USDA Natural Resources
Conservation Service

Ecological site R241XY111AK
Alpine Sedge-Scrub Frozen Loamy 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): 241X–Seward Peninsula Highlands

The Seward Peninsula Highlands (MLRA 241X) occurs in Western Alaska, along the southernmost reaches of Land Resource Region Y, which has an arctic climate and occurs in the zone of continuous permafrost. This MLRA is approximately 13,700 square miles across the central Seward Peninsula. The terrain is defined by broad and extensive rolling hills and plains and solitary groups of rugged mountains expanding from sea level to a high point of 4,714 feet on Mount Osborn. Flood plains systems are common but generally narrow. The MLRA 241X watershed drains into Kotzebue Sound and the Chukchi Sea to the north and the Bering Sea to the West. Major rivers include the Buckland, Kiwalik, Serpentine, Agiapuk-American, Kougarok, and Kuzitrin Rivers. The area is mostly undeveloped wild land that is sparsely populated. Residents use this remote area primarily for subsistence hunting, fishing, and gathering. The largest communities in this predominantly inland MLRA are along the coast and include Teller and Brevig Mission. Reindeer herding is a profitable enterprise and many areas of this MRLA are used for reindeer graze and subsistence activities. Parts of this MLRA were mined for gold during the Nome gold rush. Several mines still operate within this boundary (USDA, 2022). Federally managed lands in this MLRA include parts of the Selawik National Wildlife Refuge and parts of Bering Land Bridge National Preserve.

Geology and Soils

MLRA 241X was mostly unglaciated during the late Pleistocene. Glaciers were present during the middle and early Pleistocene in scattered areas such as the York Mountains in the west, the Kiglauik Mountains to the south, and the Upper Kiwalik River drainage. The present-day landscape is mantled with loess, colluvium, and slope alluvium (USDA, 2022).

Modified glacial moraines are evident in areas of past glacial activity. Bedrock material is a mix of rock types, with areas of sedimentary, volcanic and igneous throughout the MLRA. Bedrock is at or near the surface in most upland areas of this MLRA, which is reflected in soil development and vegetative patterns.

This MLRA is in the zone of continuous permafrost. Frozen soils are common across the landscape, though may be absent from high energy systems on floodplains, around lakes and on gravelly, well drained soils. Permafrost is generally shallow to moderately deep (10 to 40 inches) that results in a restrictive layer that perches water and creates poorly to very poorly drained soils. Alongside these permafrost soils (Gelisols), other common soil orders include soils with little to no development in the Entisol and Inceptisol orders. Periglacial features are common and include solifluction lobes, polygonal ground, and thermokarst pits (USDA, 2022). Non-soil areas (rock outcrop, riverwash, and surface water) make up approximated five percent of the MLRA surface.

Climate

Climate is predominantly continental arctic, with brief, cool summers and long, cold winters. Maritime conditions, where summer temperatures are moderated by the proximity to open water, persist through the summer along the Bering Sea coast. Mean annual precipitation is 10 to 15 inches in the north and west, increasing to 20 to 40 inches in the mountainous areas in the south and east (USDA, 2022). Mean annual temperatures ranges from 20 to 26 degrees Fahrenheit (PRISM, 2018; SNAP, 2014).

Vegetation

Vegetation is mainly influenced by climate, site, and soil characteristics such as temperature-degree days, elevation, exposure to wind, soil depth, and soil hydrology. Dwarf scrublands are present across most of the upland, with vegetation further restricted on shallow soils. Lower elevations generally support more developed soils, and host willow-sedge scrublands, mixed ericaceous shrub scrublands, and herbaceous graminoid meadows. Tussock tundra is ubiquitous across much of the poorly drained, low-sloped landforms across the MRLA. Wetland communities dominate in closed depressions and drainages (USDA, 2022).

LRU notes

There are currently no Land Resource Areas (LRUs) delineated or described in MLRA 241X. There is potential for two or more LRUs along a climatic break between the lowlands and low-elevation hills of the north and west, and the higher, mountainous regions more prevalent in the south and east. However, vegetation and land management may not differ between these areas, as soils and vegetation are already restricted by cold annual temperatures even at low elevations.

Classification relationships

Alaska Vegetation Classification:
Open low scrub (II.C.2 - level III) / Mesic shrub birch – ericaceous shrub (II.C.2.c – level IV)
(Viereck et al., 1992)

BioPhysical Settings: 6816821 – Alaska Arctic Scrub Birch – Ericaceous Shrubland (LANDFIRE, 2009)

Seward Rangesites
32 – Mixed shrub
(SCS, 1984; Swanson et al., 1985)

Ecological site concept

Ecological Site characteristics:
• Associated with alpine mountain footslopes and toeslopes
• Soils are wet and support permafrost and are considered very poorly drained
• The reference plant community is an open scrubland of ericaceous shrubs and birch
• There is no major disturbance affecting vegetation recorded for this ecological site
• Non-sorted circles are common periglacial features on the described landform. These are represented by an alternate state.

Associated sites

R241XY134AK	**Arctic Scrub Loamy Hillslopes** R241XY134AK describes a low scrubland with tussocks on permafrost soil. It is susceptible to fire.
R241XY117AK	**Alpine Dwarf Scrub Gravelly Summits** This alpine ecological site is on upper mountain, steep slopes. Soils are dry and gravelly and support a Dryas shrubland.

Similar sites

R241XY134AK	**Arctic Scrub Loamy Hillslopes** Both are associated with cold, wet permafrost soils. R241XY111AK is an alpine site, with a shorter growing season that supports a unique vegetative community.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Ledum palustre ssp. decumbens* (2) *Betula nana*

Herbaceous	(1) *Carex bigelowii* (2) *Rubus chamaemorus*

Physiographic features

This ecological site occurs on mountain alpine footslopes. Elevation ranges from 1,000 to 3,000 feet above sea level. Slope gradients are nearly level to strongly sloped (0 to 16 percent). This ecological site occurs on all aspects. Ponding is long and frequent. A shallow to moderately deep water table is present during the growing season.

Non-sorted circles are common periglacial microfeatures. They can be mounded well above the surrounding vegetation. Non-sorted circles have unique site and soil properties that result in a mosaic of vegetation and generally have drier soils compared to the reference state.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear
Hillslope profile	(1) Footslope (2) Toeslope
Landforms	(1) Mountains > Mountain (2) Mountains > Mountain (3) Mountains > Mountain > Nonsorted circle
Runoff class	Negligible to medium
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	305–914 m
Slope	0–16%
Ponding depth	0–61 cm
Water table depth	0–99 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 duration	Long (7 to 30 days)

Ponding frequency	None to frequent
Elevation	Not specified
Slope	Not specified
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

The alpine climate of this ecological site includes short, cool growing seasons and long, cold winters. Mean annual temperature ranges from 17 to 29 degrees Fahrenheit, with temperatures typically below freezing from October through April. Approximately 35 percent of total precipitation occurs during the growing season months of June through August. Across the MLRA, snowfall ranges from 40 to 100 inches (USDA-NRCS, 2022).

Table 4. Representative climatic features

Frost-free period (characteristic range)	45-75 days
Freeze-free period (characteristic range)	35-65 days
Precipitation total (characteristic range)	305-559 mm
Frost-free period (actual range)	35-75 days
Freeze-free period (actual range)	25-65 days
Precipitation total (actual range)	279-686 mm
Frost-free period (average)	60 days
Freeze-free period (average)	50 days
Precipitation total (average)	432 mm

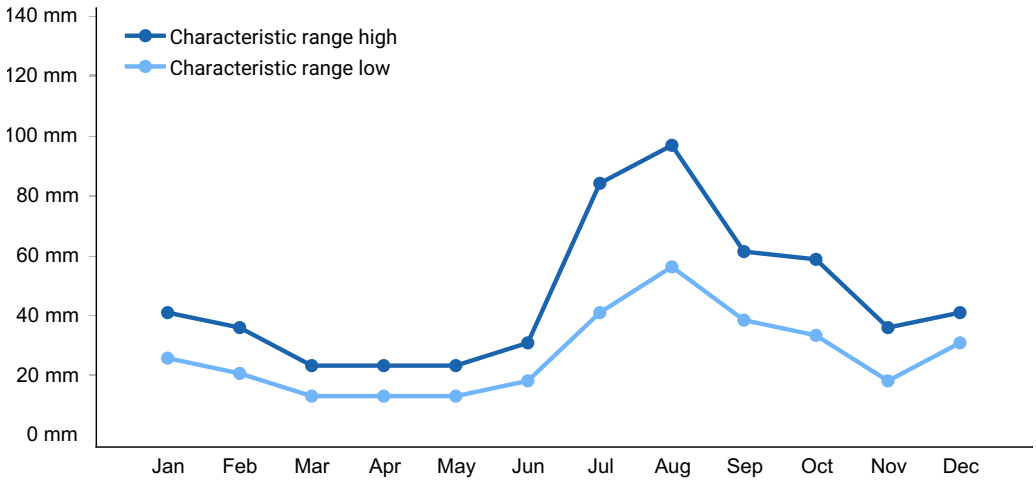


Figure 1. Monthly precipitation range

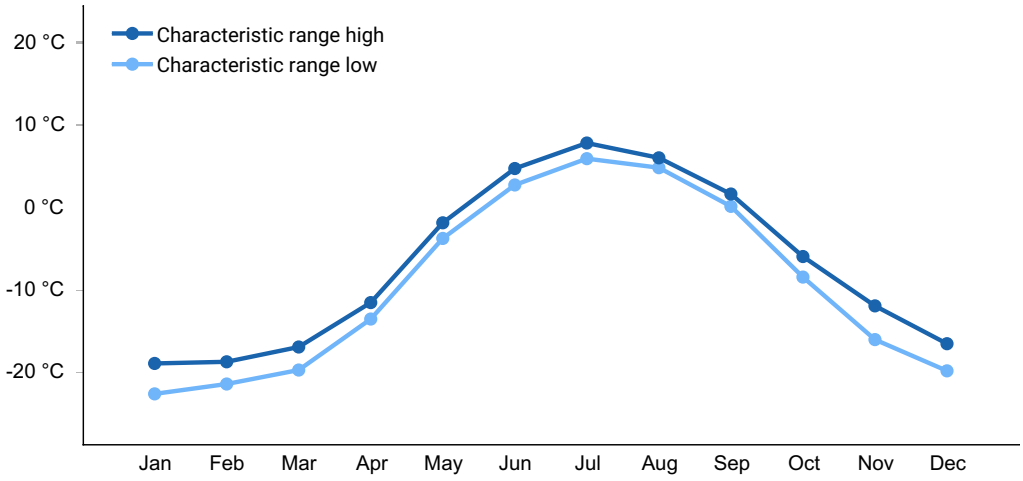


Figure 2. Monthly minimum temperature range

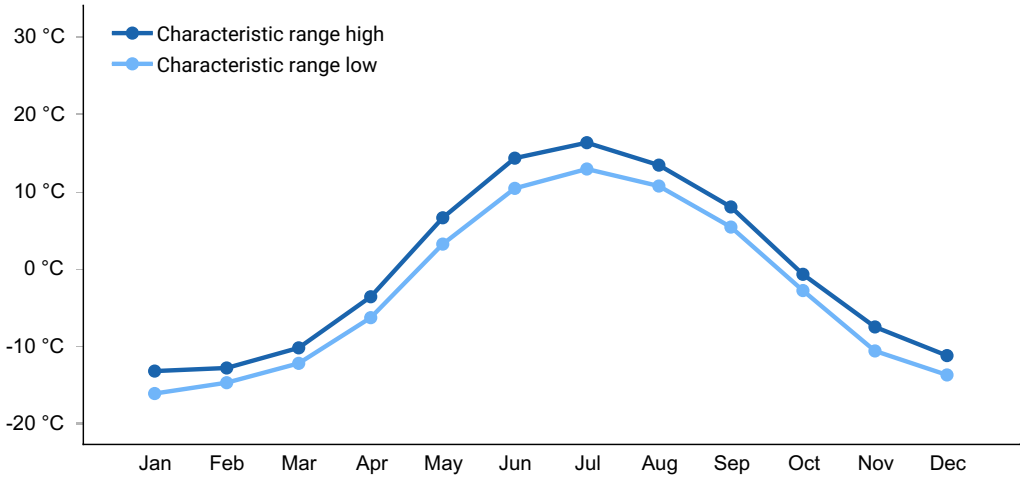


Figure 3. Monthly maximum temperature range

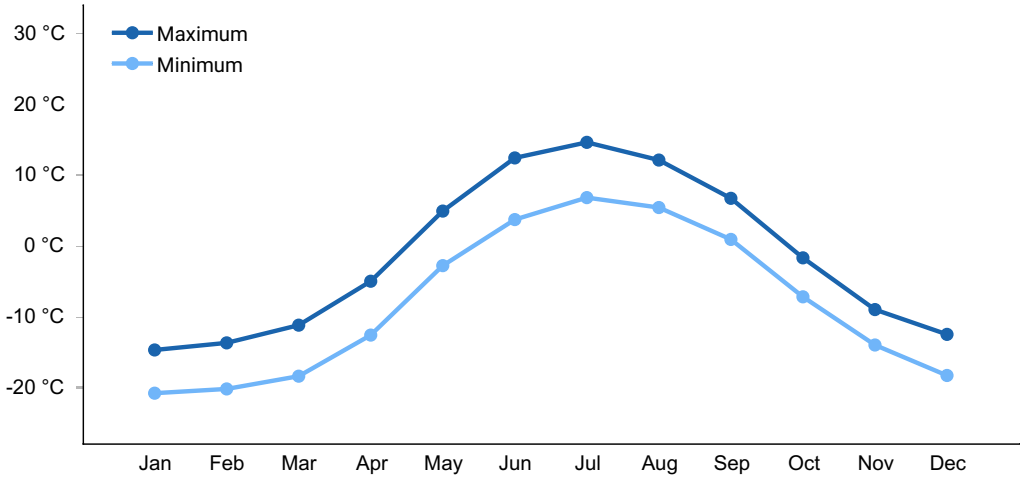


Figure 4. Monthly average minimum and maximum temperature

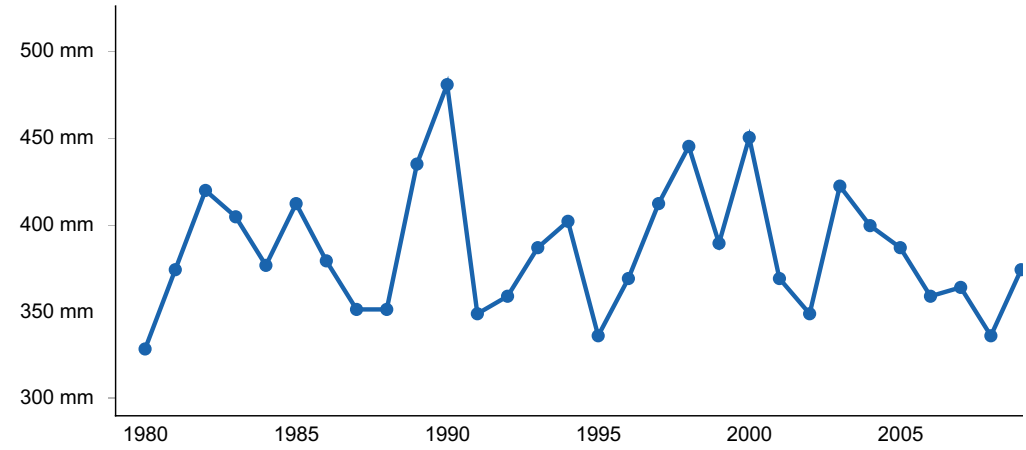


Figure 5. Annual precipitation pattern

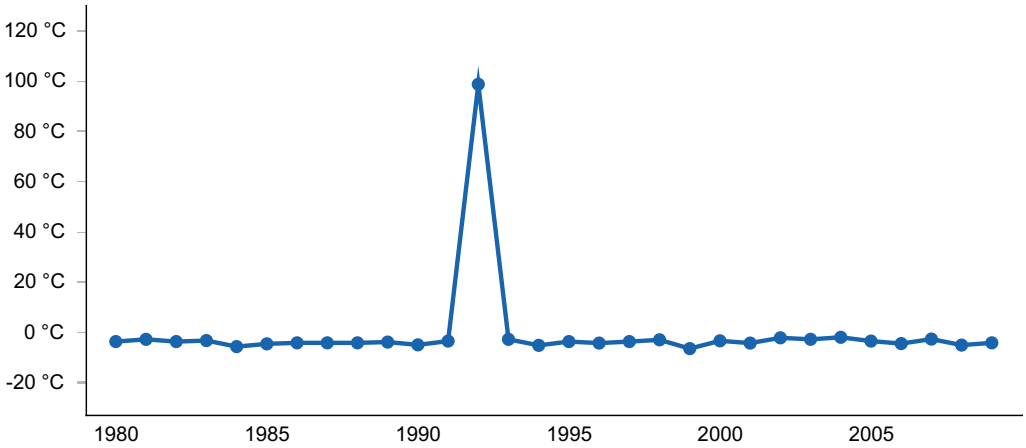


Figure 6. Annual average temperature pattern

Influencing water features

This site is not associated with or influenced by streams or wetlands. Precipitation and throughflow are the main source of water for this ecological site. Surface runoff and throughflow contribute water to downslope ecological sites.

Wetland description

This ecological site may be classified as a slope wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008). A shallow water table is present in the reference state throughout the year

Soil features

Soils in the reference state are frozen, highly organic Historthels (Soil Survey Staff, 2013). Soils developed in loamy or gravelly till. Surface rock fragments are mostly absent... Soils in the reference state support a thick organic mat (8 to 15 inches) that insulates the soil and supports permafrost. Soils are very deep, though permafrost is a root-limiting layer.

Subsurface rock fragment volume is moderate at around 20 percent. Soil pH is extremely to slightly acidic. Soils in the reference state are very poorly drained.

Soils in the alternate state are frozen, wet Aquiturbels. Non-sorted circles have unique soil properties distinct from the reference state. Soils are drier and cryoturbated with surface rock fragments present, and a greater volume of subsurface rock fragments.

Table 5. Representative soil features

Parent material	(1) Colluvium (2) Cryoturbate (3) Eolian deposits
Surface texture	(1) Silt loam (2) Peat
Drainage class	Very poorly drained
Permeability class	Moderate
Depth to restrictive layer	28–38 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	8.13–10.67 cm
Soil reaction (1:1 water) (0-25.4cm)	4.2–6.5
Subsurface fragment volume <=3" (0-76.2cm)	19–20%
Subsurface fragment volume >3" (0-152.4cm)	0–2%

Table 6. Representative soil features (actual values)

Drainage class	Very poorly drained to moderately well drained
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified

Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-76.2cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

The low scrub reference plant community is shaped by factors including cold annual air temperatures and soil wetness caused by permafrost and seasonal melt. Snow pack may further shorten an already short growing season in some concave footslope positions.

Site and soil conditions result in one community that changes little over time (Viereck et al., 1992). Cool temperatures and a shortened growing season support slow growing, often evergreen shrubs. Average shrub height is taller here than in more exposed, convex slopes. Soils are cold and wet and support permafrost. Cryoturbation is generally absent from the reference state, but is present in the alternate state, which limits plant rooting.

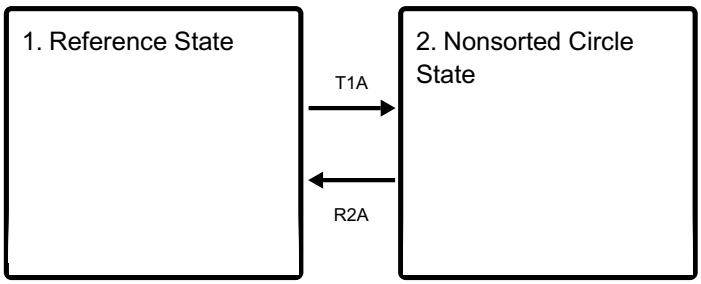
One alternate state is recognized in this ecological site. Non-sorted circles are a type of patterned ground that is not managed for. On gentle slopes, these patterned features are roughly circular and become elongated as steepness increases. These circles are considered non-sorted due to an absence of coarse rock fragments on their borders (Schoeneberger and Wysocki 2017). The formation of these non-sorted circles leads to a distinct mosaic of vegetation.

Non-sorted circles have distinct plant communities that are associated with different positions on the non-sorted circle. The first plant community (2.2) occurs between non-sorted circles and generally resembles the reference plant community. Plant community 2.2 is classified as open low scrub (Viereck et al. 1992). The second community is in the circle center and is mostly unvegetated area with high surface rock fragments (community 2.1).

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

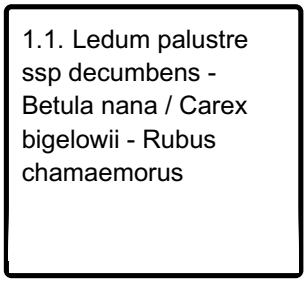
Ecosystem states



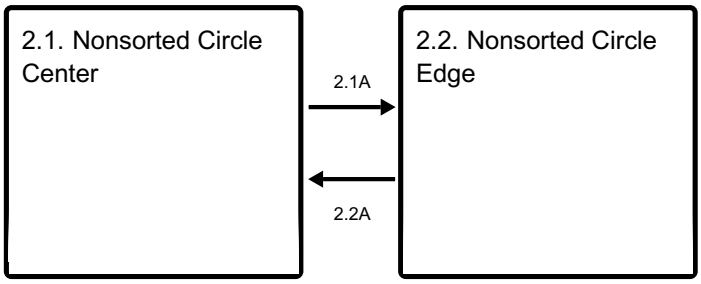
T1A - Nonsorted circle creation

R2A - Cessation of microfeature freezing processes

State 1 submodel, plant communities



State 2 submodel, plant communities



2.1A - Frost heave sorting

2.2A - Frost heave sorting

State 1
Reference State

This reference state is developed and characterized using available vegetation models, most notably United States Department of Agriculture - Soil Conservation Service range surveys (SCS, 1984; Swanson et al., 1985). The reference state describes one distinct vegetative community on frozen slopes. Exposure to wind and low annual temperatures restrict vegetation height. The reference state appears to be stable (Viereck et al., 1992) and does not appear to be susceptible to fire. There is no indication of an alternate grazing state on this site. Targeted data collection may be able to address whether grazing or browsing in the reference state result in an alternate state.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- netleaf willow (*Salix reticulata*), shrub
- eightpetal mountain-avens (*Dryas octopetala*), shrub
- sedge (*Carex*), grass
- cottongrass (*Eriophorum*), grass
- Altai fescue (*Festuca altaica*), grass
- cloudberry (*Rubus chamaemorus*), other herbaceous
- field horsetail (*Equisetum arvense*), other herbaceous

Community 1.1
Ledum palustre ssp decumbens - Betula nana / Carex bigelowii - Rubus chamaemorus

This community is an open low scrubland (Viereck et al., 1992). The major plant groups are low shrubs, dwarf shrubs, medium graminoids, and medium forbs (Swanson et al., 1985). Plant height is restricted by wind exposure. Community structure including plant height and composition are restricted by permafrost, which creates a root-restrictive layer and supports wet soils. Ground cover is a mix of mosses, lichen, and herbaceous litter. Tabular data for this community is from the 1984 Seward range site publication (SCS, 1984), with supplemental information from Swanson et al. (1985).

Forest understory. Live lichen and moss annual production cannot be measured accurately due to a lack of information on growth rates and/or slow annual growth rates. Lichen and moss biomass data below refers to total biomass, while vascular plants biomass refers to annual production.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- netleaf willow (*Salix reticulata*), shrub
- eightpetal mountain-avens (*Dryas octopetala*), shrub
- sedge (*Carex*), grass
- cottongrass (*Eriophorum*), grass
- Altai fescue (*Festuca altaica*), grass
- cloudberry (*Rubus chamaemorus*), other herbaceous
- field horsetail (*Equisetum arvense*), other herbaceous
- arctic sweet coltsfoot (*Petasites frigidus*), other herbaceous

Table 7. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Moss	1054	2275	3385
Lichen	73	381	684
Shrub/Vine	443	510	560
Grass/Grasslike	202	235	258
Forb	163	185	202
Total	**1935**	**3586**	**5089**

Table 8. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	25-50%
Grass/grasslike foliar cover	12-25%
Forb foliar cover	25-50%
Non-vascular plants	30-60%
Biological crusts	0%
Litter	12-25%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-6%
Bedrock	0%
Water	0-6%
Bare ground	0-6%

State 2
Nonsorted Circle State

This state is developed and characterized using available vegetation models and published literature and is supplemented with field experience. This state describes two communities that make up nonsorted circles. The inner part of the circle is often unvegetated and is dominated by surface rock fragments and bare soil. The circle ring is comprised of similar vegetation to that of the reference state. This community does not appear to be susceptible to fire. Exposure to wind and low annual temperatures restrict vegetation height. The historic and current use of introduced ungulates in MLRA 241X may have altered the potential natural vegetation on this ecological site. No data indicates an alternate grazing state on this site. Targeted data collection may be able to address whether grazing or browsing in the reference state result in an alternate state.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- sedge (*Carex*), grass
- Altai fescue (*Festuca altaica*), grass

Community 2.1
Nonsorted Circle Center

Vegetation in this community is sparse or absent. Surface rock fragments and bare soil make up the majority of ground cover.

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	0-2%
Grass/grasslike foliar cover	0-2%
Forb foliar cover	0-2%
Non-vascular plants	0-5%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	20-50%
Surface fragments >3"	5-15%
Bedrock	0%
Water	0%
Bare ground	50-75%

Community 2.2
Nonsorted Circle Edge

This community is a dwarf scrubland (Viereck et al., 1992). It is typically made up of species present in the reference state. Community composition of nonsorted circle ring vegetation varies between and within areas. Plant height is restricted by wind exposure. This community supports a mix of alpine and ericaceous species.

Dominant plant species

- eightpetal mountain-avens (*Dryas octopetala*), shrub
- netleaf willow (*Salix reticulata*), shrub
- entireleaf mountain-avens (*Dryas integrifolia*), shrub

- dwarf birch (*Betula nana*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- Altai fescue (*Festuca altaica*), grass
- wideleaf polargrass (*Arctagrostis latifolia*), grass
- sedge (*Carex*), grass

Pathway 2.1A
Community 2.1 to 2.2

The process that creates nonsorted circles creates communities 2.1 and 2.2 simultaneously. Soil at the center of a circle is frozen and cryoturbated, restricting most vegetation colonization and growth.

Pathway 2.2A
Community 2.2 to 2.1

The process that creates nonsorted circles creates communities 2.1 and 2.2 simultaneously. Soil pushed to the edge of the circle generally remains vegetated with the same species found in the reference state.

Transition T1A
State 1 to 2

The process that creates nonsorted circles creates communities 2.1 and 2.2 simultaneously. The creation dynamics of nonsorted circles are not fully understood. It is suggested that gaps in the insulation provided by the organic layer allow available water to freeze. Surface and subsurface freezing restrict plant roots and growth, eventually removing vegetation from the center. A ring of vegetation is created as water is pulled into the center of the bare circle (Daanen et al., 2008).

Restoration pathway R2A
State 2 to 1

The full cycle of nonsorted circles is poorly understood. It is suggested that if the freeze/thaw process that creates and maintains nonsorted circles ends, then edge vegetation may colonize the circle, reestablishing the reference state across the microfeature.

Additional community tables

Table 10. Community 1.1 plant community composition

				Annual Production	Foliar

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Undefined					
1	**Vascular plants**			807–1054	
Shrub/Vine					
2	**Shrubs**			448–560	
	marsh Labrador tea	LEPAD	*Ledum palustre ssp. decumbens*	163–179	–
	dwarf birch	BENA	*Betula nana*	151–168	–
	bog blueberry	VAUL	*Vaccinium uliginosum*	140–151	–
	mountain alder	ALVIC	*Alnus viridis ssp. crispa*	123–135	–
	tealeaf willow	SAPU15	*Salix pulchra*	101–112	–
	lingonberry	VAVI	*Vaccinium vitis-idaea*	62–67	–
	Richardson's willow	SARI4	*Salix richardsonii*	10–11	–
	black crowberry	EMNI	*Empetrum nigrum*	9–10	–
	alpine bearberry	ARAL2	*Arctostaphylos alpina*	0–1	–
	netleaf willow	SARE2	*Salix reticulata*	1	–
	small cranberry	VAOX	*Vaccinium oxycoccos*	0–1	–
	Lapland rosebay	RHLA2	*Rhododendron lapponicum*	0–1	–
	Alaska bog willow	SAFU	*Salix fuscescens*	1	–
Grass/Grasslike					
3	**Grass/Grasslike**			202–258	
	Bigelow's sedge	CABI5	*Carex bigelowii*	163–179	–
	tussock cottongrass	ERVA4	*Eriophorum vaginatum*	118–129	–
	water sedge	CAAQ	*Carex aquatilis*	11–12	–
	cottongrass	ERIOP	*Eriophorum*	8–9	–
Forb					
4	**Forbs**			163–202	
	cloudberry	RUCH	*Rubus chamaemorus*	22	–
	field horsetail	EQAR	*Equisetum arvense*	11–12	–
	arctic sweet coltsfoot	PEFR5	*Petasites frigidus*	6	–
Lichen					
5	**Live lichen biomass**			73–684	

		FLCU	*Flavocetraria cucullata*	7–15	–
	cup lichen	CLADO3	*Cladonia*	6–12	–
	greygreen reindeer lichen	CLRA60	*Cladina rangiferina*	6–11	–
	reindeer lichen	CLAR60	*Cladina arbuscula*	3–8	–
	reindeer lichen	CLMI60	*Cladina mitis*	3–7	–
	cup lichen	CLGR13	*Cladonia gracilis*	2–6	–
	island cetraria lichen	CEIS60	*Cetraria islandica*	2–6	–
	cup lichen	CLAM60	*Cladonia amaurocraea*	1–2	–
	Lichen	2LICHN	*Lichen*	1–2	–
Moss					
6	**Moss / Clubmoss biomass**			1054–3385	

Animal community

This site is distinguished from most other tundra types by the somewhat greater "structural diversity" of its vegetation; that is, in addition to supporting dwarf shrubs and herbs common on other tundra sites, taller shrubs - up to 4 ft in height - may grow scattered across these areas. The presence of taller shrubs may permit some birds and mammals otherwise not found in similar tundra areas to use this site for cover, perching, nesting feeding, etc. In addition, taller shrubs may remain accessible above the snow in winter, thus providing winter, as well as summer, food and possibly cover. As a result, moose, caribou, willow ptarmigan, and other animals that eat shrubby browse may use this site year-round. In general, however, wildlife use of this site, like of other tundra sites, shows tremendous seasonal variation. In summer, this site supports a flurry of breeding, nesting, feeding, and raising young by small plant- and insect-eating species, such as lemmings, shrews, voles, sandpipers, longspurs, and arctic hares; as well as by predators, such as least weasel, red fox, wolverine, rough-legged hawk, snowy owl, jaeger, etc. intent on feeding their own young. Moose, caribou, muskox, and grizzly bear may also appear in the summer, feeding on leaves, berries, and other scrubby browse. By winter, most birds have headed south, shrews and small rodents have moved underground, and most predators have gone to more productive sites at lower altitudes. Caribou, muskox, and less commonly moose, may still use this site, however, feeding on the shrubs protruding above the snow or pawing through the snow for buried lichens.

Recreational uses

This site is used for snowmobiling, dogsledding, hunting and trapping (for bear, muskox, and wolverine), and grayling fishing in nearby streams. Berry picking is the most important use of this site because of the abundance of berry-producing plants growing (blueberries, crowberries, low bush cranberries). This site has the potential for

sightseeing and photography since the general area includes canyons, rock formations, lakes, lavabeds, and hot springs.

Wood products

No wood products available from this site.

Other products

Grazing

This site is a good summer range and a fair fall range. Lichen production is low so would be a poor winter range. This is also a fair spring range as it is one of the first sites to start greening up and can provide nutritious forage.

Other information

These interpretive narratives were developed for USDA reports of range sites on the Seward Peninsula and appear here as written when originally published (SCS, 1984; Swanson et al., 1985).

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

LANDFIRE Biophysical Settings Models (LANDFIRE, 2009)

Ecological site descriptions of the Seward Peninsula (SCS, 1984).

Range survey of the Seward Peninsula reindeer ranges (Swanson et al., 1985)

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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	03/12/2026
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):**

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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):**

---

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:

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17. **Perennial plant reproductive capability:**
