

Ecological site YX244X00A102

Calcareous, Wet Arctic Mountain Slopes

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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 subarctic 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 Celsius), 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 - 16902 North American Arctic Dwarf-Shrub Lichen Tundra - Infrequent Fire

Ecological site concept

• This arctic ecological site occurs on mountain slopes and swales on mountain slopes underlain by limestone. This geology results in calcareous and alkaline soils. Non-sorted circles and stripes are common periglacial features. • Soils formed in silty eolian deposits and colluvium weather from limestone. • While considered very deep soils, permafrost commonly occurs at moderate deep depth (20 to 30 inches). • Soils do not pond or flood. This ecological site is a complex of poorly and somewhat poorly drained, peat capped soils with a growing season water table at very shallow and shallow depth. Well-drained, gravelly soils occur on stripes and circles. • Reference state vegetation is a sparse to open scrubland of dwarf-shrubs dominated by prostrate willow species, eightpetal mountain-avens, and various ericaceous shrubs.

Associated sites

YX244X00A103	<p>Calcareous, Dry Arctic Mountain Slopes</p> <p>Occurs along the same calcareous formations but on comparably drier soils.</p>
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Similar sites

YX244X00A112	<p>Arctic Shallow Tundra Mountain Slopes</p> <p>Wet Arctic Mountain slopes will be similar in appearance but have a higher proportion of ericaceous shrubs and forbs, where Calcareous Wet Arctic Mountain Slopes appear drier, and have a higher abundance of mosses and lichens.</p>
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Salix reticulata</i> (2) <i>Cassiope tetragona</i>
Herbaceous	(1) <i>Carex bigelowii</i> (2) <i>Carex microchaeta</i>

Legacy ID

R244XY102AK

Physiographic features

- Occurs on mountain slopes and swales on mountain slopes. Non-sorted circles and stripes are common periglacial features. The diameter of non-sorted circles commonly range from 1.5 to 10 feet and are mounded above the surrounding vegetation.
- Elevation typically ranges from about 3,400 feet along the edge of the Arctic Foothills to 6,500 feet which provisionally marks upper threshold of vegetation in this area.
- Flooding and ponding do not occur.
- A very shallow to shallow water table occurs for extended portions of the growing season (0 to 20 inches). However, non-sorted circles and stripes have no associated water table.
- Slopes commonly range from nearly level to moderately steep and occur on all aspects.
- Associated with medium to high amounts of runoff to adjacent, downslope ecological sites.

Table 2. Representative physiographic features

Slope shape across	(1) Concave
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Slope shape up-down	(1) Linear
Landforms	(1) Mountain range > Mountain slope > Swale (2) Mountain range > Mountain slope (3) Mountain range > Mountain slope > Nonsorted circle (4) Mountain range > Mountain slope > Stripe
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,040 – 1,980 m
Slope	0 – 20 %
Water table depth	0 – 50 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	600 – 2,610 m
Slope	0 – 50 %
Water table depth	0 – 150 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)	10-50 days
Precipitation total (characteristic range)	380-860 mm
Frost-free period (actual range)	
Freeze-free period (actual range)	
Precipitation total (actual range)	180-1,020 mm
Frost-free period (average)	40 days
Freeze-free period (average)	
Precipitation total (average)	

- (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). Snowmelt and precipitation events do increase vegetative potential, encouraging sedges, willows, and thicker organic material accumulation in these areas.

Wetland description

Within this complex, mountain slopes are commonly classified as slope wetlands under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

- Soils formed in silty eolian deposits and colluvium weather from limestone
- Rock fragments do not typically occur on the soil surface
- These mineral soils are capped with up to 6 inches of peat. The surface mineral horizon textures are mucky silt loam and/or very channery loam.
- Subsurface rock fragments range between 15 and 35 percent 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 to shallow depth (5 to 17 inches).
- The pH of the soil profile ranges from slightly alkaline to moderately alkaline
- Soils associated with the reference state are considered poorly to somewhat poorly drained. The associated with circles and stripes are considered well drained.

The Calcareous, Wet Arctic Mountain Slopes ecological site is correlated to four soil components: the Arctic dwarf scrub-gravelly swales,

Arctic scrub-gravelly circles and stripes, Arctic scrub-sedge frozen colluvial slopes, and Arctic scrub-sedge-gravelly frozen colluvial slopes. The colluvial slope soils are classified as Gelisols in the great group Aquorthels, while the swales and circles and stripes soils are classified as Mollisols in the great group Haplogelolls.

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 – limestone (4) Colluvium – interbedded sedimentary rock
Surface texture	(1) Mucky silt loam (2) Very channery loam
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	50 – 80 cm
Soil depth	150 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	6.1 – 7.62 cm
Soil reaction (1:1 water) (25.4-101.6cm)	7.4 – 8.4
Subsurface fragment volume <=3" (0-152.4cm)	10 – 20 %

Subsurface fragment volume >3" (0-152.4cm)	10 %
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Table 6. Representative soil features (actual values)

Drainage class	Somewhat poorly drained to well drained
Permeability class	Moderately rapid to rapid
Depth to restrictive layer	10 – 80 cm
Soil depth	Not specified
Surface fragment cover <=3"	0 – 50 %
Surface fragment cover >3"	0 %
Available water capacity (0-101.6cm)	6.1 – 13.97 cm
Soil reaction (1:1 water) (25.4-101.6cm)	5.6 – 8.4
Subsurface fragment volume <=3" (0-152.4cm)	0 – 50 %
Subsurface fragment volume >3" (0-152.4cm)	0 – 50 %

Ecological dynamics

The Calcareous, Wet Arctic Mountain Slopes ecological site is dominated by dwarf willow shrubs and is found on the exposed, concave sites in the arctic Brooks Range. The sparse to open scrubland is dominated by prostrate willow species primarily being *Salix reticulata* and *Salix rotundifolia*. Other common dwarf-shrubs include *Dryas octopetala* and *Cassiope tetragona*. Erect shrubs such as *Salix pulchra* are constant at low cover. Graminoids (*Carex bigelowii* and *Arctagrostis latifolia*), forb (*Petasites frigidus*), and lichens (*Flavocetraria cucullata* and *Thamnolia vermicularis*) have high constancy.

Other common species include forbs such as *Tephrosia atropurpurea* ssp. *frigida* and *Polygonum bistorta* var. *plumosum*, graminoids including *Eriophorum angustifolium*, *Eriophorum vaginatum*, *Luzula confusa*, and *Luzula arctica*, horsetail (*Equisetum arvense*), and bryophytes. Mosses include *Tomentypnum nitens*, *Hylocomium splendens*, *Aulacomnium* spp. and *Dicranum* spp.

This ecological site is stable in current conditions. As snowpack shifts and the potential for travel through the area increases, the organic layer and permafrost stability may be affected. Changes in depth of organic layer (protection) or drainage (subsidence or change in

wetness of site) are likely drivers of successional change.

State and transition model

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 8. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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Table 9. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
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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 concave positions. 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 MLRA.

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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Approval

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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	10/29/2026
Approved by	
Approval date	

Composition (Indicators 10 and 12) based on	Annual Production
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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:
