

Ecological site R241XY130AK

Arctic Scrub Loamy Warm Hillslopes

Last updated: 5/29/2025

Accessed: 03/12/2026

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): 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, Kougarak, 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) / Shrub birch thicket (II.C.2.a – level IV)
(Vioreck et al., 1992)

BioPhysical Settings: 6816822 – Alaska Arctic Scrub Birch – Ericaceous Shrub
(LANDFIRE, 2009)

Seward Rangesites

35A – Shrub birch (Hillside)

(SCS, 1984; Swanson et al., 1985)

Ecological site concept

Ecological Site characteristics:

- Associated with a productive closed shrubland on valley plains and hill slopes.
- Soils are poorly developed Inceptisols evidenced by a shallow cambic horizon
- Permafrost is absent but a shallow strongly contrasting textural stratification is present
- Fire is the major disturbance on site and is responsible for one post-disturbance community
- The reference plant community is a birch-ericaceous shrubland with graminoids and sparse forbs throughout

Associated sites

R241XY134AK	Arctic Scrub Loamy Hillslopes R241XY134AK describes open, low scrublands mountains, hills, and plains. Annual temperatures are cooler, average shrub height is lower, and community production is expected to be less than that of R241XY130AK.
R241XY131AK	Arctic Tussock Loamy Frozen Slopes R241XY131AK describes the tussock tundra on plains and hills with wet, permafrost soils.

Similar sites

R241XY134AK	Arctic Scrub Loamy Hillslopes R241XY134AK describes open, low scrublands on colder hill and plain slopes. Shrub height is on average lower, and community production is expected to be less than that of R241XY130AK.
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Table 1. Dominant plant species

Tree	Not specified
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Shrub	(1) <i>Betula glandulosa</i> (2) <i>Betula nana</i>
Herbaceous	(1) <i>Carex bigelowii</i> (2) <i>Calamagrostis canadensis</i>

Physiographic features

This ecological site occurs on hill slopes and plains in broad valley landscapes in the arctic climatic zone. Elevation typically ranges from 100 to 1,000 feet above sea level, though may extend higher on warmer aspects. Slope gradients are strongly sloped (4 to 20 percent) and this site occurs at all aspects. A deep-water table is present throughout the year.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Linear
Geomorphic position, hills	(1) Base Slope (2) Side Slope
Landforms	(1) Valley > Plain (2) Valley > Hill
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	30–305 m
Slope	4–20%
Water table depth	99–152 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	30–610 m
Slope	Not specified
Water table depth	Not specified

Climatic features

The Arctic climate of this ecological site includes short, cool growing seasons and long, cold winters. Mean annual temperature at sea level is about 22 degrees Fahrenheit in the coastal village of Wales. 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)	60-90 days
Freeze-free period (characteristic range)	50-80 days
Precipitation total (characteristic range)	356-406 mm
Frost-free period (actual range)	50-90 days
Freeze-free period (actual range)	40-80 days
Precipitation total (actual range)	254-457 mm
Frost-free period (average)	75 days
Freeze-free period (average)	65 days
Precipitation total (average)	381 mm

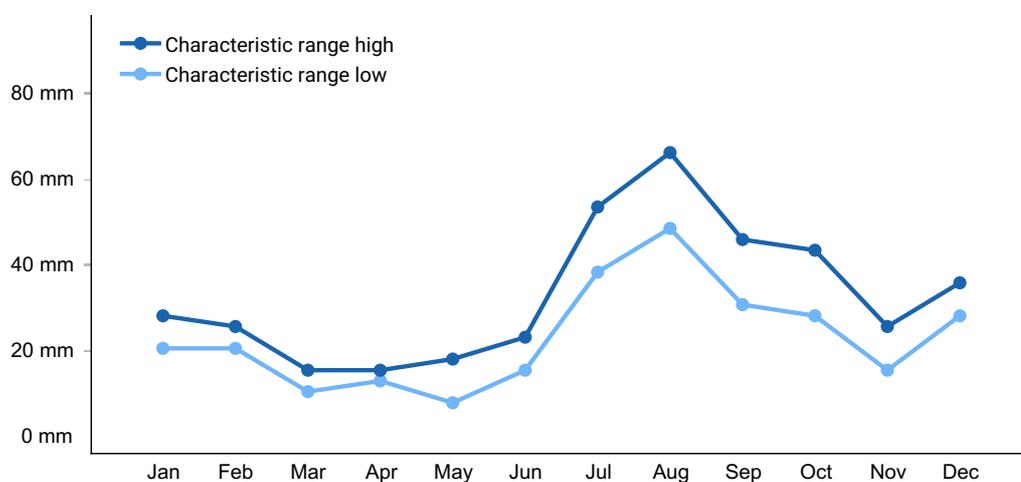


Figure 1. Monthly precipitation range

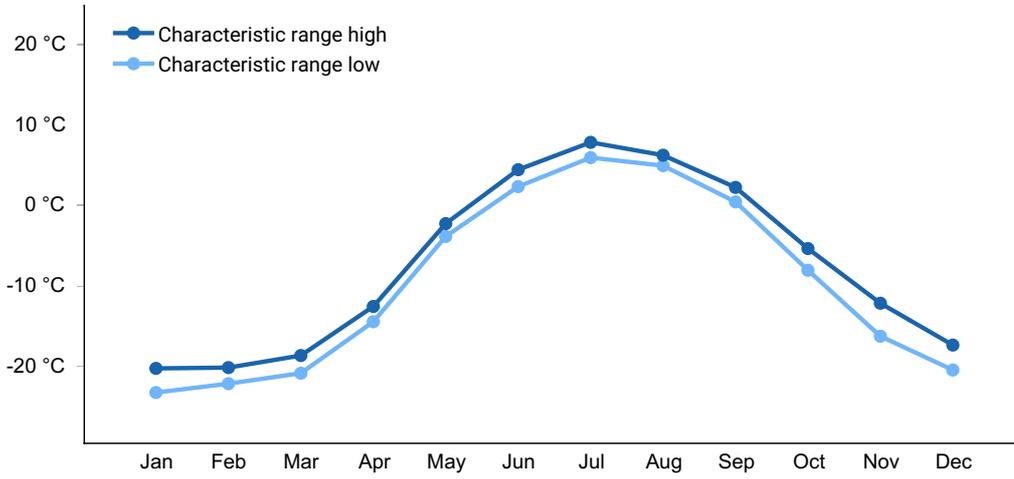


Figure 2. Monthly minimum temperature range

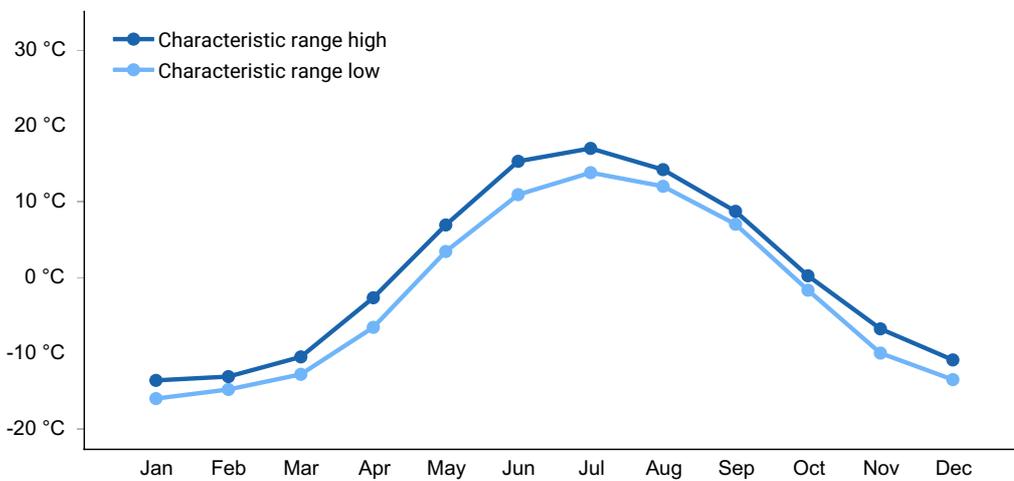


Figure 3. Monthly maximum temperature range

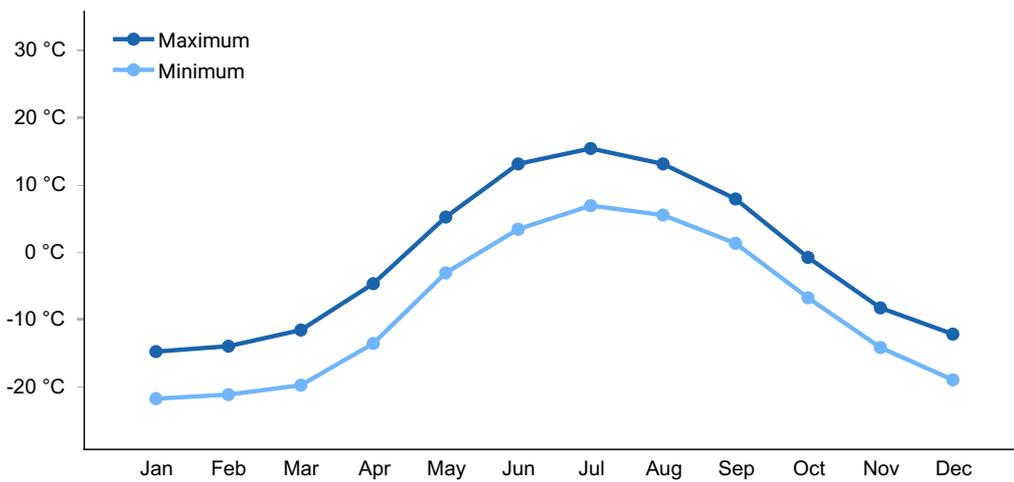


Figure 4. Monthly average minimum and maximum temperature

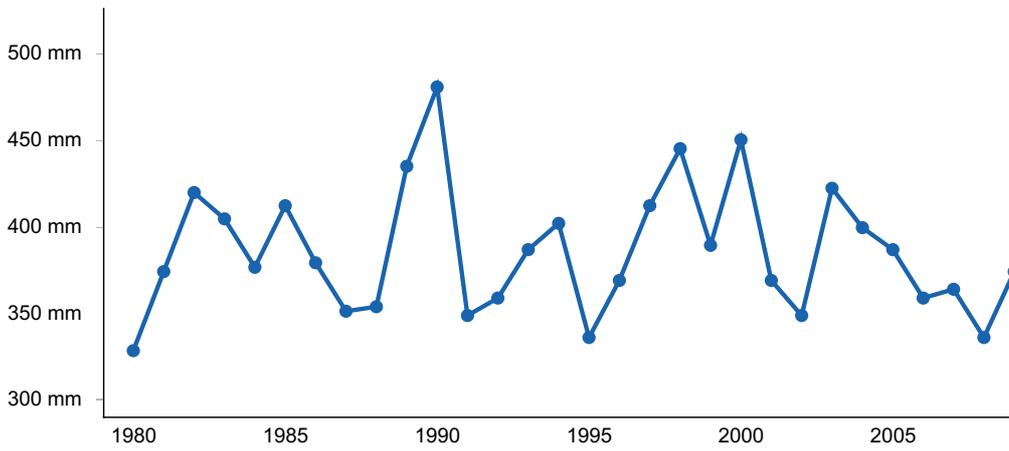


Figure 5. Annual precipitation pattern

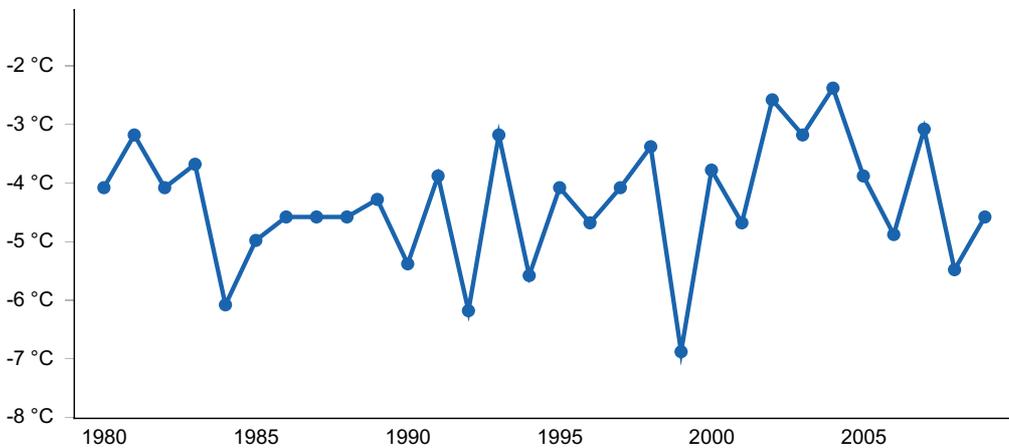


Figure 6. Annual average temperature pattern

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 is not associated with wetlands.

Soil features

Soils are dry Inceptisols formed in eolian over gravelly till (Soil Survey Staff, 2013). Rock fragments on the soil surface are rare. Soils have a thin three-inch organic cap above the mineral soil. Soils are very deep, but a shallow contrasting textural stratification is present. Subsurface rock fragment volume is moderate (35 to 45 percent). Soil pH varies in the soil profile from extremely to slightly acidic. Soils are well drained, but water is available due to a deep water table (39 to 60 inches) during the growing season.

Table 5. Representative soil features

Parent material	(1) Till (2) Eolian deposits
Surface texture	(1) Silt loam
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Depth to restrictive layer	5–15 cm
Soil depth	152 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	4.57–6.6 cm
Soil reaction (1:1 water) (0-25.4cm)	4.3–7
Subsurface fragment volume ≤3" (0-152.4cm)	35–39%
Subsurface fragment volume >3" (0-152.4cm)	2–5%

Ecological dynamics

The Seward Peninsula Highlands (MLRA 241X) is in the arctic where the harsh climate limits the composition and structure of plant communities. This area has cool, short summers and long, cold winters. Limited warmth during the short growing season inhibits trees from occurring. Ordinarily, cold temperatures limit the vertical structure of shrubs and other functional groups (Raynolds et al., 2006). However, warmer slopes do support taller shrubs.

This ecological site describes a closed shrubland on valley plains and hillslopes. Slope convexity and poorly developed soils support birch and ericaceous shrubs in the reference plant community. This ecological site is often downslope of a similar ecological site in the alpine. Temperatures are warmer and is recognized by taller shrub height, suspected higher plant annual production rates, and the inclusion of resin birch (*Betula glandulosa*), which is not present in the alpine.

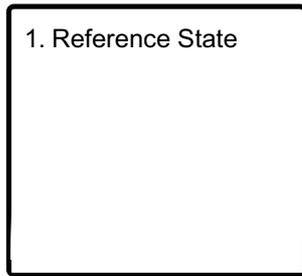
Fire is the major disturbance on this ecological site. It is responsible for a unique post-disturbance community. Post-fire community composition depends on fire factors such as frequency and severity. Moderate fires may only burn surface vegetation, leaving extant species to resprout immediately from seed source and surviving root stock. A severe fire burns the organic layer and destroys part or all of the root stock. Post-fire vegetation

consists of fast-growing herbaceous species.

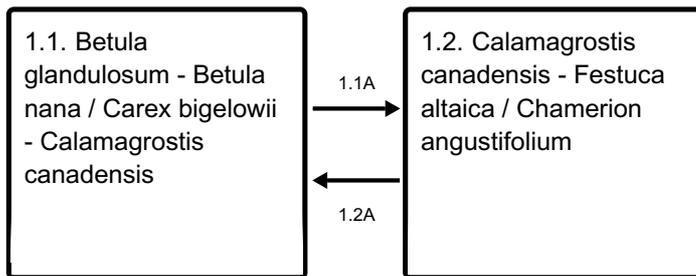
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on professional experience and a review of available scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances,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

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Fire

1.2A - Fire recovery

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 two distinct vegetative communities supported by a fire cycle regime. This ecological site is primarily found on warmer, southern aspects. Vegetation grows to taller heights than similar communities at colder aspects and higher elevations. 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

- resin birch (*Betula glandulosa*), shrub
- dwarf birch (*Betula nana*), shrub

- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- marsh Labrador tea (*Ledum palustre* ssp. *decumbens*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- bluejoint (*Calamagrostis canadensis*), grass

Community 1.1

Betula glandulosum - Betula nana / Carex bigelowii - Calamagrostis canadensis

This community is a closed low scrubland (Viereck et al., 1992). Major plant groups are medium shrubs, low shrubs, and medium graminoids (Swanson et al., 1985). This community is comprised of birch and ericaceous shrubs. Average annual temperature is warmer than alpine sites. This, along with the absence of root-restricting permafrost, allow for taller vertical shrub growth forms. Ground cover is primarily mosses. 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

- resin birch (*Betula glandulosa*), shrub
- dwarf birch (*Betula nana*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- marsh Labrador tea (*Ledum palustre* ssp. *decumbens*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- (*Flavocetraria cucullata*), other herbaceous
- island cetraria lichen (*Cetraria islandica*), other herbaceous
- greygreen reindeer lichen (*Cladina rangiferina*), other herbaceous

Table 6. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Moss	314	3239	8305
Shrub/Vine	684	818	953
Grass/Grasslike	78	95	112
Forb	39	50	56
Lichen	11	22	34
Total	1126	4224	9460

Table 7. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	50-75%
Grass/grasslike foliar cover	6-12%
Forb foliar cover	6-12%
Non-vascular plants	25-60%
Biological crusts	0%
Litter	12-25%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Community 1.2

Calamagrostis canadensis - Festuca altaica / Chamerion angustifolium

This community has generally been burned within the last 5 years (Landfire, 2009). It is comprised of extant species present pre-burn, as well as fast-growing colonizing herbaceous species. Major plant groups are tall and medium graminoids, and medium and low forbs (Landfire, 2009). Ground cover varies based on burn severity and time since burn, but usually supports mosses, lichens, herbaceous litter, and water.

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

- bluejoint (*Calamagrostis canadensis*), grass
- Altai fescue (*Festuca altaica*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous

Pathway 1.1A

Community 1.1 to 1.2

Fire is the major disturbance on this site, though poorly understood. Without fire, this site appears to be stable over time (Viereck et al., 1992). Even though susceptible to fire, the mean fire return intervals may range up to once per six hundred to one thousand years (Landfire, 2009). Fire effects on this site are dependent on fire severity and frequency. One effect is the creation of open areas where fast growing, herbaceous species colonize.

Pathway 1.2A

Community 1.2 to 1.1

Fire recovery occurs regularly quickly, generally within five years (Landfire, 2009). Shrubs recolonize and spread from surviving rootstock or via seed.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Undefined					
1	Vascular Plants			807–1121	
Shrub/Vine					
2	Shrub			684–953	
	resin birch	BEGL	<i>Betula glandulosa</i>	174–241	–
	dwarf birch	BENA	<i>Betula nana</i>	157–213	–
	bog blueberry	VAUL	<i>Vaccinium uliginosum</i>	151–213	–
	tealeaf willow	SAPU15	<i>Salix pulchra</i>	67–95	–
	black crowberry	EMNI	<i>Empetrum nigrum</i>	22–34	–
	grayleaf willow	SAGL	<i>Salix glauca</i>	17–28	–
	Alaska bog willow	SAFU	<i>Salix fuscescens</i>	17–22	–
	lingonberry	VAVI	<i>Vaccinium vitis-idaea</i>	17–22	–
	beauverd spirea	SPST3	<i>Spiraea stevenii</i>	11–17	–
	marsh Labrador tea	LEPAD	<i>Ledum palustre ssp.</i>	10–15	–

			<i>decumbens</i>		
	shrubby cinquefoil	DAFR6	<i>Dasiphora fruticosa</i>	7–10	–
	mountain alder	ALVIC	<i>Alnus viridis ssp. crispa</i>	4–6	–
	white arctic mountain heather	CATE11	<i>Cassiope tetragona</i>	4–6	–
	entireleaf mountain-avens	DRIN4	<i>Dryas integrifolia</i>	1–2	–
	bog rosemary	ANPO	<i>Andromeda polifolia</i>	1–2	–
	red fruit bearberry	ARRU	<i>Arctostaphylos rubra</i>	1	–
	netleaf willow	SARE2	<i>Salix reticulata</i>	1	–
Grass/Grasslike					
3	Grass/Grasslike			78–112	
	Bigelow's sedge	CABI5	<i>Carex bigelowii</i>	62–90	–
	bluejoint	CACA4	<i>Calamagrostis canadensis</i>	22–28	–
	water sedge	CAAQ	<i>Carex aquatilis</i>	1–2	–
	tussock cottongrass	ERVA4	<i>Eriophorum vaginatum</i>	1–2	–
	Altai fescue	FEAL	<i>Festuca altaica</i>	1–2	–
	arctic bluegrass	POAR2	<i>Poa arctica</i>	1–2	–
	glaucous bluegrass	POGL	<i>Poa glauca</i>	1–2	–
Forb					
4	Forb			39–56	
	boreal sagebrush	ARAR9	<i>Artemisia arctica</i>	17–22	–
	field horsetail	EQAR	<i>Equisetum arvense</i>	6–8	–
	tall bluebells	MEPA	<i>Mertensia paniculata</i>	4–7	–
	arctic raspberry	RUAR	<i>Rubus arcticus</i>	4–6	–
	tall Jacob's-ladder	POAC	<i>Polemonium acutiflorum</i>	3–4	–
	cloudberry	RUCH	<i>Rubus chamaemorus</i>	2–3	–
	narrowleaf saw-wort	SAAN3	<i>Saussurea angustifolia</i>	2–3	–
	roseroot stonecrop	RHRO3	<i>Rhodiola rosea</i>	2–3	–
	wintergreen	PYROL	<i>Pyrola</i>	1–2	–
	buttercup	RANUN	<i>Ranunculus</i>	1–2	–
	licorice-root	LIGUS	<i>Ligusticum</i>	1–2	–
	arctic sweet coltsfoot	PEFR5	<i>Petasites frigidus</i>	1–2	–
	lousewort	PEDIC	<i>Pedicularis</i>	1	–

	variegated scouringrush	EQVA	<i>Equisetum variegatum</i>	0–1	–
	sweetvetch	HEDYS	<i>Hedysarum</i>	1	–
	Forb (herbaceous, not grass nor grass-like)	2FORB	<i>Forb (herbaceous, not grass nor grass-like)</i>	1	–
	dwarf fireweed	CHLA13	<i>Chamerion latifolium</i>	0–1	–
	alpine bistort	POVI3	<i>Polygonum viviparum</i>	0–1	–
	purple marshlocks	COPA28	<i>Comarum palustre</i>	0–1	–
	arctic starflower	TREU	<i>Trientalis europaea</i>	1	–
	arctic dock	RUAR6	<i>Rumex arcticus</i>	0–1	–
Lichen					
5	Live lichen biomass			11–34	
	island cetraria lichen	CEIS60	<i>Cetraria islandica</i>	3–9	–
		FLCU	<i>Flavocetraria cucullata</i>	2–7	–
	reindeer lichen	CLAR60	<i>Cladina arbuscula</i>	2–6	–
	greygreen reindeer lichen	CLRA60	<i>Cladina rangiferina</i>	2–6	–
	cup lichen	CLGR13	<i>Cladonia gracilis</i>	1–2	–
	Lichen	2LICHN	<i>Lichen</i>	1–2	–
	arctic dactylina lichen	DAAR60	<i>Dactylina arctica</i>	0–1	–
Moss					
6	Moss/Clubmoss biomass			314–8305	

Animal community

A variety of birds and mammals find food and cover in this site, particularly where the dense shrub-birch canopy opens enough to permit a well-developed understory of grasses, forbs, and low-growing shrubs. Shrub birch are a preferred moose browse; hence this site provides high-quality feeding areas for moose year-round, and may be particularly important in winter when herbaceous moose forage is buried by snow. Another shrub-associated species commonly found here is the willow ptarmigan, which feeds on leaves, twigs, buds, catkins, and berries, of the birch, willow, and blueberry species abundant in this site. Other shrub-dwelling birds are the arctic warbler and the common redpoll and where grass seed can be found, white crowned and gold crowned sparrows may appear. If the herbaceous understory in this site is relatively well developed, small rodents increase in number and diversity, including voles and lemmings. These feed primarily on herbaceous species while finding cover among the shrubs. Near mountain streams, this site may also support muskrat, beaver, mink, and least weasel. On drier sites, red fox and rough-legged hawk will be among the most common predators.

Recreational uses

This site provides excellent observation for wildlife. Hunting for moose and caribou and trapping for red fox have high value on this site. Blueberries, scattered with other berry-producing plants in the understory, can be found on this site for the berry picker. In nearby streams, fishing for grayling and panning for gold might also be potential activities.

Wood products

No wood products available from this site.

Other products

Grazing

This site is a poor spring, a good summer and a fair fall range. Dwarf arctic birch (*Betula nana*) and Alaska bog willow (*Salix fuscescens*) can provide high value forage during these seasons.

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 (Vioreck 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):**

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:**
