USDA Natural Resources
Conservation Service

Ecological site YX244X00A204
Arctic Mountain Valley Terraces

Last updated: 5/28/2025
Accessed: 03/22/2026

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): 244X–Northern Brooks Range Mountains

Major Land Resource Area (MLRA) 244X includes the steep, rugged, high mountains and narrow valleys on the northern side of the Brooks Range. This remote wildland is sparsely populated and is approximately 14,525 square miles (37,615 square kilometers). The transition to the Arctic climate is the break into MLRA 244X from the surrounding subartic MLRAs. Elevation ranges from about 1,969 feet (600 meters) to 8,570 feet (2,613 meters) at the summit of Mount Igikpak. The major rivers are the Kongakut, Aichilik, Jago, Canning, Ivishak, Ribdon, Atigun, Anaktuvuk, and Killik Rivers. They drain to the Colville River and Arctic Ocean.

Except for the highest peaks, the steep upper ridges, and some unglaciated valleys, glacial ice during the Early and Middle Pleistocene covered the MLRA. By the Late Pleistocene, only the highest valleys and mountains remained glaciated. Periglacial features (gelifluction lobes, polygons, and stripes) and fluvial deposits are common on terraces and gentle slopes. Glacial deposits overlay stratified sedimentary bedrock. This area is in the zone of continuous permafrost. Inclusions of volcanic and igneous rocks occur in the eastern part of the MLRA.

The Brooks Range is characterized by continental arctic climate. The average annual precipitation ranges from 7 to 40 inches (180 to 1,015 millimeters) with an average annual snowfall of 50 to 100 inches (125 to 255 centimeters). The average annual temperature ranges from 8 to 16 degrees Fahrenheit (-13 to -9 degrees C), with freezing temperatures possible any month of the year. Summer temperatures reach 90 to 100 degrees Fahrenheit (32 to 38 degrees Celsius), and winter temperatures drop as low as -75 degrees Fahrenheit (-60 degrees Celsius). The position of this MLRA above the Arctic

Circle lends to several days of 24-hour sunlight in June and several sunless days in December.

Freshwater is very limited due to frozen or low flow through long winters. Most domestic use water is from private wells. Aquifers are highly susceptible to contamination from surface activities (septic systems, landfills, and leaking fuel storage tanks).

The dominant soil order in this MLRA is Gelisols. The main soils are Aquiturbels, Histoturbels, Molliturbels, and Haploturbels. These are shallow or moderately deep to permafrost, poorly- to very poorly- drained, and formed in colluvium, slope alluvium, and residuum. Fibristels are shallow or moderately deep to permafrost, very poorly drained, and formed in thick deposits of organic material; in depressions, drainageways, and basins. Miscellaneous areas make up about 75 percent of this MLRA primarily composed of rubble, chutes, rock outcrops, and small glaciers. Lakes make up less than two percent of the area

Low willow, ericaceous shrub scrub, and tussocks are most dominant at lower elevations, with wet sites supporting wet meadows and willow scrub. Dwarf scrub communities (black crowberry, ericaceous shrubs, Dryas, and dwarf willow) are prominent on mountain slopes and ridges with exposed areas dominated by lichens, forbs, sedges, and mosses. As elevation and exposure increase, vegetation disappears and is replaced by rubble, talus, and other miscellaneous areas. This elevational transition is highly variable but roughly occurs at 6,500 feet (Zou et al. 2023) where glaciers also commonly prevail.

Villages use this remote area primarily for subsistence. Mining and prospecting of mineral resources historically occurred. Current disturbance relates to the pipeline and construction of Dalton highway. This disturbance of the fragile permafrost-affected soils is of increasing concern.

LRU notes

No LRUs are developed for this Major Land Resource Area (MLRA). Soils that are within this area are maintained as arctic. Soils corresponding to boreal communities are correlated to the appropriate adjacent MLRA.

Classification relationships

The Brooks Range is the most northerly extension of the Rocky Mountains occurring within the Arctic Mountains province of the Rocky Mountain System.

Description of the Ecoregions of the United States (Bailey 1983)
100 Polar Domain
120 Tundra Division
M120 Tundra Division - Mountain Provinces
M121 Brooks Range Tundra--Polar Desert Province

United States National Vegetation Classification
C04. Polar & High Montane Scrub, Grassland & Barrens Class
S12. Temperate to Polar Alpine & Tundra Vegetation Subclass
F031. Polar Tundra & Barrens Formation
D044. Arctic Tundra & Barrens Division
M173. Feltleaf Willow - Eight-petal Mountain-avens - Tussock Cottongrass Tundra Macrogroup
G896. Arctic Dwarf-shrub Tundra Group
A4336. Arctic Nonacidic Dwarf Willow Tundra Alliance

LandFire BpS Model/Description Version: Nov. 2024
- 17080 North American Arctic Polygonal Ground Shrub and Tussock Tundra

Ecological site concept

• This arctic ecological site occurs on stream terraces in the mountains. Non-sorted circles and stripes are common periglacial features.
• Soils formed in silty eolian deposits and alluvium that is cryoturbated.
• While considered very deep soils, permafrost commonly occurs at moderately deep depth (20 to 30 inches).
• Soils do not pond or flood. This ecological site is a complex of poorly drained soils with a very shallow water table and well-drained gravelly soils on circles.
• Reference state vegetation is a characterized as tussock tundra. Dwarf shrubs including dwarf birch and tealeaf willow may co-dominate.

Associated sites

YX244X00A202	**Arctic Mountain Valley Floodplains** The terrace and floodplain ecological sites occur parallel to each other on the landscape. Terraces are a step up in elevation from floodplains. Terraces are more stable with less disturbance and support a higher diversity of vegetation within the community.

Similar sites

YX244X00A112	**Arctic Shallow Tundra Mountain Slopes** Wet mountain slopes have similar tundra, with the increased organic matter on the surface. However, the cover and density of vegetation is lower and more discontinuous on slopes than on terraces.
YX244X00A102	**Calcareous, Wet Arctic Mountain Slopes** The calcareous wet mountain slopes have similar tundra, with the increased organic matter on the surface. However, the cover and density of vegetation is lower and more discontinuous on slopes than on terraces.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Betula nana* (2) *Salix pulchra*
Herbaceous	(1) *Eriophorum vaginatum* (2) *Carex bigelowii*

Legacy ID

R244XY204AK

Physiographic features

- Occurs on stream terraces in the mountains. Non-sorted circles are common periglacial features and their diameters range from 1.5 to 10 feet and are mounded well above the surrounding vegetation.
- Elevation ranges from 1975 feet to 3400 feet along the edge of the Arctic Foothills.
- Soils do not flood or pond.
- A very shallow water table occurs for extended portions of the growing season (0 to 10 inches). However, non-sorted circles and stripes have no associated water table.
-Slopes are nearly level. Given the low relief, aspect is not relevant for this ecological site concept.
- Associated with very low to low amounts of runoff to adjacent, downslope ecological sites.

Table 2. Representative physiographic features

Landforms	(1) River valley > Stream terrace (2) River valley > Stream terrace > Nonsorted circle
Runoff class	Very low to low
Flooding frequency	None
Ponding frequency	None
Elevation	602–1,036 m
Slope	0–2%
Water table depth	0–25 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified

Ponding frequency	Not specified
Elevation	602–1,981 m
Slope	Not specified
Water table depth	0–152 cm

Climatic features

Brief, cool summers and long, very cold winters characterize the continental arctic climate. The average annual precipitation throughout most of this area ranges from 15 to 40 inches (380 to 1,015 millimeters). The average annual snowfall is about 50 to 100 inches (125 to 255 centimeters). The average annual temperature ranges from about 8 to 16 degrees F (-13 to -9 degrees C). Freezing temperatures can occur in any month of the year. The Chandalar Shelf DOT climate station is the only station near this MLRA (Major Land Resource Area) and has incomplete data. The station is on the border of the MLRA and is not representative of the climate within MLRA 244X.

Table 4. Representative climatic features

Frost-free period (characteristic range)	20-60 days
Freeze-free period (characteristic range)	5-45 days
Precipitation total (characteristic range)	381-864 mm
Frost-free period (actual range)	
Freeze-free period (actual range)	
Precipitation total (actual range)	178-1,016 mm
Frost-free period (average)	40 days
Freeze-free period (average)	
Precipitation total (average)	

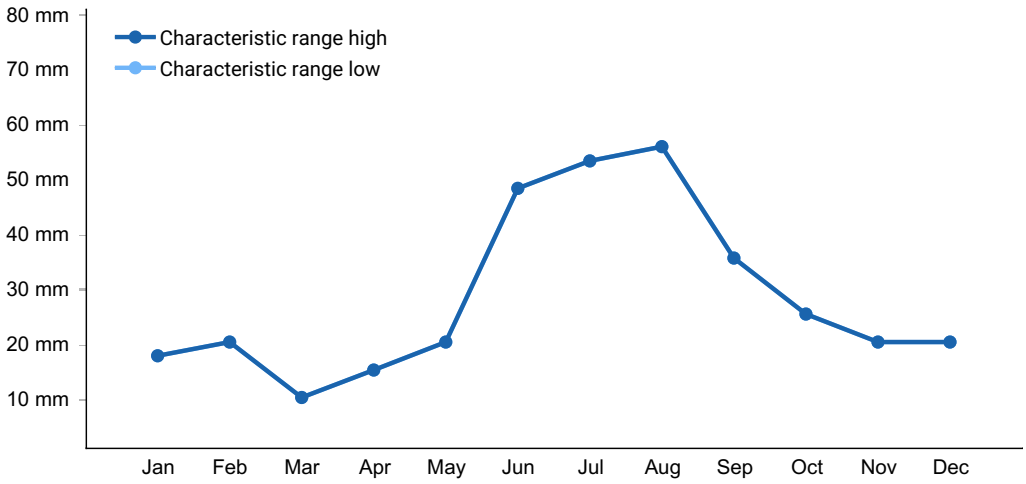


Figure 1. Monthly precipitation range

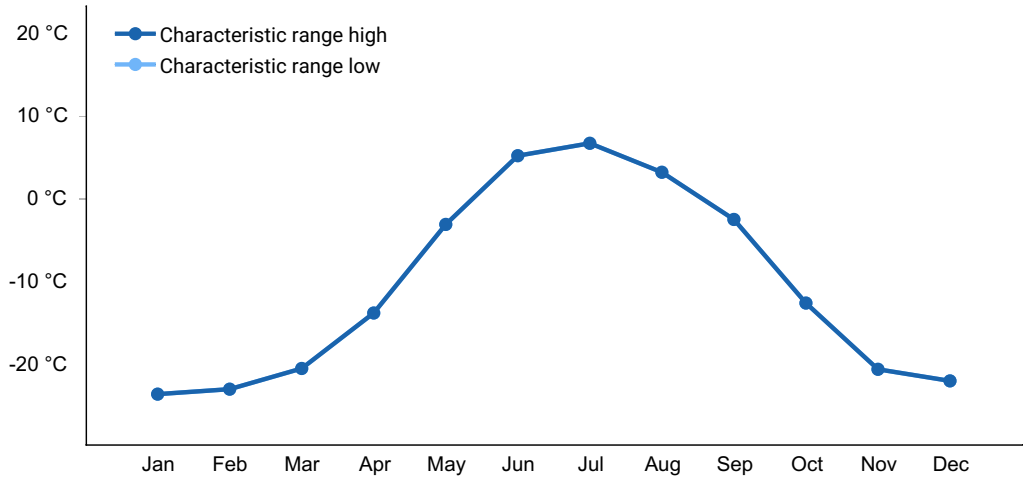


Figure 2. Monthly minimum temperature range

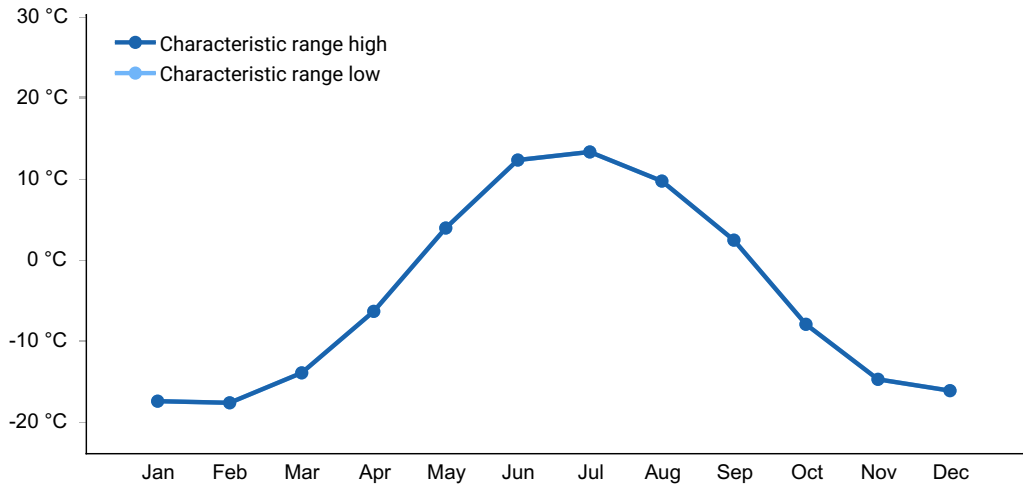


Figure 3. Monthly maximum temperature range

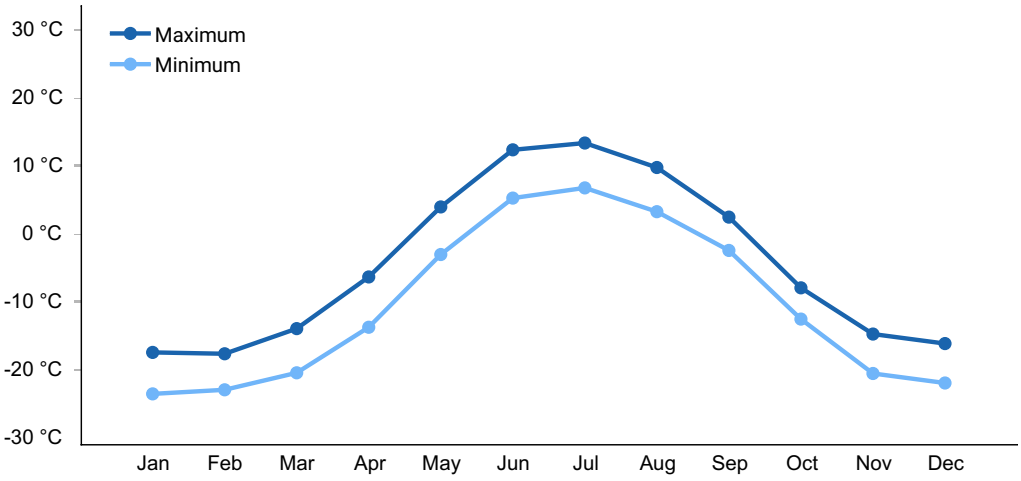


Figure 4. Monthly average minimum and maximum temperature

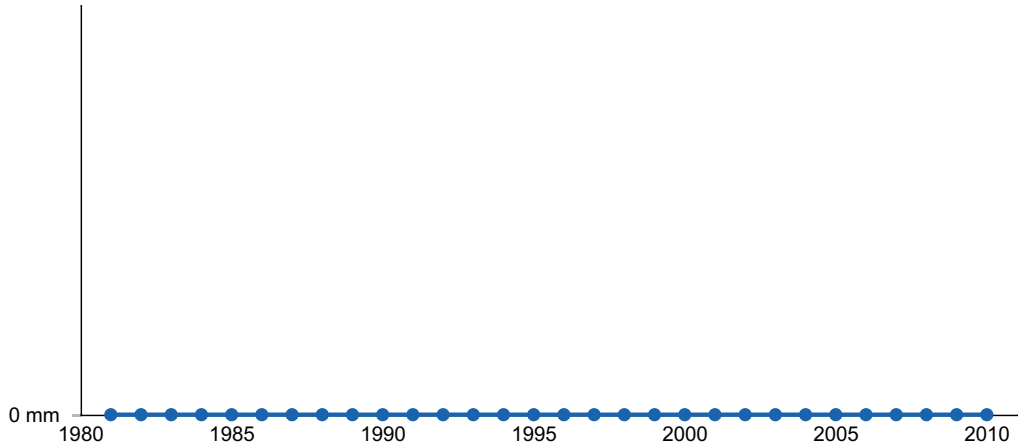


Figure 5. Annual precipitation pattern

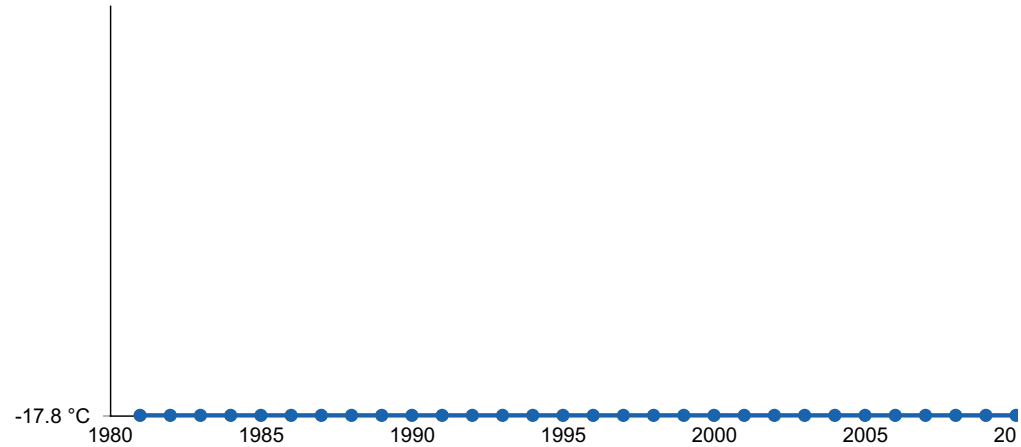


Figure 6. Annual average temperature pattern

Climate stations used

- (1) CHANDALAR SHELF DOT [USC00501497], Southerly North Slope Bo, AK

Influencing water features

Precipitation is the main source of water (USDA-NRCS 2008). Snowmelt and precipitation events do increase vegetative potential, encouraging sedges, willows, and thicker organic material accumulation in these areas.

Wetland description

The poorly drained soils associated with this ecological site are classified as a mineral soils flats wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

- Soils formed in silty eolian deposits over alluvium that is commonly cryoturbated.
- Rock fragments cover zero to five percent of the soil surface.
- These mineral soils are capped with up to one inch of organic material. The surface mineral horizon texture is silt loam.
- Subsurface rock fragments are highly variable ranging between 0 and 35 percent or more of the soil profile by volume.
- Soils are considered very deep but have permafrost at moderate depths (20 to 30 inches). The gravelly circles and stripes lack permafrost but have strongly contrasting textural stratification resulting in restrictions at very shallow depth (1 to 4 inches).
- The pH of the soil profile ranges from very strongly acidic to neutral.
-Soils associated with the reference state are considered poorly drained. The associated circles are considered well drained.

The Arctic Mountain Valley Terraces ecological site is correlated to two soil components: arctic scrub-gravelly terraces and the arctic scrub-loamy frozen circles. These soils are classified as Gelisols in the great group Aquiturbels.

This Major Land Resource Area (MLRA) is remote and difficult to reach and has not had soil verification completed. The information was obtained using the STATSGO soils information, a class 5 soils product. When opportunity presents to collect data in this MLRA, this Provisional Ecological Site will be updated.

Table 5. Representative soil features

Parent material	(1) Eolian deposits (2) Alluvium (3) Cryoturbate
Surface texture	(1) Silt loam
Family particle size	(1) Coarse-loamy (2) Sandy-skeletal
Drainage class	Poorly drained

Permeability class	Moderately rapid
Depth to restrictive layer	51–76 cm
Soil depth	152 cm
Surface fragment cover <=3"	0–1%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	8.38–12.19 cm
Soil reaction (1:1 water) (0-25.4cm)	4.1–6.6
Subsurface fragment volume <=3" (0-152.4cm)	0–30%
Subsurface fragment volume >3" (0-152.4cm)	0–5%

Table 6. Representative soil features (actual values)

Drainage class	Poorly drained to well drained
Permeability class	Not specified
Depth to restrictive layer	3–76 cm
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	5.84–12.19 cm
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	0–55%
Subsurface fragment volume >3" (0-152.4cm)	0–20%

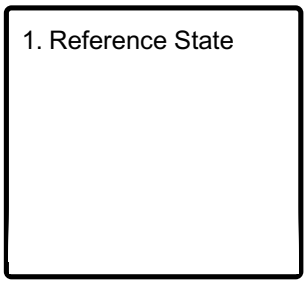
Ecological dynamics

Tussock cottongrass (*Eriophorum vaginatum*) is the primary tussock-former for this ecological site. This graminoid typically occurs in acidic, nutrient-poor, poorly drained soils that are underlain by permafrost. Tussock cottongrass dominates tussock tundra and tussock-shrub tundra in the Arctic. Ericaceous shrubs grow throughout tussock cottongrass, frequently with mosses and lichens.

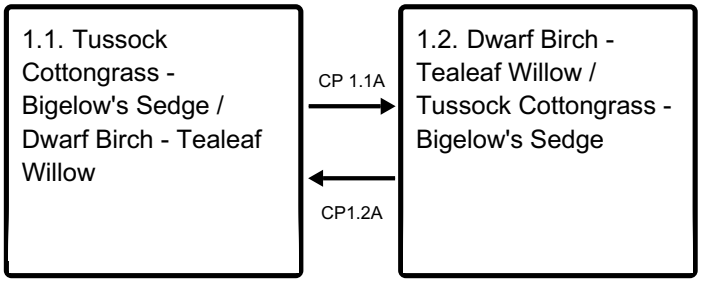
Cryoturbation and fire disturbances are highlighted in tussock tundra literature. There is evidence that fires will burn in the tussocks due to the fuel from the more consistent cover. However, there is little information about fire regimes in the arctic region of Alaska, and mean fire return interval estimates for tussock tundra ecosystems vary broadly (Landfire 2009).

State and transition model

Ecosystem states



State 1 submodel, plant communities



CP 1.1A - Fire/Cryoturbation

CP1.2A - Time

State 1
Reference State

The shrub-tussock community is common on terraces and other mesic flat to slightly sloping landforms. Tussock communities are generally cold, poorly drained, and underlain by mesic, silty mineral soils with a shallow surface organic layer surrounding the tussocks (Viereck et al. 1992). Permafrost is usually present, and the tundra patchwork is relatively continuous across the terrace landforms, interrupted only by cryoturbated areas and potentially isolated areas of bedrock and frost scarring. The only specified community for this ecological site at this time is a tussock cottongrass (*Eriophorum vaginatum*), Bigelow's sedge (*Carex bigelowii*), dwarf birch (*Betula nana*), and tealeaf willow (*Salix pulchra*) community. A post-disturbance community is captured in the state and transition model.

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- tussock cottongrass (*Eriophorum vaginatum*), grass

- Bigelow's sedge (*Carex bigelowii*), grass
- sphagnum (*Sphagnum*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- turgid aulacomnium moss (*Aulacomnium turgidum*), other herbaceous

Community 1.1
Tussock Cottongrass - Bigelow's Sedge / Dwarf Birch - Tealeaf Willow

Community 1.1 is the well-established vegetation cover on the Arctic Mountain Valley Terrace ecological site. The tussock forming herbaceous cover, including tussock cottongrass (*Eriophorum vaginatum*) and Bigelow's sedge (*Carex bigelowii*), are the dominant components. Dwarf shrubs including dwarf birch (*Betula nana*) and tealeaf willow (*Salix pulchra*) are present in the community and may co-dominate. The community is rich in herbaceous species, ericaceous and dwarf shrubs, as well as moss and lichen cover.

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- tussock cottongrass (*Eriophorum vaginatum*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- wideleaf polargrass (*Arctagrostis latifolia*), grass
- dwarf fireweed (*Chamerion latifolium*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous
- polytrichum moss (*Polytrichum strictum*), other herbaceous

Community 1.2
Dwarf Birch - Tealeaf Willow / Tussock Cottongrass - Bigelow's Sedge

Community 1.2 is a shrub dominant community with degraded or weakly formed tussocks of tussock cottongrass and Bigelow's sedge. This community is identified as a successional stage following disturbance.

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- tussock cottongrass (*Eriophorum vaginatum*), grass
- Bigelow's sedge (*Carex bigelowii*), grass

Pathway CP 1.1A
Community 1.1 to 1.2

The result of fire, cryoturbation or permafrost action causing detriment to the tussock

forming grasses/sedges.

Pathway CP1.2A
Community 1.2 to 1.1

Time following disturbance, allowing tussocks to stabilize and mosses, lichens and ericaceous shrubs to regain composition.

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1				–	
	tussock cottongrass	ERVA4	*Eriophorum vaginatum*	–	–
	Bigelow's sedge	CABI5	*Carex bigelowii*	–	–
	bluejoint	CACA4	*Calamagrostis canadensis*	–	–
	wideleaf polargrass	ARLA2	*Arctagrostis latifolia*	–	–
	water sedge	CAAQ	*Carex aquatilis*	–	–
	tall cottongrass	ERAN6	*Eriophorum angustifolium*	–	–
Forb					
2				–	
	dwarf fireweed	CHLA13	*Chamerion latifolium*	–	–
Shrub/Vine					
3				–	
	dwarf birch	BENA	*Betula nana*	–	–
	tealeaf willow	SAPU15	*Salix pulchra*	–	–
	marsh Labrador tea	LEPAD	*Ledum palustre ssp. decumbens*	–	–
	lingonberry	VAVI	*Vaccinium vitis-idaea*	–	–
	bog blueberry	VAUL	*Vaccinium uliginosum*	–	–
	black crowberry	EMNI	*Empetrum nigrum*	–	–
	white arctic mountain heather	CATE11	*Cassiope tetragona*	–	–
Moss					

4				–	
	sphagnum	SPHAG2	*Sphagnum*	–	–
	polytrichum moss	POST70	*Polytrichum strictum*	–	–
	splendid feather moss	HYSP70	*Hylocomium splendens*	–	–
	turgid aulacomnium moss	AUTU70	*Aulacomnium turgidum*	–	–
Lichen					
5				–	

Animal community

The Brooks Range is an important big-game area in Alaska. Mammals common to the area include brown bear, black bear, wolf, caribou, and Dall sheep. The smaller mammals include marmot, red fox, Arctic fox, wolverine, ground squirrel, lemming, and pika. The Brooks Range is an important resting area for migrating waterfowl and songbirds during summer. Raptors prominent in many areas include golden eagles, marsh hawks, gyrfalcons, and snowy and other open country owls.

Hydrological functions

Overland water seepage and subsurface water seepage from snowmelt and precipitation events supports enhanced vegetation in these landforms. Otherwise, there is no active connection to ground water or channel hydraulics.

Recreational uses

This remote area is used for sport hunting and other kinds of wildland recreation. Visitors use air taxi, guiding, and outfitting companies operating out of the major Alaska communities.

Wood products

Wooded areas reside just outside of the Major Land Resource Area.

Other products

This remote area is primarily used for subsistence hunting, fishing, and gathering.

Inventory data references

No on-site data are available. Information used to build this ecological site was obtained from existing land cover and vegetation maps, literature review, and vegetative summaries

from partnering agencies.

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Contributors

Marji Patz
Blaine Spellman
Phil Barber

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Matthew Mayer, Ecological Site Specialist in Wasilla Alaska provided the R script to

summarize geospatial data for climate information.

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	03/22/2026
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):**

   _____

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:**