Ecological site R240XY730AK
Alpine Dwarf Scrub Gravelly Slopes

Last updated: 6/05/2025
Accessed: 12/18/2025

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): 240X–Nulato Hills-Southern Seward Peninsula Highlands

The Nulato Hills-Southern Seward Peninsula Highlands (MLRA 240X) is in Western Alaska, which describes the mostly treeless zone of discontinuous permafrost in the arctic. This MLRA is approximately 18,500 square miles in size. The terrain is defined by rolling hills, low mountains and river valleys. Flood plains systems are common but generally narrow. This watershed drains into Norton Sound and Bering Sea. Major rivers include the Unalakleet, Koyuk, and Fish Rivers. The area is mostly undeveloped wild land that is sparsely populated. Residents use this remote area primarily for subsistence hunting, fishing, and gathering. Villages are primarily located along the coast and include the two larger municipalities of Nome and Unalakleet, and various other villages such as Koyuk and Saint Michael.

Geology and Soils

This MLRA was mostly unglaciated during the late Pleistocene. Glaciers were limited to upper elevations on the Seward Peninsula. Coastal lowlands are filled with Holocene deposits. Silty eolian deposits mantle coastal areas and the slopes of lower elevation hills and mountains. Flood plains and terraces are built on fluvial deposits. Modified glacial moraines are evident in areas of past glacial activity. Bedrock material is primarily a mix of sedimentary and volcanic rock (USDA, 2022).

This MLRA is in the zone of discontinuous permafrost. Shallow permafrost is most common on coastal plains, gentle footslopes, and organic swales. Permafrost constitutes a root- restrictive layer that perches water and creates poorly drained or poorly drained

soils.

Common soil orders include Gelisols that support permafrost and Entisols and Inceptisols which are marked by little to no development. The Gelisols are typically shallow or moderately deep to permafrost, occur on finer to gravelly textured sediments, and are poorly or very poorly drained. Common Gelisol suborders are Histels, Orthels, and Turbels. The Histels have thick accumulations of surface organic material and commonly occur on mounds of plains. The Orthels and Turbels have comparably thinner surface organic material. Turbels show signs of cryoturbation while Orthels do not. Entisols and Inceptisols are common on shallow rocky soils of the alpine and subalpine, as well as scoured flood plain soils. Non-soil areas (rock outcrop, rubble land and beaches) make up approximately five percent of the MLRA surface.

Climate

The climate is a mix of maritime in the summer and continental in the winter, which is a result of sea ice in Norton Sound. Summers are brief and cool summers and winters are long and cold. Mean annual precipitation is 15 to 20 inches at lower elevations, increasing to 20 to 40 inches at higher elevations (USDA, 2022). Mean annual temperatures ranges from 23 to 31 degrees F (SNAP, 2014a).

Vegetation

Vegetation is mainly influenced by site and soil characteristics such as temperature-degree days, exposure to wind, soil depth, and soil hydrology. Dwarf scrublands are present across much of the uplands. Lower elevations generally support more developed soils. Well drained soils support tall shrubs. Organic soils support mosses, graminoids and low shrubs. Forests occur on some low mountain slopes and river valleys but are associated with the Yukon-Kuskokwim Highlands (MLRA 230X). Tussock tundra is ubiquitous across much of the poorly drained, low gradient slopes and coastal plains (USDA, 2022).

LRU notes

There are two life zones delineated by plant communities along a temperature gradient driven by elevation. The predominant climate across MLRA 240X is arctic lowlands. Low mean annual air temperatures and a short growing season shape the vegetation across the landscape. The alpine climate zone is generally reserved for elevations above 1,200 feet. Decreased mean annual temperatures at these higher elevations support unique soils and vegetation.

Classification relationships

Alaska Vegetation Classification:
Dryas scrubland (II.D.1 - level III) / Dryas tundra (II.D.1.a - level IV)

(Viereck et al., 1992)

BioPhysical Settings:
6819880 – Alaska Arctic Acidic Dryas Dwarf Shrubland
(Landfire, 2009)

Circumpolar Arctic Vegetation Map:
B3e.2 (comm 40) – Erect dwarf shrub, lichen communities
(CAVM Team, 2003)

Ecological site concept

• Occurs on slopes in the alpine life zone at elevations typically above 1,200 feet. It is located at lower elevations on north-facing slopes and local summits
• Soils are gravelly and dry, lack permafrost, and are considered well drained
• Depth to paralithic or lithic bedrock contact is shallow to very deep
• The reference plant community is a mix of dwarf alpine and ericaceous shrubs along with graminoids and high lichen cover
• There is no major disturbance affecting vegetation recorded for this ecological site

Associated sites

R240XY731AK	**Subalpine Ericaceous Scrub Loamy Slopes** R240XY731AK describes the subalpine ericaceous-willow scrubland. It is on warmer, lower elevation slopes with higher available water and more developed soils.
R240XY732AK	**Subalpine Tall Scrub Gravelly Slopes** R240XY732 describes the subalpine alder and bluejoint scrubland. It is on warmer, lower elevation slopes with greater available water.

Similar sites

R240XY721AK	**Arctic Scrub Silt Lava Plains** R240XY721AK describes the dwarf scrub-lichen shrubland on lava fields. Both ecological sites support dwarf scrublands, but community composition and plant productivity differ.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Dryas octopetala* (2) *Loiseleuria procumbens*
Herbaceous	(1) *Anthoxanthum monticola ssp. alpinum*

Physiographic features

This ecological site occurs on alpine slopes above 1,200 feet of elevation. Slope gradients are strongly sloped to very steep (12 to 65 percent). This ecological site occurs on all aspects. There is no water table during the growing season.

Table 2. Representative physiographic features

Slope shape across	(1) Linear (2) Convex
Slope shape up-down	(1) Linear (2) Convex
Hillslope profile	(1) Summit (2) Shoulder (3) Backslope
Landforms	(1) Mountains > Mountain (2) Mountains > Mountain slope
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	1,200–3,000 ft
Slope	12–65%
Water table depth	60 in
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	500–3,700 ft
Slope	Not specified
Water table depth	Not specified

Climatic features

The mixed maritime/continental climate in MLRA 240X includes short, cool summers and long, cold winters. Mean annual temperature ranges from 23 to 31 degrees Fahrenheit, with temperatures typically below freezing from November through March. Approximately 40 percent of total precipitation occurs during the June – August growing season (PRISM,

2018; SNAP, 2014a; SNAP, 2014b). Across the MLRA, snowfall ranges from 40 to 100 inches (USDA-NRCS, 2022).

Table 4. Representative climatic features

Frost-free period (characteristic range)	64-84 days
Freeze-free period (characteristic range)	80-104 days
Precipitation total (characteristic range)	13-20 in
Frost-free period (actual range)	24-96 days
Freeze-free period (actual range)	72-108 days
Precipitation total (actual range)	10-23 in
Frost-free period (average)	72 days
Freeze-free period (average)	92 days
Precipitation total (average)	14 in

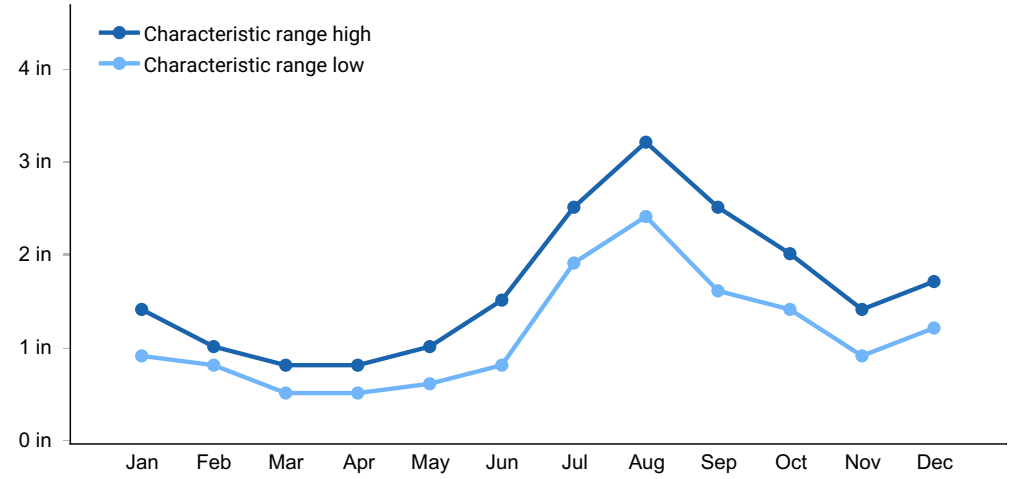

Figure 1. Monthly precipitation range

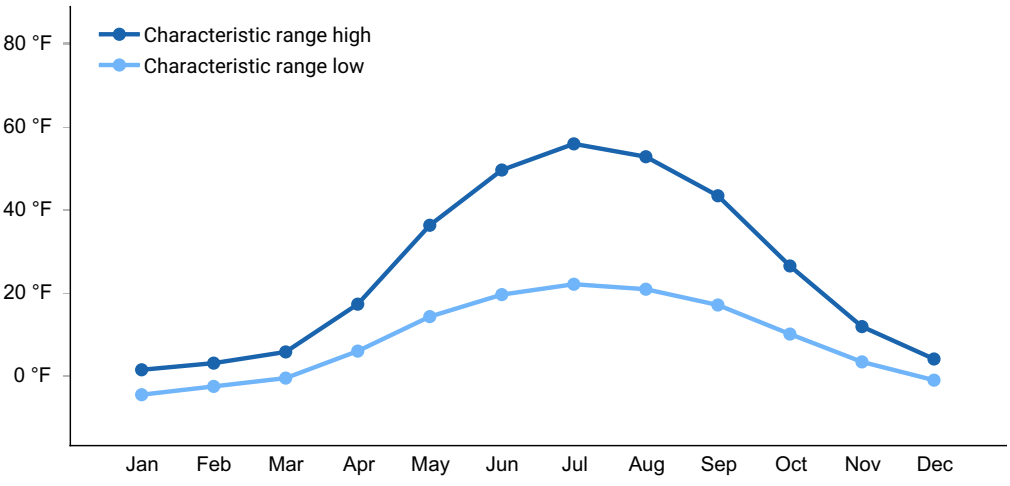

Figure 2. Monthly minimum temperature range

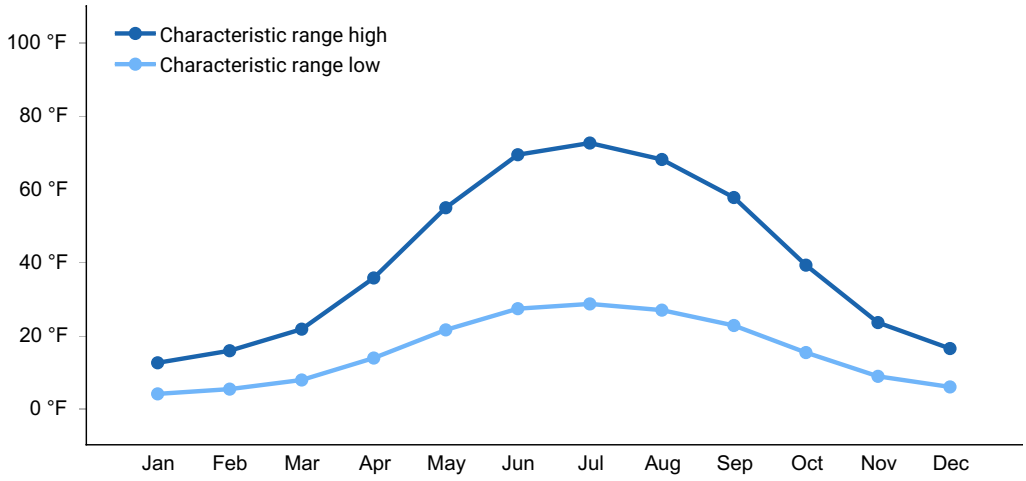

Figure 3. Monthly maximum temperature range

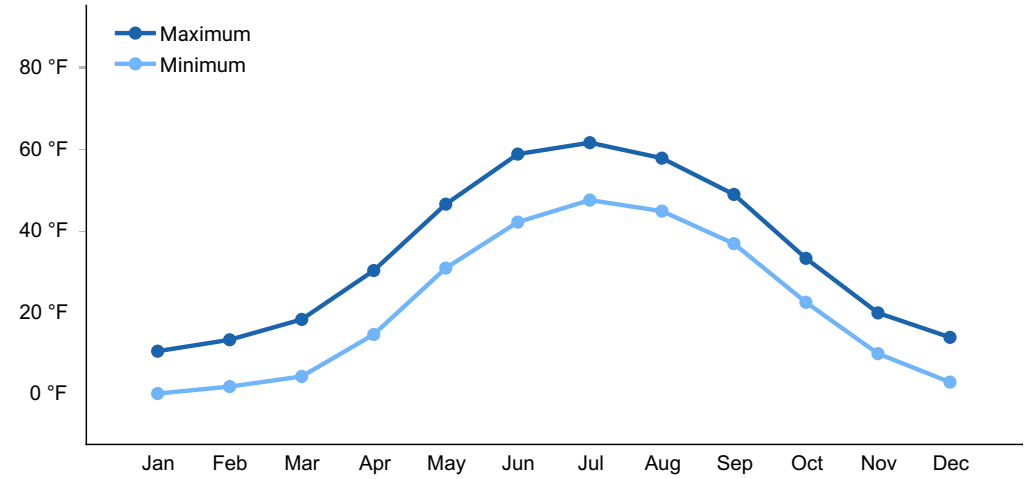

Figure 4. Monthly average minimum and maximum temperature

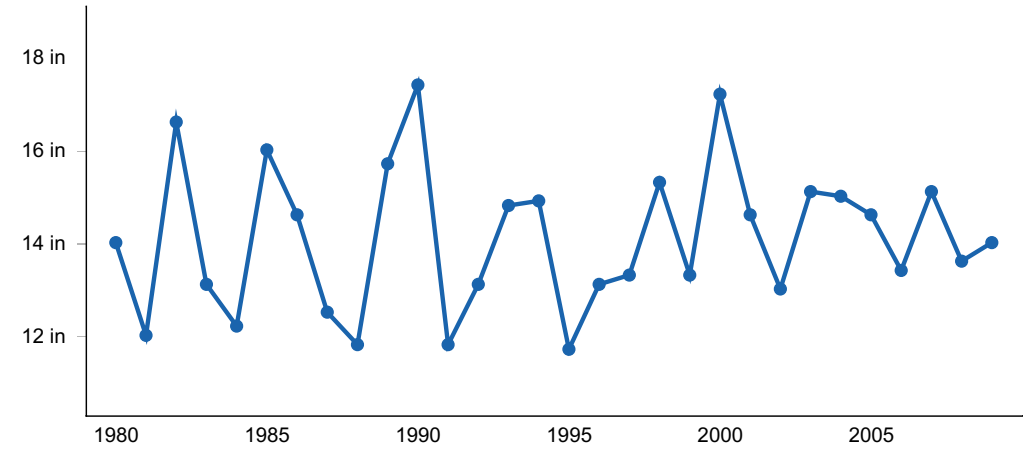

Figure 5. Annual precipitation pattern

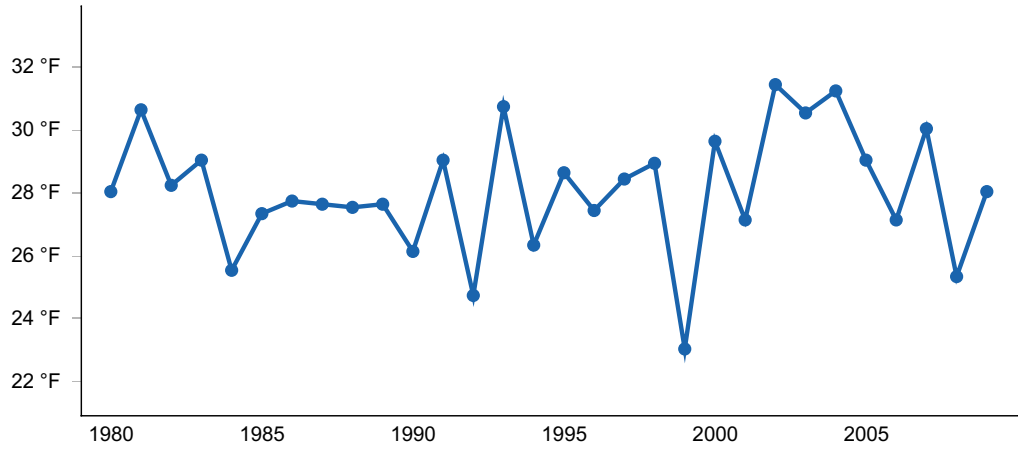

Figure 6. Annual average temperature pattern

Influencing water features

Precipitation is the main source of water for this ecological site. Surface runoff and throughflow contribute run-in to downslope ecological sites.

Wetland description

This ecological site is not associated with wetlands.

Soil features

Soils are mostly dry, minimally developed Orthents, Gelepts, and Cryepts (Soil Survey Staff, 2013). They formed in gravelly colluvium over residuum. Surface rock fragments range up to more than forty percent. Soils have a thin, one-inch organic cap. Soil depth varies, with contact of paralithic to lithic bedrock ranging from shallow to very deep. Subsurface rock fragment volume is between 10 and 55 percent. Soil pH is extremely to slightly acidic. Soils are classified as well drained, and they are dry during the growing season.

Table 5. Representative soil features

Parent material	(1) Colluvium (2) Residuum
Surface texture	(1) Silt loam (2) Channery silt loam (3) Extremely cobbly silt loam
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	20–60 in
Soil depth	20–60 in

Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–17%
Available water capacity (0-40in)	0.6–3.6 in
Soil reaction (1:1 water) (0-10in)	4–5.7
Subsurface fragment volume <=3" (0-60in)	5–39%
Subsurface fragment volume >3" (0-60in)	5–50%

Ecological dynamics

The Nulato Hills-Southern Seward Peninsula Highlands MLRA (MLRA 240X) occurs in Western Alaska with arctic vegetation and has a harsh climate that limits the composition and structure of plant communities. This area has cool, short summers and long, cold winters. Trees are restricted to warmer slopes in mountain valleys and flood plains. The expansive tundra is comprised of a mosaic of shrubs, sedges, moss, and lichen.

The dwarf scrub reference plant community is shaped by local factors including cold temperatures, wind exposure, and a shortened growing season. Convex mountain summits and shoulders are exposed to wind. Snowpack is usually absent during the winter. Exposure and low temperature limits plant height.

Site and soil conditions result in one community. Slow growing, often evergreen shrubs are the dominant vegetative group. Wind exposure limits plant height leading to most shrubs growing prostrate. Vegetation is further limited where root-limiting paralithic and lithic bedrock are at shallow depths. Soils are weakly developed and rocky. A high volume of subsurface rock fragments transfers and stores heat, preventing permafrost from developing within the top 60 inches of the soil surface.

There is no recognized disturbance that shifts community composition on this ecological site. Wind scouring and erosion shape the vegetation but do not result in a unique, post-disturbance community. Fire is unlikely as the typical fuel load in the reference plant community is low.

The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Eightpetal mountain avens (Dryas octopetala) - Alpine azalea (Loiseleuria procumbens) / Alpine sweetgrass (Anthoxanthum

State 1
Reference State

The reference state describes one distinct vegetative community on alpine slopes. Fire is unlikely as fuel loads are low, and temperatures are cool. Site factors such as exposure to wind and low annual temperatures restrict vegetation height and community composition on this ecological site. The reference state is developed and characterized using available vegetation models, including Landfire BpS and the Alaska vegetation classification system (Landfire, 2009; Viereck et al., 1992).

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- skeletonleaf willow (*Salix phlebophylla*), shrub

- alpine bearberry (*Arctostaphylos alpina*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- alpine sweetgrass (*Anthoxanthum monticola ssp. alpinum*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- locoweed (*Oxytropis*), other herbaceous

Community 1.1
Eightpetal mountain avens (Dryas octopetala) - Alpine azalea (Loiseleuria procumbens) / Alpine sweetgrass (Anthoxanthum monticola ssp. alpinum)

This community is a Dryas dwarf scrubland (Viereck et al., 1992). Major plant groups are dwarf shrubs, medium forbs, and lichens. Species are predominantly dwarf evergreen shrubs or fast-growing herbaceous species that thrive in the short, cool growing season. Ground cover is predominantly rock fragments and lichens.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- skeletonleaf willow (*Salix phlebophylla*), shrub
- alpine bearberry (*Arctostaphylos alpina*), shrub
- arctic willow (*Salix arctica*), shrub
- alpine sweetgrass (*Anthoxanthum monticola ssp. alpinum*), grass
- sedge (*Carex*), grass
- Altai fescue (*Festuca altaica*), grass
- bluegrass (*Poa*), grass
- locoweed (*Oxytropis*), other herbaceous
- arctic lupine (*Lupinus arcticus*), other herbaceous

Additional community tables

Inventory data references

Vegetative communities and transitions are described using existing models and expert knowledge. There are no vegetation inventory data points in NASIS associated with this ecological site.

External model data sources:

The Alaska-Yukon Region of the Circumboreal Vegetation Map (CBVM) (Jorgensen and Meidinger, 2015)

Circumpolar Arctic Vegetation Mapping Project (CAVM, 2003).

LANDFIRE Biophysical Settings Models (Landfire, 2009)

The Alaska Vegetation Classification (Viereck et al., 1992)

References

Viereck, L.A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station General Technical Report PNW-GTR-286..

Other references

CAVM Team. 2003. Circumpolar Arctic Vegetation Map. Scale 1:7,500,000. Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska

Jorgensen, T., and D. Meidinger. 2015. The Alaska Yukon Region of the Circumboreal Vegetation Map (CBVM). CAFF Strategies Series Report. Conservation of Arctic Flora and Fauna, Akureyri, Iceland. ISBN: 978-9935-431-48-6.

LANDFIRE Biophysical Settings (Landfire). 2009. Biophysical Setting 6819880 – Alaska Arctic Acidic Dryas Dwarf Shrubland. In: LANDFIRE Biophysical Setting Model: Map zone 68, [Online]. In: Vegetation Dynamics Models. In: LANDFIRE. Washington, DC: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory; U.S. Geological Survey; Arlington, VA: The Nature Conservancy (Producers). Available: https://www.landfire.gov/vegetation/bps Accessed March 18, 2025

PRISM Climate Group (PRISM). 2018. Alaska – average monthly and annual precipitation

and minimum, maximum, and mean temperature for the period 1981-2010. Oregon State University, Corvallis, Oregon. https://prism.oregonstate.edu/projects/alaska.php. Accessed Sept 17, 2024.

Scenarios network for Alaska and arctic planning (SNAP). 2014. Historical Monthly Temperature – 1km, 1901-2009. http://ckan.snap.uaf.edu/dataset/. Accessed Sept 17, 2024.

Scenarios network for Alaska and arctic planning (SNAP). 2014. Historical monthly and derived precipitation products downscaled from CRU TS data via the delta methods – 2km, 1901-2009. http://ckan.snap.uaf.edu/dataset/. Accessed Sept 17, 2024.

Soil Survey Staff. 2013. Simplified Guide to Soil Taxonomy. USDA-Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE.

United States Department of Agriculture, Natural Resources Conservation Service. 2022. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Western Regional Climate Center. 2021. Climate of Alaska. Retrieved from https://wrcc.dri.edu/Climate/narrative_ak.php. Accessed November 15, 2024.

Western Regional Climate Center. 2024. Unalakleet WSO Airport, Alaska 'Freeze Free' Season Probabilities. https://wrcc.dri.edu/cgi-bin/cliTFrezD.pl?akunal. Accessed Jan 23, 2025.

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This ecological site description (ESD) fulfills the requirements of the Provisional Ecological

Site (PES) national initiative. This ESD is published to fit current site-soil correlations as they are currently mapped and understood. Further data collection may provide the information to update this ESD from the provisional level to the approved level.

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	12/18/2025
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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:**
