USDA Natural Resources
Conservation Service

Ecological site YX244X00A113
Arctic Tussock Tundra Mountain Slopes

Last updated: 5/28/2025
Accessed: 02/14/2026

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

LandFire BpS Model/Description Version: Nov. 2024
- 16292 North American Arctic-Subarctic Tussock Tundra - Infrequent Fire

Ecological site concept

- This arctic ecological site occurs on the footslopes and backslopes of hills and mountains. The associated slopes are not associated with limestone geology.
- Soils formed in silty eolian deposits over gravelly colluvium and/or till. These mineral soils are commonly capped with 8 to 11 inches of peat.
- While soils are very deep, permafrost occurs at shallow to moderate depths (13 to 25 inches).
- Soils do not flood or pond. These poorly drained soils have a water table at very shallow depth for extended portions of the growing season.
- Vegetation is characterized as tussock tundra with dwarf-shrub subdominant cover.

Associated sites

YX244X00A112	**Arctic Shallow Tundra Mountain Slopes** Across the Brooks Range, outside of limestone parent material, most of the slopes will be an intermixed patchwork of wet and dry acidic (non-calcareous) soils. The tundra of R244XY112AK is sparse and dominated more by lichens and ericaceous shrubs where the tussocks of this ecological site are denser with mosses and sedges prominent in the community.

Similar sites

YX244X00A102	**Calcareous, Wet Arctic Mountain Slopes** The tussock acidic sites (or non-calcareous substrates) are similar in structure with a change in substrate changing soil chemistry and acidity. Acidic sites have less azalea and bog rosemary and support different moss species compared to calcareous sites.

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Betula nana* (2) *Ledum palustre ssp. decumbens*
Herbaceous	(1) *Carex bigelowii* (2) *Eriophorum vaginatum*

Legacy ID

R244XY113AK

Physiographic features

- Occurs on footslopes and backslopes of glaciated hills and rounded mountains.
- Elevation commonly ranges from 1,950 to 3,650 feet along the edge of the Arctic Foothills.
- Soils do not flood or pond. These wet soils have a water table at very shallow depth throughout much of the growing season
- Slopes typically range from 2 to 16 percent but may occasionally range up to 40 percent. Occurs on all aspects.
- Associated with low to medium amounts of runoff to adjacent, downslope ecological sites.

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Table 2. Representative physiographic features

Slope shape across	(1) Linear (2) Concave
Slope shape up-down	(1) Linear (2) Concave
Hillslope profile	(1) Backslope (2) Footslope
Landforms	(1) Mountain range > Mountain (2) Mountain range > Hill
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	594–1,113 m
Slope	2–16%
Water table depth	0–25 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	594–2,612 m
Slope	2–40%
Water table depth	Not specified

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)	

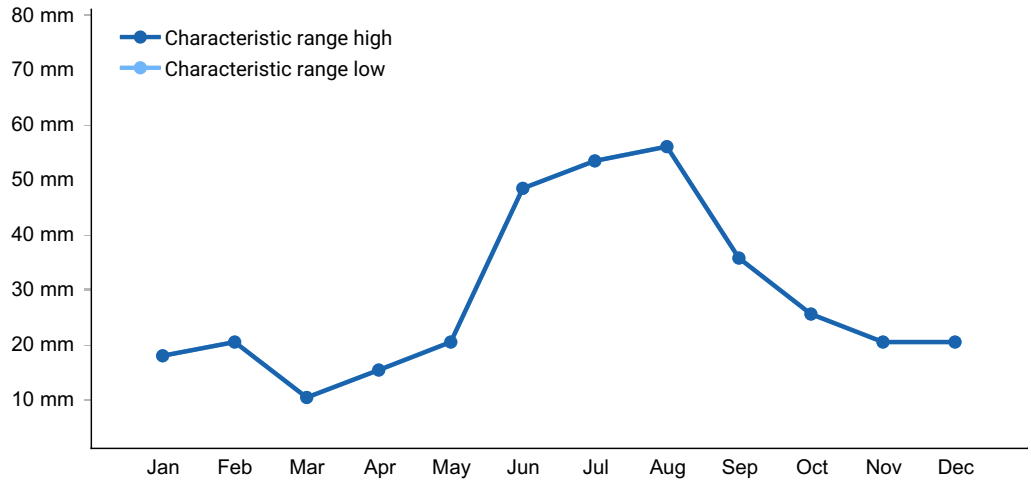


Figure 1. Monthly precipitation range

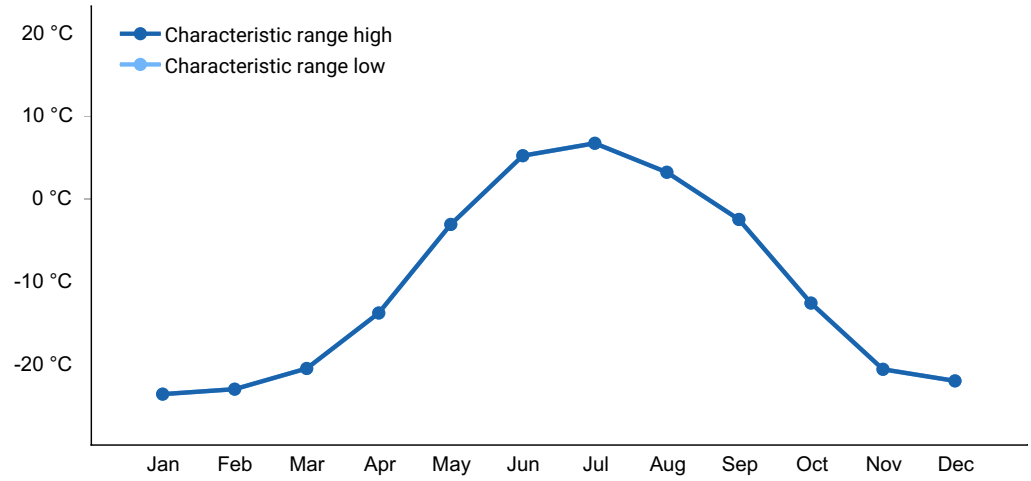


Figure 2. Monthly minimum temperature range

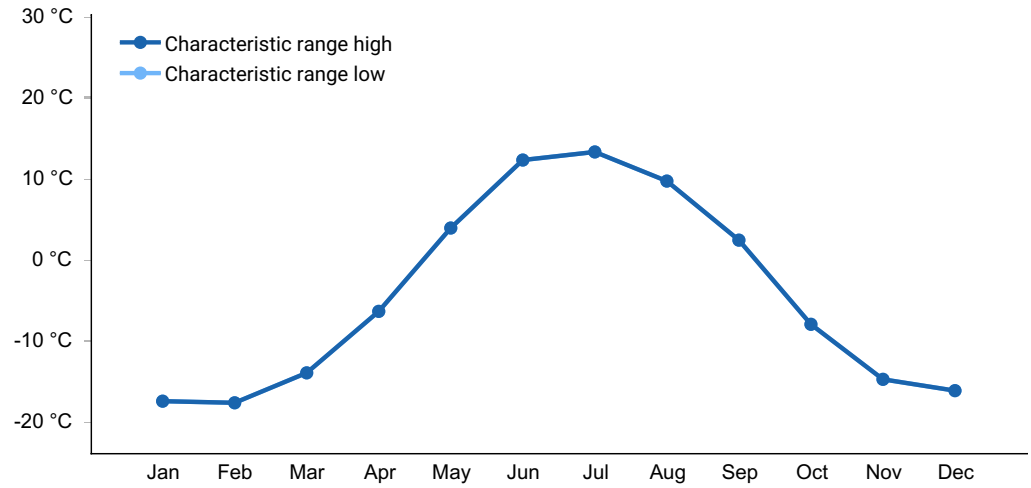


Figure 3. Monthly maximum temperature range

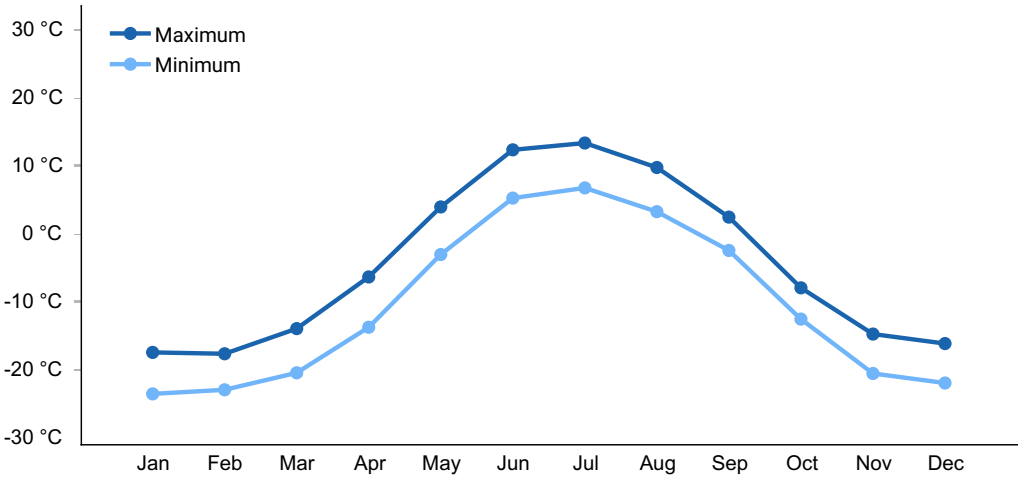


Figure 4. Monthly average minimum and maximum temperature

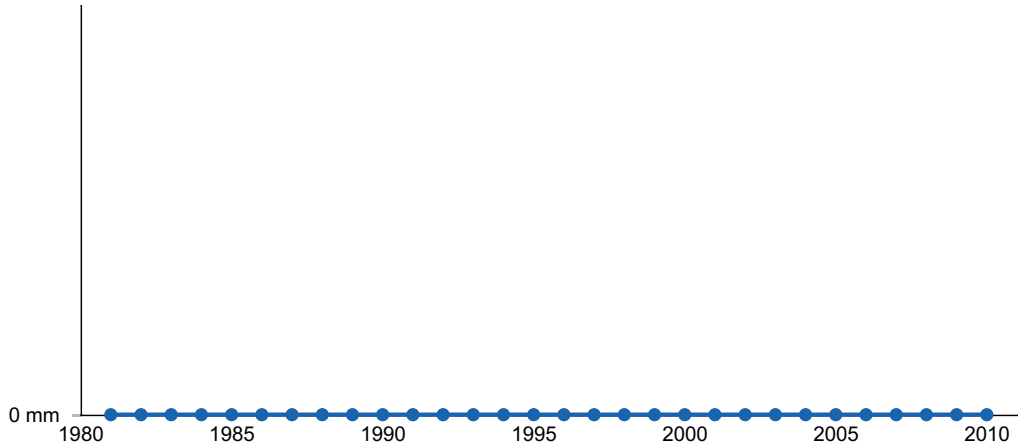


Figure 5. Annual precipitation pattern

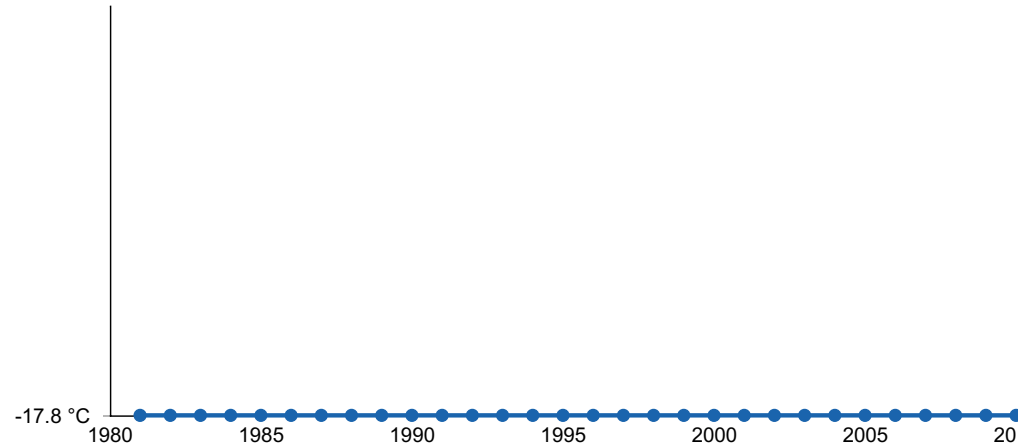


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

Precipitation and ground water are the main sources of water (Smith et al. 1995).Vegetation is affected by water held and released by late snow bed melt and precipitation captured in the organic cap.

Wetland description

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

Soil features

- Soils formed in silty eolian deposits over gravelly colluvium or till.
- Rock fragments do not typically occur on the soil surface.
These mineral soils are capped with up to 8 to 11 inches of peat. The surface mineral horizon textures are mucky silt loam or silt loam.
- Subsurface rock fragments range from 10 to 35 percent of the soil profile by volume, with gravels more abundant than cobbles.
- While soils are very deep, permafrost occurs at shallow to moderate depths (13 to 25 inches) and strongly contrasting textural stratification occurs at shallow depths (11 to 15 inches).
- The pH of the soil profile ranges from moderately acidic to neutral.
- Soils are poorly drained with moderately rapid permeability.

The components correlated to this ecological site are Arctic scrub-sedge-gravelly frozen till slopes and Arctic sedge-dwarf-scrub-gravelly frozen slopes. Soils are classified as Gelisols in the great group Historthels.

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) Organic material (2) Eolian deposits (3) Colluvium (4) Till
Surface texture	(1) Peat (2) Mucky silt loam (3) Silt loam
Family particle size	(1) Loamy-skeletal (2) Fine-loamy
Drainage class	Poorly drained

Permeability class	Moderately rapid
Depth to restrictive layer	28–64 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	10.41–24.13 cm
Soil reaction (1:1 water) (0-25.4cm)	4.1–6.9
Subsurface fragment volume <=3" (0-152.4cm)	10–30%
Subsurface fragment volume >3" (0-152.4cm)	0–5%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	0–2%
Available water capacity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	0–45%
Subsurface fragment volume >3" (0-152.4cm)	0–25%

Ecological dynamics

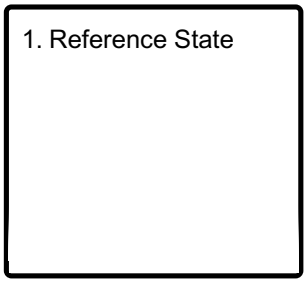
The Arctic Tussock Mountain Slopes ecological site is dominated by tussock tundra with dwarf-shrub subdominant cover. Tussocks are substantial in size but are dispersed on the landscape. They are comprised of Bigelow's sedge (*Carex bigelowii*), tussock cottongrass (*Eriophorum vaginatum*), and wideleaf polargrass (*Arctagrostis latifolia*). Sparse to open cover of dwarf shrubs include dwarf birch (*Betula nana*) and marsh Labrador tea (*Ledum palustre* ssp. decumbens). Mosses will form a nearly continuous layer around tussocks

with interspersed lichens. The acidic site accumulates a dense organic layer build up.

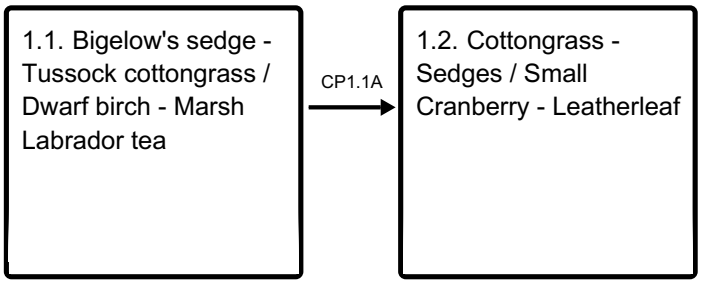
This site is relatively stable in current conditions. In areas where peat material builds, paludification may occur and lower the tussock cover, causing a shift to a shrubland. Changes in depth of organic layer (protection) or drainage (subsidence or change in wetness of site) are drivers of this successional change.

State and transition model

Ecosystem states



State 1 submodel, plant communities



CP1.1A - Paludification

State 1
Reference State

Dynamics specific to late lying snow beds support unique soils and vegetation. Across the landscape, as exposure increases to the winds, little snow cover remains, and lichen cover is low. But in areas with higher snow cover, the lichen will vary and can account for 25 percent of cover (Viereck et al. 1992). Vegetation will vary across this ecological site based on where late-lying snow and the most exposed soils occur. This natural variance is common across the organic soils described by this ecological site. The natural buildup of peat material (paludification) can restrict tussock growth and is responsible for a unique community in this state. The ecological site has plant communities representative of the native or natural conditions. Minimal impact from human influence is seen.

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- blueberry (*Vaccinium*), shrub

- Bigelow's sedge (*Carex bigelowii*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- wideleaf polargrass (*Arctagrostis latifolia*), grass
- sphagnum (*Sphagnum*), other herbaceous
- polytrichum moss (*Polytrichum strictum*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous

Community 1.1
Bigelow's sedge - Tussock cottongrass / Dwarf birch - Marsh Labrador tea

Tussocks are comprised of Bigelow's sedge (*Carex bigelowii*), tussock cottongrass (*Eriophorum vaginatum*), and wideleaf polargrass (*Arctagrostis latifolia*). Cover by dwarf shrubs is sparse to open and may include dwarf birch (*Betula nana*), marsh Labrador tea (*Ledum palustre* ssp. decumbens), red berry bearberry (*Arctostaphylos rubra*), and bog blueberry (*Vaccinium uliginosum*). Mosses will form a nearly continuous layer around tussocks with interspersed lichens. The common mosses are Sphagnum spp., *Polytrichum strictum*, and splendid feather moss (*Hylocomium splendens*). Common lichens are curled snow lichen (*Flavocetraria cucullata*), island cetraria lichen (*Cetraria islandica*), cup lichen (Cladonia spp.), greygreen reindeer lichen (*Cladina rangiferina*), and whiteworm lichen (*Thamnolia vermicularis*).

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- leatherleaf (*Chamaedaphne calyculata*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- wideleaf polargrass (*Arctagrostis latifolia*), grass
- sphagnum (*Sphagnum*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous

Community 1.2
Cottongrass - Sedges / Small Cranberry - Leatherleaf

After surface disturbance, the seral species that colonize are tussock cottongrass (*Eriophorum vaginatum*), Bigelow's sedge (*Carex bigelowii*), leatherleaf (*Chamaedaphne calyculata*), and small cranberry (Vaccinium oxycoccus). Other species may be common, including cottongrass species (Eriophorum spp.), sedge species (Carex spp.), blueberry species (Vaccinium spp.), as well as dwarf birch (*Betula nana*) and marsh Labrador tea (Ledum decumbens).

Dominant plant species

- leatherleaf (*Chamaedaphne calyculata*), shrub
- small cranberry (*Vaccinium oxycoccos*), shrub
- cottongrass (*Eriophorum*), grass
- sedge (*Carex*), grass

Pathway CP1.1A
Community 1.1 to 1.2

Degradation of the tussock community will occur as a result of paludification. Paludification is a process over time (gradual) where the water table rises in response to impeded drainage due to an accumulation of peat (decaying/decayed organic material).

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				–	
	Bigelow's sedge	CABI5	*Carex bigelowii*	–	–
	tall cottongrass	ERAN6	*Eriophorum angustifolium*	–	–
	wideleaf polargrass	ARLA2	*Arctagrostis latifolia*	–	–
	bluejoint	CACA4	*Calamagrostis canadensis*	–	–
	wideleaf polargrass	ARLA2	*Arctagrostis latifolia*	–	–
	cottongrass	ERIOP	*Eriophorum*	–	–
	sedge	CAREX	*Carex*	–	–
Shrub/Vine					
2				–	
	small cranberry	VAOX	*Vaccinium oxycoccos*	–	–
	blueberry	VACCI	*Vaccinium*	–	–
	dwarf birch	BENA	*Betula nana*	–	–
	marsh Labrador tea	LEPAD	*Ledum palustre ssp. decumbens*	–	–
	leatherleaf	CHCA2	*Chamaedaphne calyculata*	–	–
	lingonberry	VAVI	*Vaccinium vitis-idaea*	–	–
	bog blueberry	VAUL	*Vaccinium uliginosum*	–	–
Moss					

Moss					
3				–	
	sphagnum	SPHAG2	*Sphagnum*	–	–
	Schreber's big red stem moss	PLSC70	*Pleurozium schreberi*	–	–
	polytrichum moss	POST70	*Polytrichum strictum*	–	–
	splendid feather moss	HYSP70	*Hylocomium splendens*	–	–
Lichen					
4				–	
		FLCU	*Flavocetraria cucullata*	–	–
	island cetraria lichen	CEIS60	*Cetraria islandica*	–	–
	cup lichen	CLADO3	*Cladonia*	–	–
	greygreen reindeer lichen	CLRA60	*Cladina rangiferina*	–	–
	whiteworm lichen	THSU60	*Thamnolia subuliformis*	–	–

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 hydrophytic vegetation on these landforms.

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 is 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.

References

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Wells, Aaron F., Christopher S. Swingley, Susan L. Ives, Robert W. McNown, and Dorte Dissing; Vegetation classification for northwestern Arctic Alaska using an EcoVeg approach: tussock tundra and low and tall willow groups and alliances; Pages 87–117 in Changcheng Liu, editors. Vegetation Classification and Survey, International Association for Vegetation Science, Online, 2022

Contributors

Marji Patz
Blaine Spellman

Acknowledgments

Nathan Roe, Ecological Site Specialist in California (Southwest Region) provided the R script and analysis process to summarize data within the NASIS database.
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	02/14/2026
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):

---

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:**
