0–6
small cranberry	VAOX	*Vaccinium oxycoccos*	Native	0–0.1	0–5
bog rosemary	ANPO	*Andromeda polifolia*	Native	0–0.1	0–5
Nonvascular					
sphagnum	SPHAG2	*Sphagnum*	Native	0–0.1	15–45
	FLCU	*Flavocetraria cucullata*	Native	0–0.1	0–20
greygreen reindeer lichen	CLRA60	*Cladina rangiferina*	Native	0–0.1	0–15
cup lichen	CLADO3	*Cladonia*	Native	0–0.1	0–10
polytrichum moss	POLYT5	*Polytrichum*	Native	0–0.1	0–5
peppermint drop lichen	ICER	*Icmadophila ericetorum*	Native	0–0.1	0–3

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
08CS04301, 09NP00601, 09NP00602, 09NP00604, 11BB02101, 11BB02901, 1BB04103, 13NR00801, S2014AK290007, 2016AK290419

Community 1.2
2015AK290509, 2015AK290916, 2015AK290952, 2015AK290QS002, 2016AK290412, 2016AK290708

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Approval

Kirt Walstad, 2/13/2024

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	07/17/2024
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:

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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):**

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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:**
