USDA Natural Resources Conservation Service

Ecological site R234XY705AK
Alpine dwarf scrub gravelly slopes

Last updated: 6/09/2025
Accessed: 12/05/2025

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): 234X–Interior Brooks Range Mountains

Geography
The Interior Brooks Range mountains area consists of predominantly steep, jagged mountains and narrow valleys that drain the southern side of the Brooks Range. This area is bordered by the Northern Brooks Range Mountains (Major Land Resource Area (MLRA) 244) to the north, the Western Brooks Range Mountains Foothills and Valleys (MLRA 243) to the west, and the Upper Kobuk and Koyukuk Hills and Valleys (MLRA 233) and the Interior Alaska Highlands (MLRA 231) to the south. The Brooks Range represents a drainage divide that is also the dividing line between MLRA 234 and MLRA 244. Rivers draining to the north wind their way along the North Slope until they reach the Arctic Ocean, while rivers that drain to the south reach the northern Pacific Ocean via the Bering Sea. MLRA 234 covers an area of 22,479 miles and is sparsely populated (USDA, 2022).

Geology
The Brooks Range is the northernmost extension of the Rocky Mountains and the highest range within the Arctic Circle, with high peaks in the eastern part of the range reaching elevations of nearly 9,000 feet. This area falls within the zone of discontinuous permafrost, with the continuous permafrost zone primarily occurring north of the Brooks Range. Wide, U-shaped valleys are evidence of extensive glaciation in the Early and Mid-Pleistocene, with most glaciers retreating to their current, high-elevation positions by the Late Pleistocene. The characteristically sharp upper peaks give way to lower mountain slopes comprised of alluvial and colluvial fans before reaching the gently sloping flood plains and terraces of the valley bottoms. While Paleozoic and Jurassic igneous and volcanic rocks can be found in the eastern part of the range, most of the lower slopes of this area are comprised of modified glacial material, alluvial, and colluvial deposits. Many rivers and

streams, such as the Koyukuk, have their headwaters in the Brooks Range and drain to the Bering Sea and North Pacific Ocean via the Yukon River.

Soils
The dominant soils orders in this MLRA are Gelisols, Entisols, and Inceptisols. Soils in the area have a gelic (subgelic) or cryic temperature regime, a udic or aquic moisture regime, and mixed minerology. Gelisols are common on soils that are shallow or moderately deep to permafrost and are somewhat poorly to very poorly drained. Gelisols are more common on cold slopes and stream terraces. In some cases, higher-intensity wildfires lead to loss of insulation when the surface organic layer is burned. This can lead to permafrost loss or active layer expansion and ultimately alter hydrology and taxonomic classification. Entisols and Inceptisols lacking in permafrost range from excessively-well to poorly drained. Entisols and Inceptisols are more common on rocky terrain, warm boreal slopes, and flood plains. Miscellaneous areas such as glaciers, riverwash, rock outcrop, and rubble land make up 63 percent of the MLRA.

Vegetation
The continental subarctic climate of the Brooks Range in conjunction with shallow, rocky soils leads to a sparsely forested landscape in this MLRA. Spruce-hardwood forests and woodlands tend to be relegated to lower elevations where deeper soils form on foot slopes and terraces. This is contrasted by the ericaceous dwarf shrub communities that are abundant on shallow, rocky slopes and ridges. Exposed sites are predominantly covered in lichen and sporadic forbs. Black spruce (*Picea mariana*) woodlands and tussock-forming sedge communities are on high stream terraces and foot slopes where permafrost occurs, as are wet sedge meadows. Floodplains tend to be dominated by low to tall willow scrub communities.

Land use
Except for areas along the Dalton Highway, access to most of this MLRA is extremely limited, lending itself to intact natural vegetation communities. For this reason, land use primarily takes the form of subsistence hunting, gathering, and fishing by local communities. In additions to subsistence activity, the Brooks Range is also a popular recreation destination, with many users utilizing air taxi and guiding services to access remote parts of the area. As is the case with much of interior Alaska, major resource concerns involve the persistence of permafrost, the degradation of which can lead to various changes in hydrology and nutrient cycling.

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 where soil is too wet or dry 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 taller than one meter in height (commonly Betula glandulosa and Salix pulchra). In the alpine, trees no longer occur, and all shrubs are dwarf or lay prostrate on the ground. In this area, the boreal life zone occurs below 2,500 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 (greater than ten percent 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 (*Picea glauca*) 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

Alaska Vegetation Classification
Dryas dwarf scrub (II.D.1. – level IV)
(Viereck et al. 1992)

LANDFIRE Biophysical Settings
7416310 – Western North American Boreal Alpine Dwarf-Shrub Summit (LANDFIRE biophysical settings, 2009)

Ecological site concept

Key soil and Site Characteristics
• Occurs in the alpine life zone typically at elevations ranging 2,620 to 3,350 feet
• Cold slopes (northwest to east facing)
• Moderately steep slopes (25 to 45 percent)
• Gravelly, well-drained soils with permafrost

Associated sites

R234XY702AK	**Subalpine scrub gravelly slopes** Occurs downslope on warm subalpine slopes.

Similar sites

R234XY706AK	**Alpine dwarf scrub gravelly frozen slopes** Both ecological sites support dwarf shrub communities. R234XY706AK has wet and frozen soils with different kinds and amounts of vegetation.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Dryas octopetala ssp. octopetala* (2) *Salix phlebophylla*
Herbaceous	(1) *Flavocetraria cucullata* (2) *Alectoria*

Physiographic features

This ecological site occurs on moderately steep backslopes in the southern Brooks Range Mountains. It typically occurs at elevations ranging from 2,620 to 3,350 feet on cold north-facing slopes. Slopes range from 25 to 45 percent. Ponding and flooding do not occur, and there is no water table present in the soil profile.

Table 2. Representative physiographic features

Geomorphic position, mountains	(1) Center third of mountainflank
Landforms	(1) Mountains > Mountain slope
Runoff class	Low
Flooding frequency	None
Ponding frequency	None
Elevation	799–1,021 m
Slope	25–45%
Aspect	NW, N, NE, E

Table 3. Representative physiographic features (actual ranges)

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

Elevation	396–1,490 m
Slope	8–70%

Climatic features

Characterized by a continental subarctic climate, cool, short summers interspace long, cool winters in this Major Land Resource Area (MLRA). Average annual temperatures range from 8 to 16 degrees, with freezing temperatures possible throughout the year. Precipitation ranges from 10 inches at low elevations up to 30 inches in the high elevations, with average snowfall ranging from 60 to 100 inches, annually. On average, there are only four frost free days per year at lower elevations, with frost possible throughout the year at higher elevations. The average high temperature in July (the warmest month, on average) is 65 degrees F, while the average high temperature in January is -1 degrees F. Extreme lows are common throughout interior Alaska. The lowest temperature recorded in Bettles Field, the location of one of the weather stations below, reached -69 degrees F.

Table 4. Representative climatic features

Frost-free period (characteristic range)	3-4 days
Freeze-free period (characteristic range)	48-59 days
Precipitation total (characteristic range)	254-356 mm
Frost-free period (actual range)	3-4 days
Freeze-free period (actual range)	46-61 days
Precipitation total (actual range)	229-356 mm
Frost-free period (average)	4 days
Freeze-free period (average)	54 days
Precipitation total (average)	305 mm

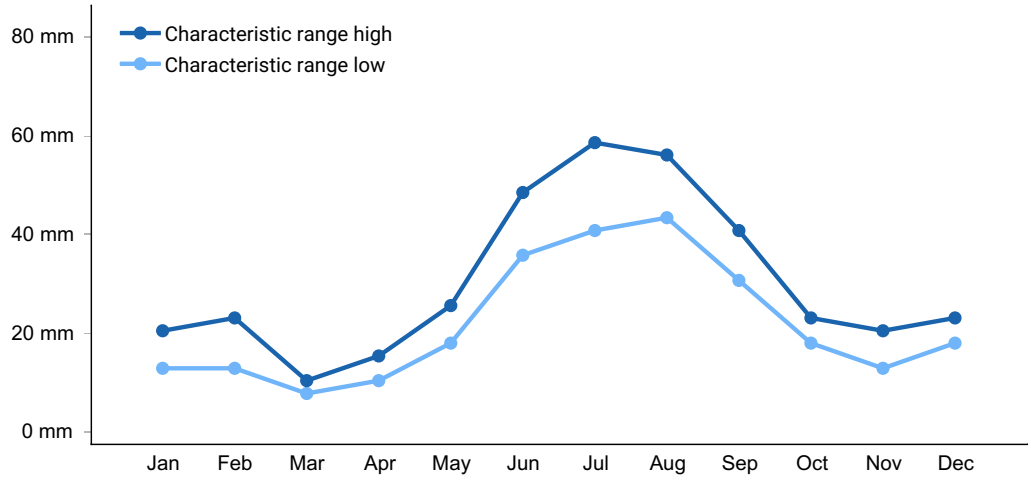


Figure 1. Monthly precipitation range

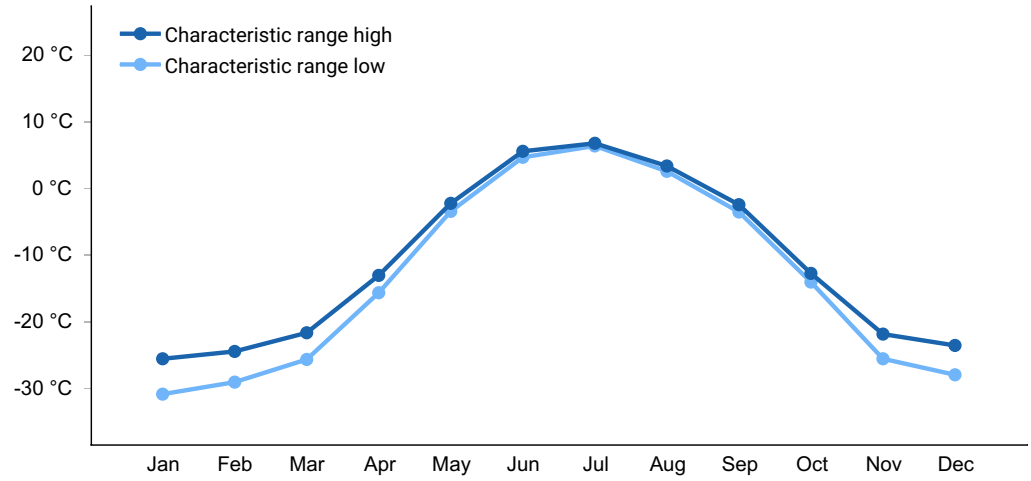


Figure 2. Monthly minimum temperature range

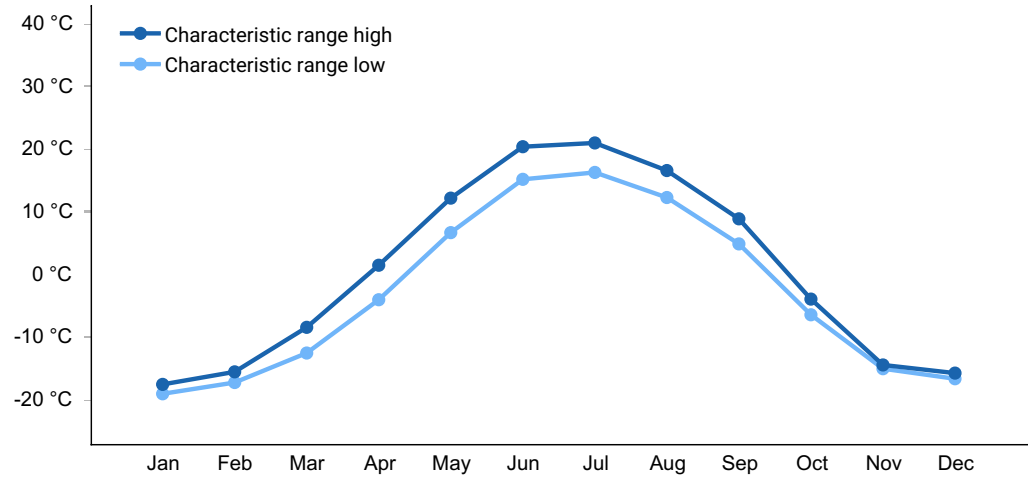


Figure 3. Monthly maximum temperature range

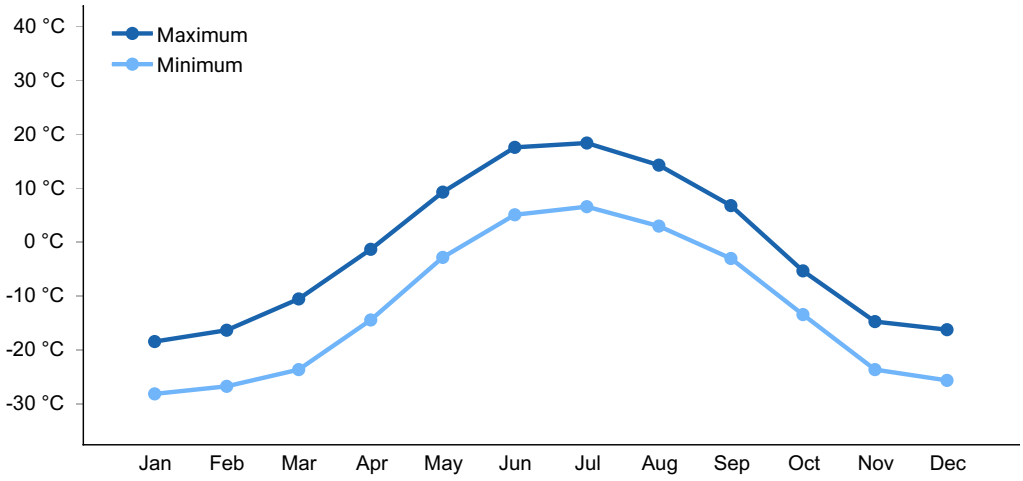


Figure 4. Monthly average minimum and maximum temperature

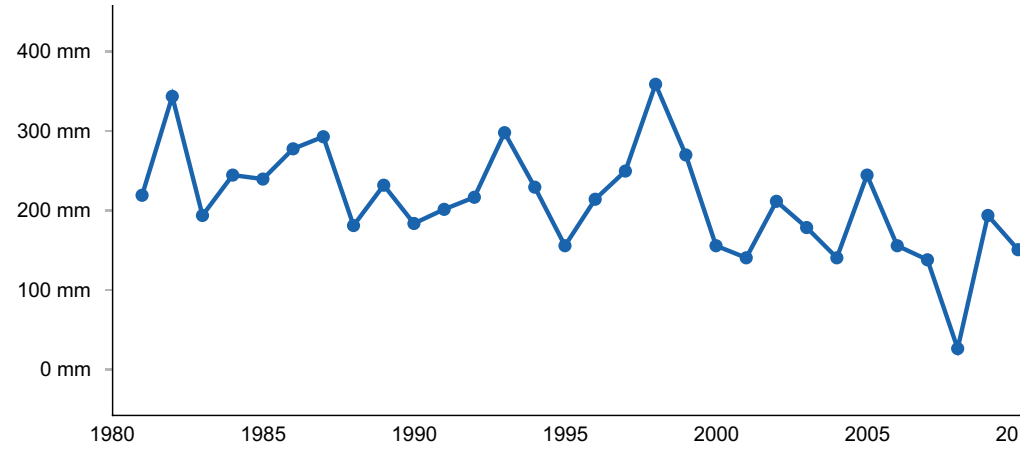


Figure 5. Annual precipitation pattern

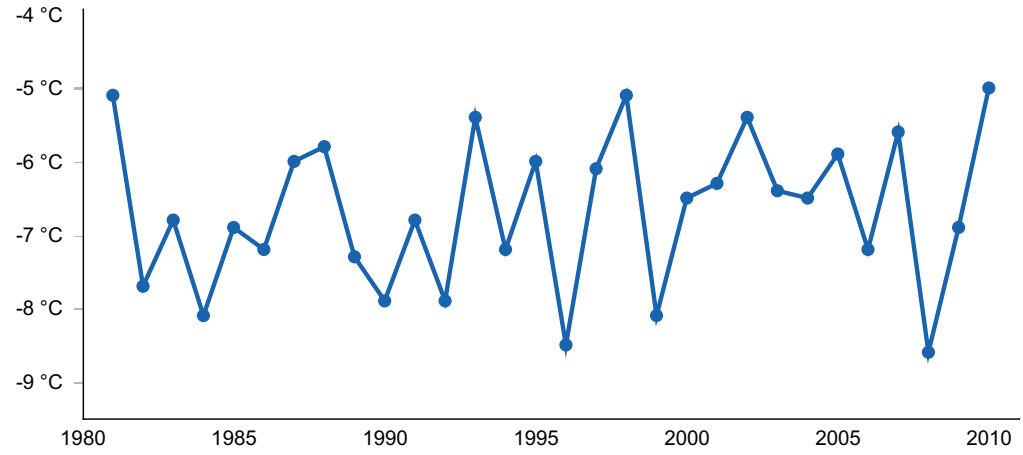


Figure 6. Annual average temperature pattern

Climate stations used

- (1) WISEMAN [USC00509869], Bettles Field, AK
- (2) CHANDALAR SHELF DOT [USC00501497], Southerly North Slope Bo, AK
- (3) CHANDALAR LAKE [USC00501492], Yukon Flats Nat Wildlife, AK

Influencing water features

Due to landscape position, no streams or wetlands are associated with this ecological site. Precipitation and throughflow are the main sources of water.

Wetland description

This ecological site is not a wetland.

Soil features

Soils formed in windblown silts over gravelly colluvium and glacial till and have permafrost. Rock fragment cover on the soil surface is typically low, ranging from 1 to 15 percent. These mineral soils are capped with up to three inches of organic material. The mineral soil below the organic material is a silt loam formed in wind-blown loess. Below the silty parent material is gravelly colluvium and glacial till with rock fragments typically ranging between 21 to 24 percent of the soil profile by volume. Although strongly contrasting textural stratification can occasionally form a restrictive layer between two and five inches, soils are very deep. The pH of the soil profile ranges from extremely acidic to slightly acidic. The soils lack any influence from a seasonal water table and are considered well-drained.

Table 5. Representative soil features

Parent material	(1) Loess (2) Colluvium (3) Till
Surface texture	(1) Silt loam
Family particle size	(1) Loamy-skeletal
Drainage class	Well drained
Permeability class	Very rapid
Depth to restrictive layer	5–13 cm
Soil depth	152 cm
Surface fragment cover <=3"	1–15%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	0 cm
Calcium carbonate equivalent (0-101.6cm)	0%
Electrical conductivity (0-101.6cm)	0 mmhos/cm

Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (25.4-101.6cm)	4.2–6.2
Subsurface fragment volume <=3" (0-152.4cm)	21–24%
Subsurface fragment volume >3" (0-152.4cm)	5–13%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	3–15 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 (0-101.6cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (25.4-101.6cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	13–46%
Subsurface fragment volume >3" (0-152.4cm)	5–57%

Ecological dynamics

Climate
Located in the alpine life zone, this ecological site is exposed to a variety of harsh environmental conditions. In this area, snowfall first appears and persists the longest in the alpine. As a result, snowpack tends to be deeper and persist for longer durations of time compared to lower-elevation ecological sites and alpine vegetation has a comparatively shorter growing season. When the described slopes are snow-free, cold soil temperatures

and high winds also inhibit plant growth and vigor. This harsh climate maintains the dwarf vegetation within this ecological site and prevents the establishment and/or growth of dominant boreal species like white spruce (*Picea glauca*) and black spruce (*Picea mariana*).

Snow beds
Community 1.2 occurs in sheltered positions that have atypically deep snowpack. These sheltered positions are small, occur adjacent to community 1.1, and commonly occur on the leeward side of rock outcrops and/or sharp ridges or on steep northing facing slopes. These sheltered positions were often observed to have snowpack that persisted for longer durations of time compared to the more wide-spread community 1.1. This persistent snowpack led to community 1.2 having moister soils with greater amounts of ericaceous scrubs like white arctic mountain heather (*Cassiope tetragona*).

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 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.

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 well drained, the typical fire scenario for this ecological site is considered to result in a high severity burn.

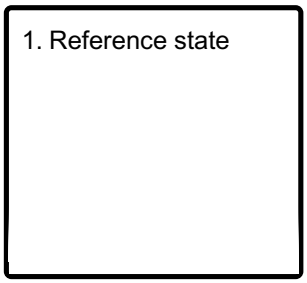
Large portions of the organic mat are consumed during a high-severity fire event, commonly exposing pockets of mineral soil. The loss of this organic mat, which insulates the mineral soil, and the decrease in site albedo tends to cause overall soil temperatures to increase (Hinzman et al. 2006). These 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.

Literature and field data from similar ecological sites suggest that the scrub dominant community 1.1 burns and that fire events will cause a transition to the pioneering stage of fire succession. This stage (community 1.3) 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., fireweed [*Chamerion angustifolium*] and Ceratodon moss [*Ceratodon purpureus*]). The pioneering stage of fire succession is primarily composed of dwarf scrubs, grasses, forbs, grasses, and weedy bryophytes. This stage of succession currently persists for an unknown amount of time but is thought to last 10 to 30 years post-fire. Eightpetal mountain avens (*Dryas*

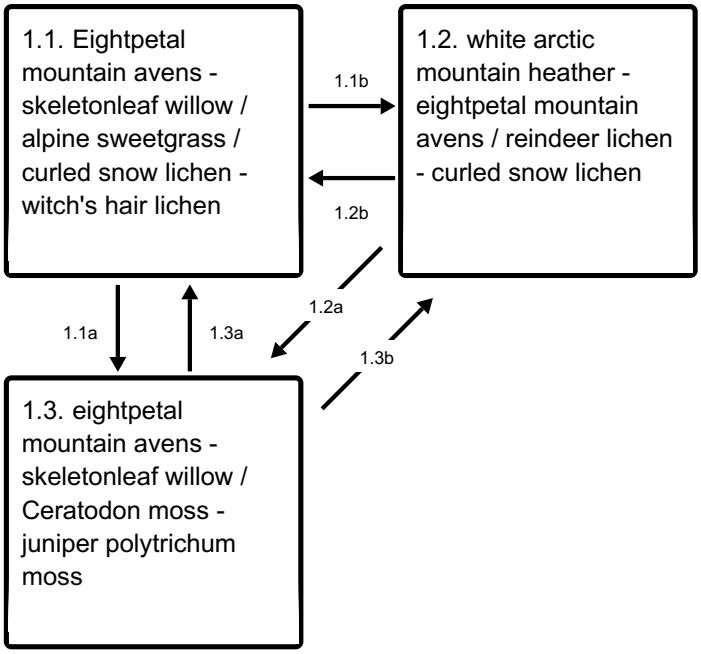
octopetala) and other dwarf shrubs and lichen continue to colonize and grow until they become dominant in the plant community, which marks the transition to the reference plant community (community 1.1).

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1b - Wet soils, composition shift

1.1a - Fire

1.2b - Dry soils, composition shift

1.2a - Fire

1.3a - Time without fire

1.3b - Time without fire

State 1
Reference state

The reference plant community (community 1.1) is dryas dwarf scrub (Viereck et al. 1992). There are three plant communities in the reference state related to either snowpack or fire. Community 1.2 occurs in sheltered positions that have atypically deep snowpack. These sheltered positions are small in size, occur in close proximity to community 1.1, and

commonly occur on the leeward side of rock outcrops and/or sharp ridges or on steep northing facing slopes. These sheltered positions were often observed to have snowpack that persisted for longer durations of time compared to the more wide-spread community 1.1. This persistent snowpack led to community 1.2 having slightly moister soils. Both of these communities have the potential to burn, resulting in community 1.3. Cryoturbation is associated with this state and results in the formation of non-sorted circles, sorted circles, and sorted stripes. Cryoturbation is a collective term used to describe all soil movements due to frost action, characterized by folded, broken and dislocated beds and lenses of unconsolidated deposits (Schoeneberger and Wysocki 2017). Since non-sorted circles are uncommon for this ecological site and data did not support these features having a vegetation mosaic, no alternative state was developed for this ecological site. No alternative state or plant communities were developed for sorted circles and stripes as they are primarily barren rock.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- skeletonleaf willow (*Salix phlebophylla*), shrub
- alpine sweetgrass (*Anthoxanthum monticola ssp. alpinum*), grass
- (*Flavocetraria cucullata*), other herbaceous
- witch's hair lichen (*Alectoria ochroleuca*), other herbaceous

Community 1.1
Eightpetal mountain avens - skeletonleaf willow / alpine sweetgrass / curled snow lichen - witch's hair lichen

The reference plant community is characterized as dryas dwarf scrub (Viereck et al. 1992). Stunted white spruce (*Picea glauca*) occasionally occur but have limited cover. Common species include eight-petal mountain avens (*Dryas octopetala*), Alaskan mountain avens (*Dryas octopetala* ssp alaskensis), skeletonleaf willow (*Salix phlebophylla*), alpine bearberry (*Arctostaphylos alpina*), alpine azalea (*Loiseleuria procumbens*), lingonberry (*Vaccinium vitis-idaea*), alpine sweetgrass (*Anthoxanthum monticola* ssp. alpinum), Bigelow's sedge (*Carex bigelowii*), smallawned sedge (*Carex microchaeta*), curled snow lichen (*Flavocetraria cucullata*), witch's hair lichen (Alectoria spp.), and Bryocaulon lichen. The vegetative strata that characterize this community are dwarf shrubs (less than eight inches) and foliose and fruticose lichen. The soil surface is primarily covered with herbaceous litter, surface rock fragments, and lichen.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- Alaskan mountain-avens (*Dryas octopetala ssp. alaskensis*), shrub
- skeletonleaf willow (*Salix phlebophylla*), shrub
- alpine bearberry (*Arctostaphylos alpina*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub

- alpine sweetgrass (*Anthoxanthum monticola ssp. alpinum*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- smallawned sedge (*Carex microchaeta*), grass
- (*Flavocetraria cucullata*), other herbaceous
- witch's hair lichen (*Alectoria ochroleuca*), other herbaceous
- bryocaulon lichen (*Bryocaulon divergens*), other herbaceous

Community 1.2
white arctic mountain heather - eightpetal mountain avens / reindeer lichen - curled snow lichen

Community 1.2 is characterized as ericaceous dwarf scrub (Viereck et al. 1992). Common species include white arctic mountain heather (*Cassiope tetragona*), eightpetal mountain avens (*Dryas octopetala*), alpine azalea (*Loiseleuria procumbens*), crowberry (*Empetrum nigrum*), marsh Labrador tea (*Ledum palustre* ssp. decumbens), bog blueberry (*Vaccinium uliginosum*), lingonberry (*Vaccinium vitis-idaea*), various reindeer lichen (Cladina spp.), and curled snow lichen (*Flavocetraria cucullata*). The vegetative strata that characterize this community are dwarf shrubs (less than eight inches) and foliose and fruticose lichen. The soil surface is primarily covered with herbaceous litter, surface rock fragments, and lichens.

Dominant plant species

- white arctic mountain heather (*Cassiope tetragona*), shrub
- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- greygreen reindeer lichen (*Cladina rangiferina*), other herbaceous
- (*Flavocetraria cucullata*), other herbaceous
- star reindeer lichen (*Cladina stellaris*), other herbaceous

Community 1.3
eightpetal mountain avens - skeletonleaf willow / Ceratodon moss - juniper polytrichum moss

Community 1.3 is in the pioneering stage of fire-induced secondary succession for this ecological site. Community 1.3. is characterized as dryas dwarf scrub (Viereck et al. 1992). Commonly observed species include eightpetal mountain avens, arctic willow, skeletonleaf willow, Altai fescue, bluegrass, fireweed, Ceratodon moss, and juniper Polytrichum moss. The vegetative strata that characterize this community are dwarf shrubs (less than 8 inches) and moss. The soil surface is primarily covered with a mixture of herbaceous litter, weedy bryophyte species, and surface rock fragments.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- skeletonleaf willow (*Salix phlebophylla*), shrub
- arctic willow (*Salix arctica*), shrub
- Altai fescue (*Festuca altaica*), grass
- bluegrass (*Poa*), grass
- ceratodon moss (*Ceratodon purpureus*), other herbaceous
- juniper polytrichum moss (*Polytrichum juniperinum*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous

Pathway 1.1b
Community 1.1 to 1.2

Multiple growing seasons with atypically deep snowpack. This snowpack persists for longer duration of time and result in slightly moister soils during the growing season. Vegetation shifts from dryas dwarf scrub to ericaceous dwarf scrub.

Pathway 1.1a
Community 1.1 to 1.3

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated dry soils, this ecological 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

Protected positions no longer receive atypically deep snowpack. This results in slightly drier soils during the growing season. Vegetation shifts from ericaceous dwarf scrub to Dryas dwarf scrub.

Pathway 1.2a
Community 1.2 to 1.3

A fire sweeps through and incinerates much of the above ground vegetation. Because of the associated dry soils, this ecological 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 1.3a

Community 1.3 to 1.1

Time without fire results in decreases to graminoid and weedy moss cover and increases to shrub and lichen cover.

Pathway 1.3b
Community 1.3 to 1.2

Time without fire results in decreases to graminoid and weedy moss cover and increases to shrub and lichen cover.

Additional community tables

Inventory data references

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

Plant community composition is largely based on ecological sites from Major Land Resource Area (MLRA) 231X: Interior Alaska Highlands.

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Contributors

Tyler Annetts
Phil Barber

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	12/05/2025
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

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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:

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:**