USDA Natural Resources
Conservation Service

Ecological site R238XY402AK
Arctic Scrub Hills and Mountains Complex

Last updated: 6/05/2025
Accessed: 12/17/2025

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): 238X–Yukon-Kuskokwim Coastal Plain

Geography

The Yukon-Kuskokwim Coastal Plain area (MLRA 238x) consists of the broad, nearly level delta along the lower reaches of the Yukon and Kuskokwim rivers, where the rivers empty into the Bering Sea. The Yukon River runs along the northern edge of the area while the Kuskokwim River runs along the southern edge. This MLRA makes up 31,565 square miles. MLRA 238x is bordered by MLRA 240x (Nulato Hills-Southern Seward Peninsula Highlands) to the North, MLRA 237x (Ahklun Mountains) to the South, and MLRAs 230x (Yukon-Kuskokwim Highlands) and 229x (Interior Alaska Lowlands) to the East. Although the MLRA is mostly undeveloped wild land and is sparsely populated, there are 42 villages scattered along the coast or the banks of the Yukon and Kuskokwim Rivers. The principal communities are Aniak, Bethel, Emmonak, Hooper Bay, and Saint Mary’s.
Physiography

Although primarily comprised of deltaic lowlands, in a few areas, isolated low hills rise above the surrounding coastal plain. Numerous low-gradient streams meander through this MLRA, many of which are tributaries or former channels of the Yukon and Kuskokwim Rivers. Depressions and shallow basins on the coastal plain are dotted with interconnecting stream channels, wetlands, and countless small and medium-size lakes. On the floodplains between channels and wetlands, low escarpments, meander scars, oxbow lakes, sloughs, and islands can be found. The coastline is broken by several large inlets and bays, including Baird Inlet, which forms a large inland sea behind Nelson Island.

Elevations generally range from sea level to 300 feet but reach heights of 2,342 feet at the

summit of Towak Mountain. A vast majority of the surface water from interior and western Alaska drains into the Bering Sea through MLRA 238x. Major rivers include the Yukon, Kuskokwim, Tovers, Black, Azun, Kashunuk, and Izaviknek Rivers. In addition to the various rivers and tributaries, lakes make up about 40 percent of this MLRA. This area is in the zone of discontinuous permafrost, where permafrost is thin to moderately thick and primarily occurs in fine textured soils. Permafrost does not generally occur on flood plains or in areas near bodies of water.

Geology

MLRA 238x was unglaciated during the Pleistocene, except for along the southern edge, where glaciers from the Ahklun mountains may have extended into portions of the lowlands. A majority of the sediments across the area are fine textured Holocene and Pleistocene deltaic deposits from the Yukon and Kuskokwim Rivers, and loamy and sandy Holocene fluvial deposits on flood plains and stream terraces. In the western part of the MLRA, low basalt hills, cinder cones, and volcanic craters from the Cretaceous and Tertiary can be found.

Climate

The climate of MLRA 238x is primarily maritime throughout the summer, and when Bering Sea ice pack forms in the winter, it becomes more characteristic of a continental climate. Summers are short, cloudy, and rainy while winters are long, cold, and foggy, especially in coastal areas. Windy conditions are common throughout the year. Mean annual precipitation is 12 to 30 inches and mean annual snowfall ranges from 40 to 90 inches. Freeze-free period range 116 to 150 days, but freezing temperatures can occur year-round, although rare in June, July, and August. This cold climate leads to MLRA 238x being included in the Arctic.
Soils

The dominant soil orders in MLRA 238x are Gelisols, Histosols, Inceptisols, and Entisols. Soils have a subgelic or cryic temperature regime, and an aquic or udic moisture regime. Fibristels, Hemistels, Histoturbels, and Aquiturbels are the most common Gelisol great groups. Fibristels and Hemistels have thick accumulations of organic material and occur in depressions and shallow basins. The Orthels and Turbels have comparably thinner surface organic material. The Histoturbels are common in elevated and convex areas and Aquiturbels are common on terraces and drainageways. Inceptisols, Entisols, and Histosols do not have permafrost within the soil profile. Histosols occur in depressions with thick accumulations of organic material. Inceptisols occur on the slopes of hills and mountains, swales, terraces, and flood plains. Entisols occur on shore complex and flood plains.

Vegetation

Lakes, ponds, and other types of surface water are common in this area and vegetation

near these water bodies include wet sedge meadows, sedge-shrub meadows, and sedge-moss meadows. Low uplands support low and dwarf ericaceous shrubs, tussock-forming sedges, other hydrophytic plants, and mosses. Sites with higher local relief and better drainage support low ericaceous scrub with mosses, lichens, willows, and forbs. Low ericaceous shrubs, willow, alder, and mosses are understory associated in these forests and woodlands.

Land use

Residents use this area primarily for subsistence hunting, fishing, and gathering. Less than one percent of the MLRA is urban, and most communities are along the coast or major rivers and lakes. Disturbance of fragile permafrost soils is the major soil resource concern in this area, resulting from damage of insulating organic material that allows permafrost in upper soil layers to thaw. This can lead to ponding, soil subsidence, erosion, and altered hydrologic function. In order to slow the thawing of permafrost, management is needed to protect organic material and promote thermal balance of soils.

Classification relationships

Landfire Biophysical Settings:
16890 – Alaska Arctic Non-Acidic Dryas Dwarf-Shrubland
(LANDFIRE biophysical settings 2009)

Viereck Communities:
Dryas Dwarf Shrub Tundra – II.D.1.a
(Viereck et al. 1992)

Ecological site concept

• This arctic ecological site occurs on stream terraces and the slopes of hills, plains, mountains, and volcanic cone.
• Soils commonly formed in loess and/or volcanic ash over colluvium, till, or alluvium.
• Soils do not pond or flood. A water table is typically absent from the soil profile and these soils are considered well drained.
• Soils are typically very deep. Bedrock, strongly contrasting textural stratification, and permafrost are occasional restrictions that occur at very shallow to moderate depths. • The reference plant community is characterized as dryas dwarf shrub tundra (Viereck et al. 1992) with a highly diverse plant community commonly dominated by eightpetal mountain-avens.

Associated sites

R238XY404AK	**Arctic Loamy Frozen Tussock Tundra** Ecological site 404 occurs on adjacent stream terraces and slopes but with wetter soils underlain by permafrost that supports tussock tundra.

R238XY405AK	**Arctic Scrub Loamy Flood Plain** Ecological site 405 occurs on adjacent flood plains and supports tall willow scrub and herbaceous communities.
R238XY408AK	**Arctic Scrub Loamy Frozen Swales and Drainageways** Ecological site 408 occurs on adjacent swales and drainageways with wetter soils underlain by permafrost that support low scrub and sedge vegetation.

Similar sites

R239XY070AK	**Alpine Dwarf Scrub Gravelly Slopes** Associated with similar dwarf scrub vegetation on slopes of hills, plains, volcanic cone but to the West in the Northern Bering Sea Islands MLRA (239X).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Dryas octopetala ssp. octopetala*
Herbaceous	(1) *Lupinus arcticus* (2) *Carex scirpoidea*

Physiographic features

• This ecological site occurs on stream terraces and the slopes of hills, plains, mountains, and volcanic cone. Earth hummock are occasional microfeatures associated with the coastal plain.
• Elevations range from 20 to 1100 or more feet above sea level.
• Associated with nearly level to strongly sloping terrain (0 to 8 percent). Slopes of some hills and volcanic cone can be steep.
• Soils do not pond or flood.
• A water table is typically absent from the soil profile but does occasionally occur at deep or very deep depths for portions of growing season.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Stream terrace (2) Plains > Coastal plain > Earth hummock (3) Plains > Mountain slope (4) Plains > Volcanic cone (5) Plains > Plain (6) Plains > Hill
Runoff class	Very low to low
Flooding frequency	None
Ponding frequency	None

Elevation	20–1,100 ft
Slope	2–12%
Water table depth	40–60 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to medium
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	20–1,575 ft
Slope	0–60%
Water table depth	Not specified

Climatic features

Sea ice strongly influences the climate of MLRA 238x, as it does throughout Western Alaska. The climate is characteristically maritime throughout the summer months, where cool, moist air moves from the Bering Sea into coastal lowlands. As sea ice forms in the winter, the climate becomes more characteristic of a continental climate. These cold year-round conditions is the reason MLRA 238x is considered Arctic despite being approximately 500 miles south of the Arctic circle.

Winters are cold and long, with average low temperatures between 0 and 4 degrees (F) December through February. Winter and early spring is the driest time of the year with less than an inch of precipitation per month falling January through April. Summers in this area are cool, short, and often cloudy and rainy. June through October are considerably wetter, with the most precipitation falling in August and September. This area receives, on average, 16 inches of precipitation and 116 frost free days per year.

Table 4. Representative climatic features

Frost-free period (characteristic range)	106-122 days
Freeze-free period (characteristic range)	129-142 days
Precipitation total (characteristic range)	15-18 in
Frost-free period (actual range)	90-129 days
Freeze-free period (actual range)	116-150 days
Precipitation total (actual range)	12-30 in
Frost-free period (average)	116 days

Freeze-free period (average)	136 days
Precipitation total (average)	16 in

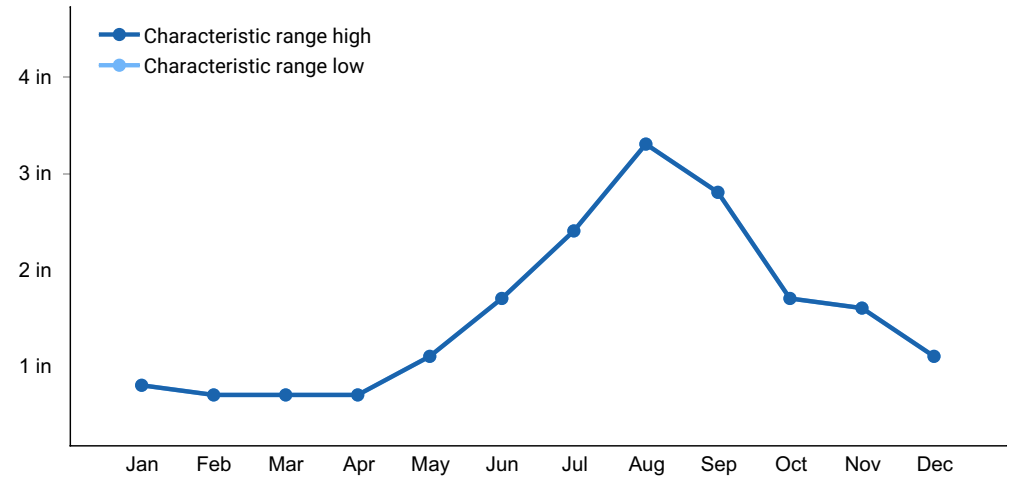

Figure 1. Monthly precipitation range

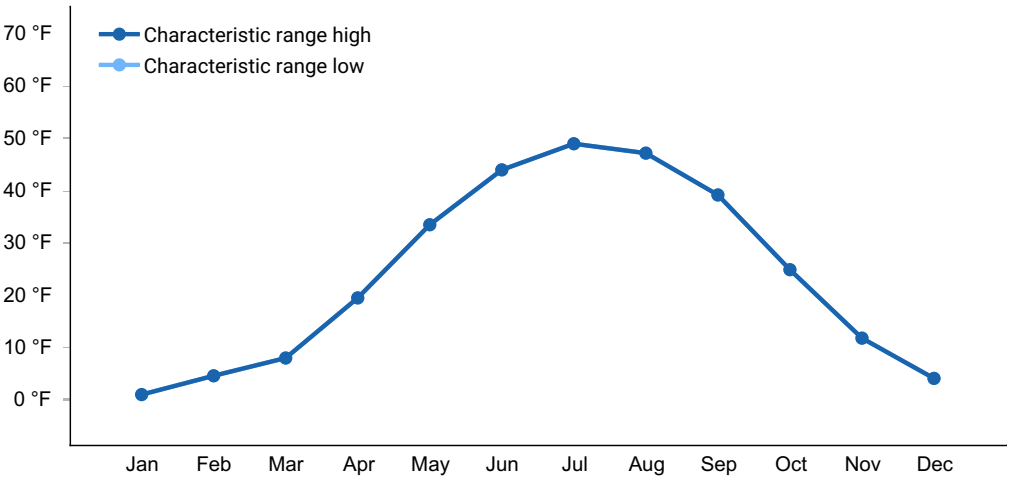

Figure 2. Monthly minimum temperature range

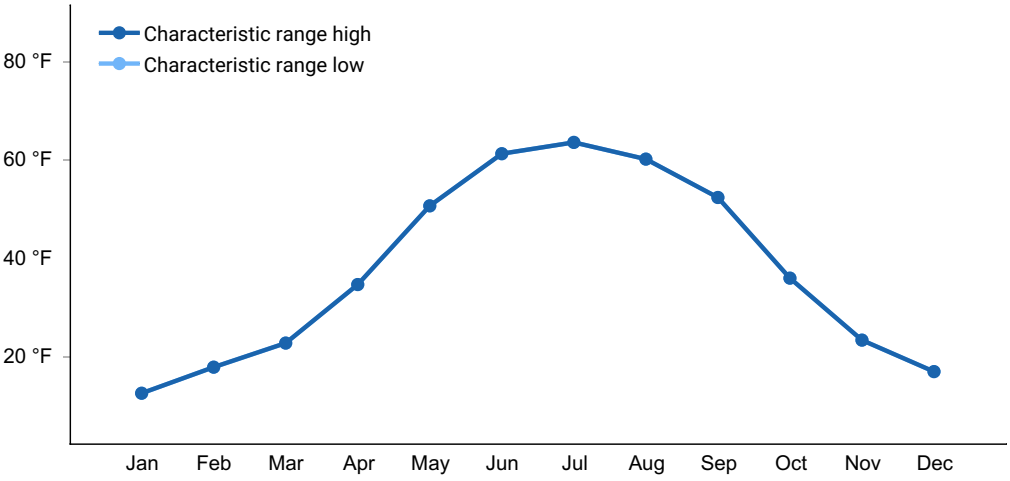

Figure 3. Monthly maximum temperature range

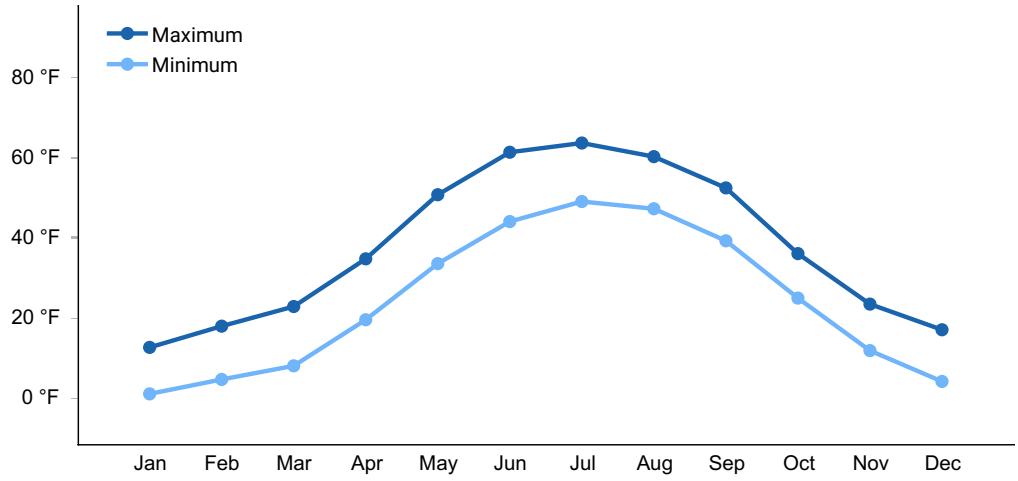

Figure 4. Monthly average minimum and maximum temperature

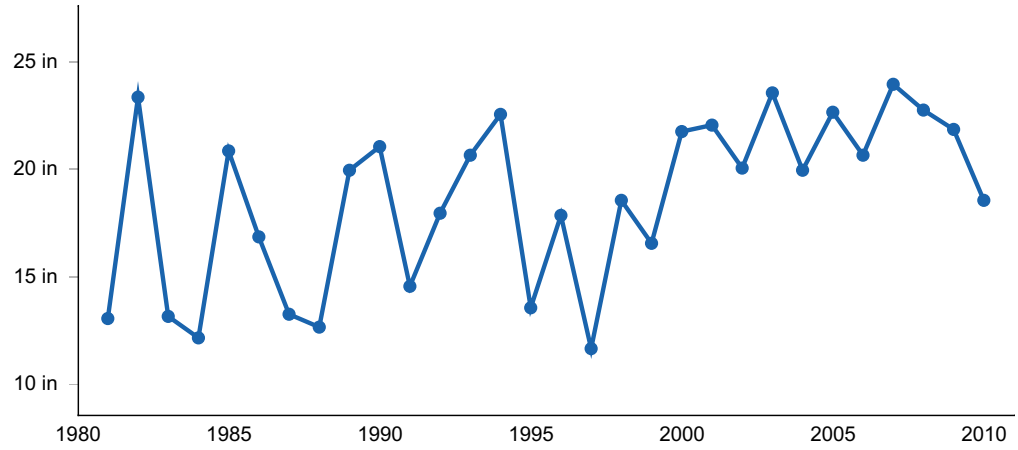

Figure 5. Annual precipitation pattern

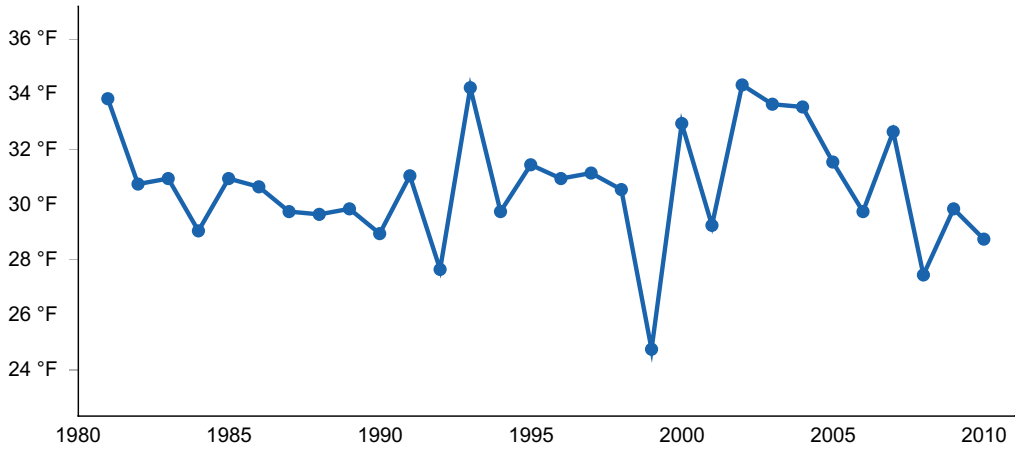

Figure 6. Annual average temperature pattern

Climate stations used

- (1) BETHEL AP [USW00026615], Bethel, 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

Not a wetland.

Soil features

• Soils commonly formed in loess and/or volcanic ash over colluvium or till. On stream terraces loess occurs over alluvium, while on volcanic cones the parent material is ash and gravelly tephra.
• Rock fragments do not occur on the soil surface.
• Mineral soils are capped with a thin one-to-six inch layer of organic material. The surface mineral horizon textures are commonly medial silt loam, very cobbly-ashy-silt loam, silt loam, or silt.
• Subsurface rock fragments are highly variable commonly ranging from 0 to 35 percent or more of the soil profile. Gravelly soils are associated with mountain slopes and volcanic cones.
• Soils are typically very deep. Bedrock occurs at moderate depth on volcanic cones. Strongly contrasting textural stratification occurs at very shallow to moderate depths on mountains slopes with loess and/or ash over gravelly till. Permafrost rarely occurs at shallow depth on slopes of plains with earth hummocks.
• Soil pH ranges from extremely acidic to neutral.
• Soils are considered well drained.

The Arctic Scrub Hills and Mountains ecological site complex is correlated to 10 soil components. Soils are classified as Inceptisols, Spodosols and occasionally Andisols and Gelisols. Inceptisols classify in the great groups Dystrocryepts and Haplocryepts; Spodosols classify in the great groups Haplocryods and Humicryods; Andisols classify in the great group Vitricryands; and Gelisols classify in the great group Umbriturbels.

Table 5. Representative soil features

Parent material	(1) Loess (2) Volcanic ash (3) Tephra (4) Colluvium (5) Alluvium (6) Till
Surface texture	(1) Medial silt loam (2) Very cobbly, ashy silt loam (3) Silt (4) Silt loam

Family particle size	(1) Medial (2) Medial over loamy-skeletal (3) Ashy-skeletal (4) Loamy-skeletal
Drainage class	Well drained
Permeability class	Moderately rapid
Depth to restrictive layer	11–30 in
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-40in)	6.8–10.5 in
Calcium carbonate equivalent (0-40in)	0%
Clay content (0-40in)	4–15%
Electrical conductivity (0-20in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-10in)	3.6–6.9
Subsurface fragment volume <=3" (0-60in)	0–20%
Subsurface fragment volume >3" (0-60in)	0–15%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	7–35 in
Soil depth	20–60 in
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-40in)	1.7–13.4 in

Calcium carbonate equivalent (0-40in)	Not specified
Clay content (0-40in)	Not specified
Electrical conductivity (0-20in)	Not specified
Sodium adsorption ratio (0-40in)	0–3
Soil reaction (1:1 water) (0-10in)	Not specified
Subsurface fragment volume <=3" (0-60in)	0–45%
Subsurface fragment volume >3" (0-60in)	0–30%

Ecological dynamics

The Yukon-Kuskokwim Coastal Plain MLRA has a harsh climate and cold soils and occurs in the zone of discontinuous permafrost. This MLRA occurs in the arctic biome and has a growing season that is both short and cold. As a result, the vertical and horizontal structure of vegetation is severely limited. Vegetation within the arctic biome is typically restricted to dwarf shrubs, mosses, and lichens.

This ecological site (R238Y402AK) can be described as a dryas dwarf shrub tundra. Dryas tundra is common on windswept sites throughout northern and western Alaska. *Dryas octopetala* ssp. octopetala (eightpetal mountain-avens) is the dominant subshrub on this site. Eightpetal mountain-avens is a circumpolar species found in the arctic tundra of Eurasia and North America. Mountain Avens is one of the first plants to establish itself in recently deglaciated landscapes, helping to stabilize soil and initiate ecological processes. Eightpetal mountain-avens is rarely found in fire prone landscapes.

State and transition model

Ecosystem states

1. Reference state

State 1 submodel, plant communities

1.1. eightpetal mountain-avens / purple saxifrage - arctic lupine / singlespike sedge

State 1
Reference state

The reference plant community is characterized as dryas dwarf shrub tundra (Viereck et al. 1992). This ecological site has no known associated disturbance regimes and has one plant community within the reference state (Landfire 2009). All plant communities associated with this ecological site have limited data, so the state-and-transition model is provisional.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- northern singlespike sedge (*Carex scirpoidea*), grass
- arctic lupine (*Lupinus arcticus*), other herbaceous
- purple mountain saxifrage (*Saxifraga oppositifolia*), other herbaceous

Community 1.1
eightpetal mountain-avens / purple saxifrage - arctic lupine / singlespike sedge

This plant community is described as dryas dwarf shrub tundra (Viereck et al 1992). Dominant plant species include eightpetal mountain-avens, purple saxifrage, Lapland rosebay, arctic willow, snow willow, red fruit bearberry, arctic lupine, singlespike sedge, curly sedge, blackish oxytrope, and various lichen and moss. The vegetative strata with the highest cover are dwarf shrubs (Landfire 2009). The binomial name of these and other provisionally associated plants can be found in the below dominant plant species table.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala ssp. octopetala*), shrub
- Lapland rosebay (*Rhododendron lapponicum*), shrub
- arctic willow (*Salix arctica*), shrub
- netleaf willow (*Salix reticulata*), shrub
- white arctic mountain heather (*Cassiope tetragona*), shrub
- entireleaf mountain-avens (*Dryas integrifolia*), shrub
- northern singlespike sedge (*Carex scirpoidea*), grass
- curly sedge (*Carex rupestris*), grass
- alpine sweetgrass (*Anthoxanthum monticola ssp. alpinum*), grass

- arctic lupine (*Lupinus arcticus*), other herbaceous
- blackish oxytrope (*Oxytropis nigrescens*), other herbaceous
- oneflower cinquefoil (*Potentilla uniflora*), other herbaceous
- purple mountain saxifrage (*Saxifraga oppositifolia*), other herbaceous
- northern sweetvetch (*Hedysarum boreale ssp. mackenziei*), other herbaceous
- horsetail (*Equisetum*), other herbaceous

Additional community tables

Animal community

Not available.

Hydrological functions

Not available.

Recreational uses

Not available.

Wood products

Not available.

Other products

Not available.

Other information

Not available.

Inventory data references

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

Other references

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Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	12/17/2025
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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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:

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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:**
