Ecological site R231XY109AK
Boreal Scrub Gravelly Slopes Dry

Last updated: 2/13/2024
Accessed: 11/21/2024

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 – 7416120 – Western North American Boreal Dry Grassland (Landfire 2009)

Ecological site concept

This boreal site occurs on hillslopes and escarpments that are very steep and prone to erosion. Associated soils lack permafrost, do not have a seasonal water table, and are considered somewhat excessively to excessively drained. The typical soil profile has a thin layer of loess over residuum or gravelly colluvium. Soils with residuum commonly contact bedrock at moderate depths.

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 graminoids, forbs, and weedy mosses. With time and lack of another fire event, the post-fire vegetation goes through 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 scrub (Viereck et al. 1992).

Erosion is common on these steep slopes which likely prevent the establishment of stands of trees. The reference plant community ranged from 10 to 40 percent bare ground or surface rock fragments, while the post-fire community has 25 to 70 percent bare ground or surface rock fragments. This indicates that erosion is prevalent in the reference state and that fire increases erosion on these very steep slopes through removal of stabilizing vegetation. Fire and erosion likely combine to prevent the establishment and growth of trees in both plant communities associated with this site.

For the reference plant community, prairie sagewort and prickly rose are the dominant shrubs. Other common species include common juniper, kinnikinnick, Alaska wormwood, purple reedgrass, slender wheatgrass, Pumpelly's brome, Altai fescue, bluebunch wheatgrass, downy ryegrass, eastern pasqueflower, three toothed saxifrage, and second rockcress. The vegetative strata that characterize this community are medium shrubs (between 3 and 10 feet), low shrubs (between 8 and 36 inches), foliose and fruticose lichen, and mosses.

Associated sites

F231XY110AK	**Boreal Forest Gravelly Slopes Steep** Occurs adjacent to site 109 but on less erosive slopes that support stands of white spruce.
F231XY181AK	**Boreal Forest Gravelly Slopes Steep Cold** Occurs on the same escarpments but on colder slopes that are less erosive and support stands of white spruce.

Similar sites

F231XY110AK	**Boreal Forest Gravelly Slopes Steep** Site 110 occurs on less steep and erosive slopes that support stands of trees.
XA232X02Y211	**Boreal Loamy Escarpments** Occurs on escarpments in the Yukon Flats Lowlands area. Sites 109 and 211 have similar plant communities.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia frigida* (2) *Rosa acicularis*
Herbaceous	(1) *Calamagrostis purpurascens* (2) *Pulsatilla patens*

Physiographic features

This boreal site occurs on very steep slopes of hills and escarpments. While backslopes are the most common hillslope position, this site occasionally occurs on shoulders. The site occurs below 2500 feet elevation. These are very steep slopes commonly ranging between 55 and 85 percent or more slope and occur on all aspects. This site does not flood or pond and does not have a water table in the soil profile. This site generates moderate amounts of runoff to adjacent, downslope ecological sites.

Figure 1. A steep, erosive escarpment adjacent to the Yukon River.

Figure 2.

Table 2. Representative physiographic features

Hillslope profile	(1) Shoulder (2) Backslope
Landforms	(1) Hill (2) Escarpment
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	259–671 m
Slope	55–85%
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	104–671 m
Slope	15–100%
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

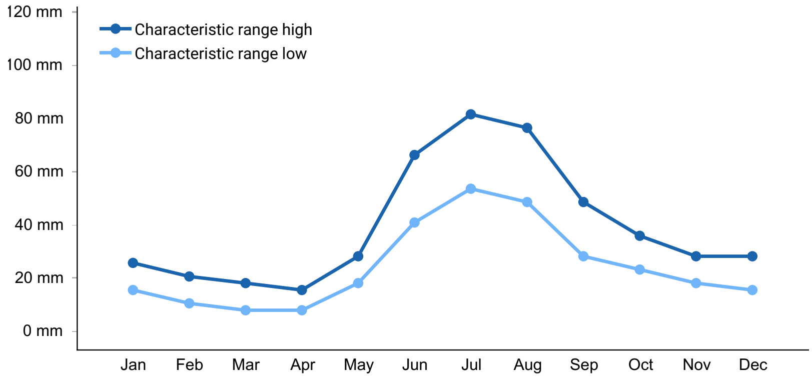


Figure 3. Monthly precipitation range

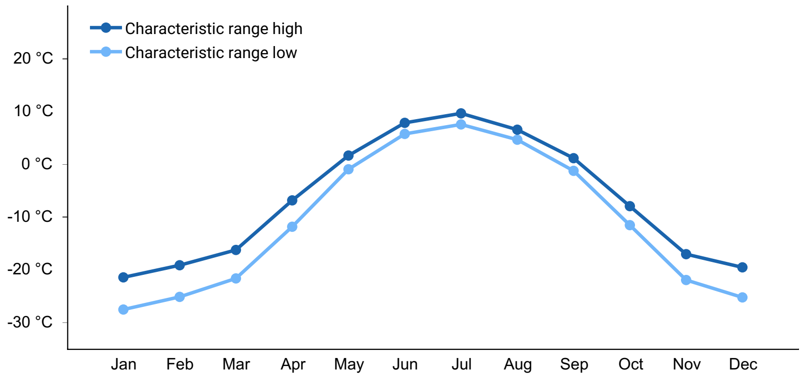


Figure 4. Monthly minimum temperature range

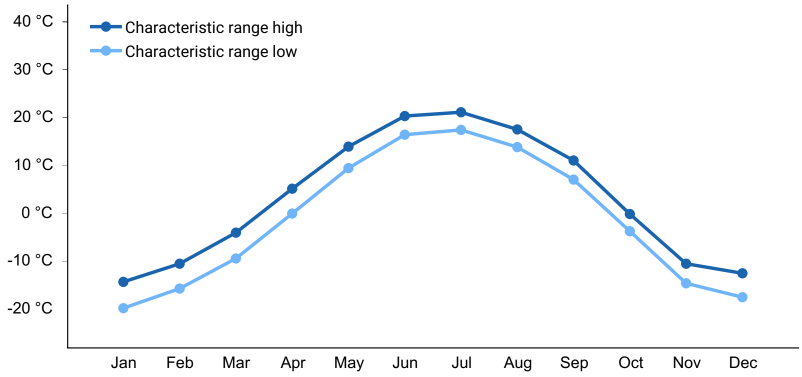


Figure 5. Monthly maximum temperature range

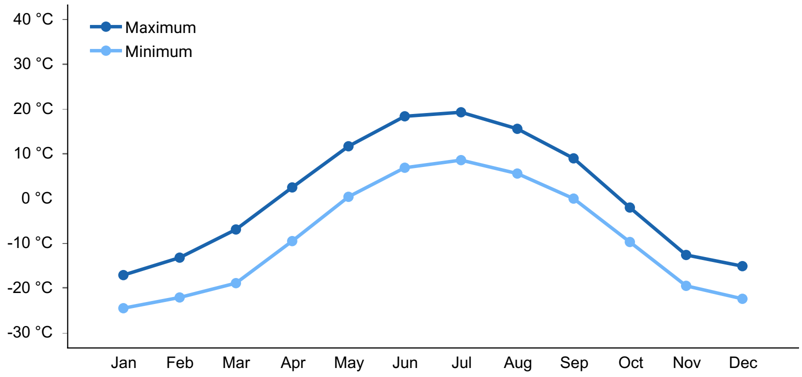


Figure 6. Monthly average minimum and maximum temperature

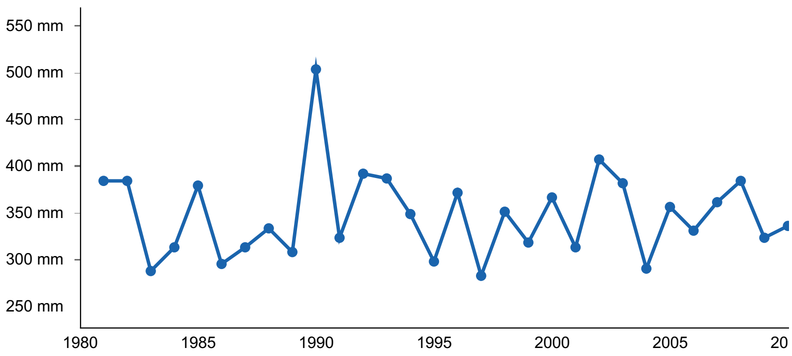


Figure 7. Annual precipitation pattern

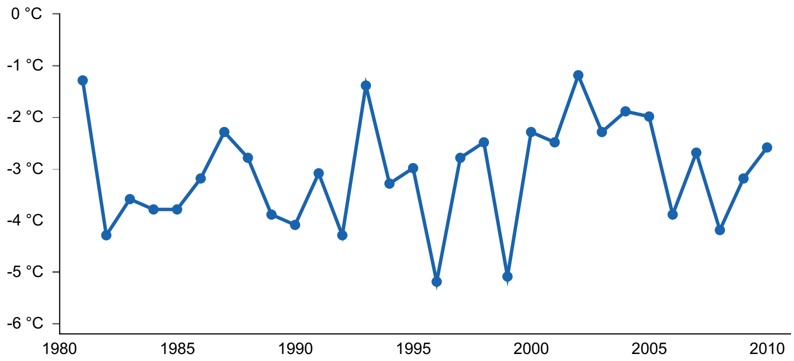


Figure 8. Annual average temperature pattern

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 and throughflow are the main source of water for this ecological site. Surface runoff and throughflow contribute some water to downslope ecological sites.

Wetland description

n/a

Soil features

Soils commonly formed in windblown silts over residuum or gravelly colluvium and do not have permafrost. Rock fragments are common on the soil surface typically ranging between 5 and 35 percent cover. These are mineral soils commonly capped with 0 to 2 inches of organic material. The mineral soil below the organic material is commonly a silt loam formed from wind-blown loess, which lacks rock fragments and has high water holding capacity. The thickness of the loess layer is highly variable ranging from 0 to 12 inches, with the thickness of loess highly related to erosion. Below the loess, the soil parent material is most commonly residuum or gravelly colluvium with rock fragments ranging between 35 and 90 percent of the soil profile by volume. Soils with colluvium are very deep. Soils with residuum typically contact bedrock at moderate depths (28 to 37 inches) with some instances of contact at shallower depths. The pH of the soil profile often ranges from neutral to moderately alkaline. The soils are dry and are considered somewhat excessively to excessively drained.

Figure 9. A soil profile of an escarpment adjacent to the Yukon River. This soil is very deep.

Table 5. Representative soil features

Parent material	(1) Loess (2) Colluvium (3) Residuum
Surface texture	(1) Silt loam (2) Very flaggy sandy loam
Family particle size	(1) Loamy-skeletal (2) Coarse-loamy
Drainage class	Somewhat excessively drained to excessively drained
Permeability class	Moderately rapid
Depth to restrictive layer	71 cm
Soil depth	71 cm
Surface fragment cover <=3"	5–35%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	3.3–11.68 cm
Calcium carbonate equivalent (25.4-101.6cm)	0–9%
Clay content (0-50.8cm)	5–10%
Electrical conductivity (25.4-101.6cm)	0–6 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0
Soil reaction (1:1 water) (25.4-101.6cm)	6.6–8.4
Subsurface fragment volume <=3" (0-152.4cm)	15–30%
Subsurface fragment volume >3" (0-152.4cm)	20–60%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified

Depth to restrictive layer	36 cm
Soil depth	36 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	3.3–16.51 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)	5.5–9.6
Subsurface fragment volume <=3" (0-152.4cm)	5–31%
Subsurface fragment volume >3" (0-152.4cm)	5–61%

Ecological dynamics

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). The earliest stage of post-fire succession is dominated by grasses and forbs and the oldest stage of succession dominated by shrubs. During field work, it was noted that erosion was more significant in the earliest stages of post-fire succession.

Fire

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 percent 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 percent 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 to 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. High-severity fire events also destroy a majority of the vascular and nonvascular biomass above ground.

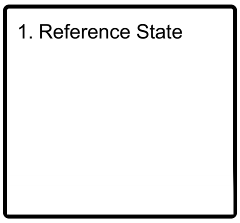
Field data suggest that the scrub dominant community phase burns and that fire events will cause a transition to the pioneering stage of fire succession. This stage (community 1.2) is a mix of species that either regenerate in place (e.g., subterranean root crowns for willow and rhizomes for graminoids) and/or from wind-dispersed seed or spores that colonize exposed mineral soil (e.g., quaking aspen [*Populus tremuloides*] and Ceratodon moss [*Ceratodon purpureus*]). The pioneering stage of fire succession is primarily composed of forbs, grasses, and weedy bryophytes. This stage of succession currently persists for an unknown amount of time post-fire. Shrubs like prairie sagewort and prickly rose continue to colonize and grow in stature on recently burned sites until they become dominant in the overstory, which marks the transition to the reference community phase (community 1.1).

Erosion

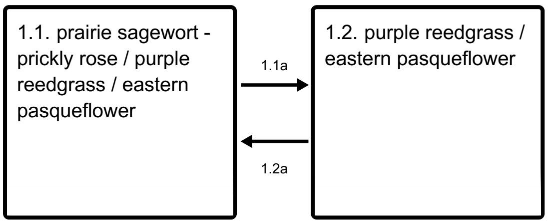
Erosion is common on the steep slopes associated with this site which likely prevent the establishment of stands of trees. Community 1.1 ranged from 10 to 40 percent bare ground or surface rock fragments, which indicates erosion occurs even when stable plant communities are well established. Community 1.2 ranged from 25 to 70 percent bare ground or surface rock fragments, which indicates fire increases erosion on these very steep slopes through removal of stabilizing vegetation. These erosive slopes are likely unstable enough to prevent the establishment and growth of trees, which are uncommon in either community phase.

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.

1.2a - Time without fire.

State 1
Reference State

Figure 10. Prairie sagewort on an escarpment adjacent to the Yukon River.

Figure 11. Fire results in these steep slopes becoming more erosive.

The reference plant community is open low scrub (Viereck et al. 1992) with the dominant shrub species including prairie sagewort and prickly rose. There are two community phases within the reference state related to fire.

Dominant plant species

- prairie sagewort (*Artemisia frigida*), shrub
- prickly rose (*Rosa acicularis*), shrub
- purple reedgrass (*Calamagrostis purpurascens*), grass
- eastern pasqueflower (*Pulsatilla patens*), other herbaceous

Community 1.1
prairie sagewort - prickly rose / purple reedgrass / eastern pasqueflower

Figure 12. Typical plant community associated with community phase 1.1.

The reference plant community phase is characterized as an open low scrub (25 to 60 percent cover) with the most common shrub species being prairie sagewort and prickly rose. Other common understory species for this community include common juniper, kinnikinnick, Alaska wormwood, purple reedgrass, slender wheatgrass, Pumpelly’s brome, Altai fescue, bluebunch wheatgrass, downy ryegrass, eastern pasqueflower, three toothed saxifrage, and second rockcress. Areas with exposed bare ground and surface rock fragments are common.

Dominant plant species

- prairie sagewort (*Artemisia frigida*), shrub
- prickly rose (*Rosa acicularis*), shrub
- common juniper (*Juniperus communis*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- Alaska wormwood (*Artemisia alaskana*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub
- purple reedgrass (*Calamagrostis purpurascens*), grass

- slender wheatgrass (*Elymus trachycaulus*), grass
- Pumpelly's brome (*Bromus inermis ssp. pumpellianus*), grass
- Altai fescue (*Festuca altaica*), grass
- bluebunch wheatgrass (*Pseudoroegneria spicata*), grass
- downy ryegrass (*Leymus innovatus*), grass
- eastern pasqueflower (*Pulsatilla patens*), other herbaceous
- three toothed saxifrage (*Saxifraga tricuspidata*), other herbaceous
- second rockcress (*Arabis holboellii var. retrofracta*), other herbaceous
- tufted fleabane (*Erigeron caespitosus*), other herbaceous
- pygmyflower rockjasmine (*Androsace septentrionalis*), other herbaceous
- Pennsylvania cinquefoil (*Potentilla pensylvanica*), other herbaceous
- Rocky Mountain goldenrod (*Solidago multiradiata*), other herbaceous
- Jakutsk snowparsley (*Cnidium cnidiifolium*), other herbaceous
- tortula moss (*Tortula ruralis*), other herbaceous
- cup lichen (*Cladonia*), other herbaceous

Community 1.2
purple reedgrass / eastern pasqueflower

Figure 13. Typical plant community associated with community phase 1.2.

Figure 14. A recently burned escarpment adjacent to the Yukon River. Erosion increases after fire.

Community 1.2 is in the pioneering stage of fire-induced secondary succession for this ecological site. It is characterized as dry graminoid herbaceous (Viereck et al. 1992). Common grass and herbaceous species for this community include purple reedgrass, slender wheatgrass, Pumpelly's brome, bluejoint, eastern pasqueflower, northern bedstraw, common yarrow, Rocky Mountain goldenrod, second rockcress, and fireweed. Prairie sagewort and prickly rose are common indicating an ability to regenerate from rootstocks after the fire event. Areas with exposed bare ground and surface rock fragments are common.

Dominant plant species

- prairie sagewort (*Artemisia frigida*), shrub
- prickly rose (*Rosa acicularis*), shrub
- russet buffaloberry (*Shepherdia canadensis*), shrub
- Saskatoon serviceberry (*Amelanchier alnifolia*), shrub
- kinnikinnick (*Arctostaphylos uva-ursi*), shrub
- common juniper (*Juniperus communis*), shrub
- purple reedgrass (*Calamagrostis purpurascens*), grass
- slender wheatgrass (*Elymus trachycaulus*), grass
- Pumpelly's brome (*Bromus inermis ssp. pumpellianus*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- Altai fescue (*Festuca altaica*), grass
- eastern pasqueflower (*Pulsatilla patens*), other herbaceous
- northern bedstraw (*Galium boreale*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous
- Rocky Mountain goldenrod (*Solidago multiradiata*), other herbaceous
- second rockcress (*Arabis holboellii var. retrofracta*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- three toothed saxifrage (*Saxifraga tricuspidata*), other herbaceous
- Gorman's beardtongue (*Penstemon gormanii*), other herbaceous
- Pennsylvania cinquefoil (*Potentilla pensylvanica*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

prairie sagewort - prickly rose / purple reedgrass / eastern pasqueflower

purple reedgrass / eastern pasqueflower

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. These steep slopes can experience significant amounts of erosion after a fire event. Vegetation usually resprouts from surviving individuals or is recruited from nearby areas via seed or seedbank.

Pathway 1.2a
Community 1.2 to 1.1

purple reedgrass / eastern pasqueflower

prairie sagewort - prickly rose / purple reedgrass / eastern pasqueflower

Time without fire results in increased sagebrush and prickly rose shrub cover and decreased graminoid and forb cover.

Additional community tables

Table 7. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
Pumpelly's brome	BRINP5	*Bromus inermis ssp. pumpellianus var. pumpellianus*	Native	0.2–0.6	0–4
bluebunch wheatgrass	PSSPS	*Pseudoroegneria spicata ssp. spicata*	Native	0.2–0.6	0–4
Forb/Herb					
tufted fleabane	ERCA2	*Erigeron caespitosus*	Native	0–0.2	0–6
eastern pasqueflower	PUPA5	*Pulsatilla patens*	Native	0–0.2	0–5
Pennsylvania cinquefoil	POPE8	*Potentilla pensylvanica*	Native	0.2–0.6	0–4
Rocky Mountain goldenrod	SOMU	*Solidago multiradiata*	Native	0.2–0.6	0–2
field sagewort	ARCA12	*Artemisia campestris*	Native	0.2–0.6	0–1
Jakutsk snowparsley	CNCN	*Cnidium cnidiifolium*	Native	0.2–0.6	0–0.1
three toothed saxifrage	SATR5	*Saxifraga tricuspidata*	Native	0–0.1	0–0.1
Shrub/Subshrub					
prairie sagewort	ARFR4	*Artemisia frigida*	Native	0.2–0.9	60–70
prickly rose	ROAC	*Rosa acicularis*	Native	0.2–0.9	0–2
Alaska wormwood	ARAL5	*Artemisia alaskana*	Native	0.2–0.9	–
Biological Crusts					
cup lichen	CLPO60	*Cladonia pocillum*	Native	0–0.1	0–5
bruised lichen	TONIN	*Toninia*	Native	0–0.1	0–2
Nonvascular					
tortula moss	TORU70	*Tortula ruralis*	Native	0–0.1	0–35
schistidium moss	SCHIS4	*Schistidium*	Native	0–0.1	0–15
cup lichen	CLADO3	*Cladonia*	Native	0–0.1	0–3
ring lichen	EVME60	*Evernia mesomorpha*	Native	0–0.1	0–0.1

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
08CS01901, 10TC00401, 10TC00402

Community 1.2
09TC01701, 10TC00202, 10TC00203, 10TC00204, 09NP00303, 09NP01302

Additional Observations:
https://www.inaturalist.org/observations?nelat=64.53394825514847&nelng=-147.00595309300272&place_id=any&subview=map&swlat=64.53121713693928&swlng=-147.0111029343113&user_id=blainespellman&verifiable=any

https://www.inaturalist.org/observations?nelat=64.70969730975364&nelng=-148.29559889418488&place_id=any&subview=map&swlat=64.70250956775483&swlng=-148.3072718678177&user_id=blainespellman&verifiable=any

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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	11/21/2024
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:**

17. **Perennial plant reproductive capability:**