USDA Natural Resources
Conservation Service

Ecological site R240XY732AK
Subalpine Tall Scrub Gravelly Slopes

Last updated: 6/05/2025
Accessed: 03/22/2026

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): 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:
Open tall scrubland (II.B.2 - level III) / Alder scrubland (II.B.2.b - level IV) (Viereck et al.,

1992)

BioPhysical Settings:
6816380 – Alaska Arctic Mesic Alder Shrubland
(Landfire, 2009)

Circumpolar Arctic Vegetation Map:
S2.1 – Closed alder (community 51)
(CAVM Team, 2003)

Ecological site concept

• Occurs on strongly sloping to steep mountain and hill slopes
• Generally, occurs between 1,000 and 1,200 feet above sea level but may extend to much higher and lower slopes as local annual temperature allows
• Soils are gravelly and well drained, lacking permafrost
• Fire is the major disturbance on this site and results in one distinct post-fire community
• The reference plant community is an open tall alder scrubland with low and medium shrubs in open areas

Associated sites

R240XY730AK	**Alpine Dwarf Scrub Gravelly Slopes** R240XY730AK describes the alpine dwarf scrub-lichen community. It is located on shallow, less developed soils on exposed landforms. It is upslope of this ecological site.
R240XY710AK	**Arctic Scrub Wet Drainages** R240XY710AK describes scrub wet drainages. These mountain drainages bisect the ecological site where they are found together in the subalpine.
R240XY731AK	**Subalpine Ericaceous Scrub Loamy Slopes** R240XY731AK describes an ericaceous and willow scrubland found at similar elevations. Associated soils are cold, wet, and are more poorly drained than those associated with this ecological site.

Similar sites

R240XY710AK	**Arctic Scrub Wet Drainages** R240XY710AK describes scrub wet drainages. Presence of a flooding regime and differences in soil characteristics support unique vegetation and different ecological sites.

Table 1. Dominant plant species

Tree	Not specified

Shrub	(1) *Alnus* (2) *Spiraea stevenii*
Herbaceous	(1) *Calamagrostis canadensis* (2) *Dryopteris expansa*

Physiographic features

This ecological site occurs on non-alpine arctic mountain and hill slopes. Elevation generally ranges from 1,000 to 1,200 feet above sea level but can extend much lower and higher in elevation as temperature conditions allow. This ecological site is restricted to the subalpine in areas where trees have colonized from neighboring MLRAs. Slope gradients are strongly sloping to steep (8 to 45 percent). This ecological site occurs on all aspects. A water table is absent from this ecological site. Flooding and ponding do not occur.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Linear (2) Convex
Hillslope profile	(1) Backslope (2) Shoulder (3) Footslope
Landforms	(1) Mountains > Mountain (2) Mountains > Mountain (3) Hills > Hill
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	305–366 m
Slope	8–45%
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	152–914 m
Slope	0–70%

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)	330-508 mm
Frost-free period (actual range)	24-96 days
Freeze-free period (actual range)	72-108 days
Precipitation total (actual range)	254-584 mm
Frost-free period (average)	72 days
Freeze-free period (average)	92 days
Precipitation total (average)	356 mm

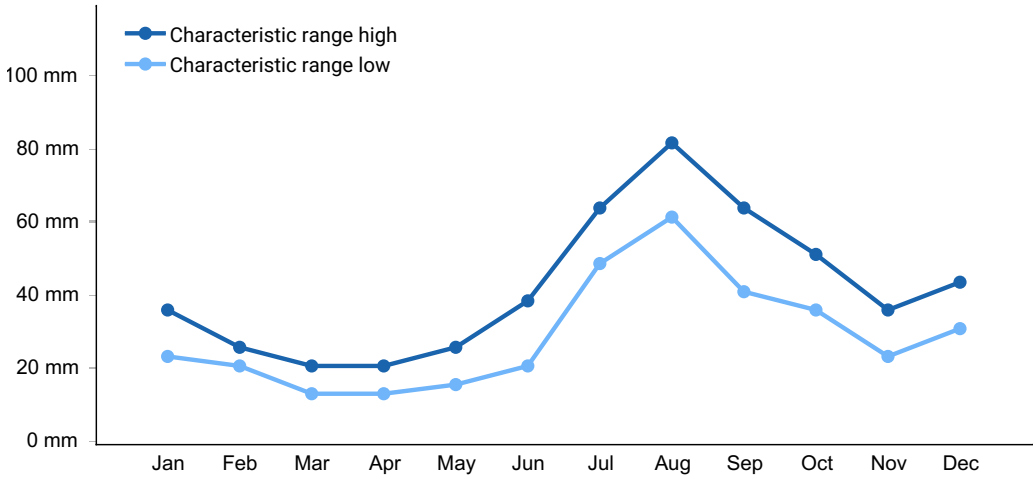


Figure 1. Monthly precipitation range

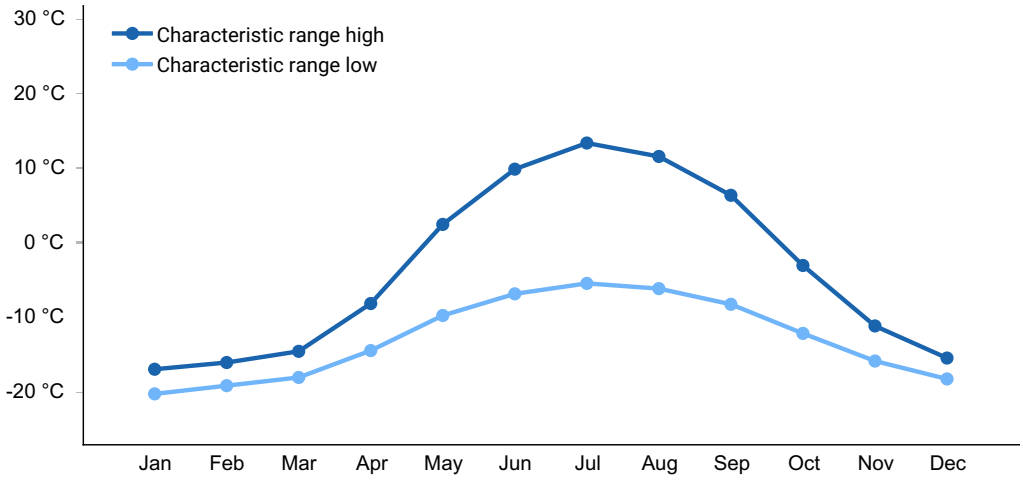


Figure 2. Monthly minimum temperature range

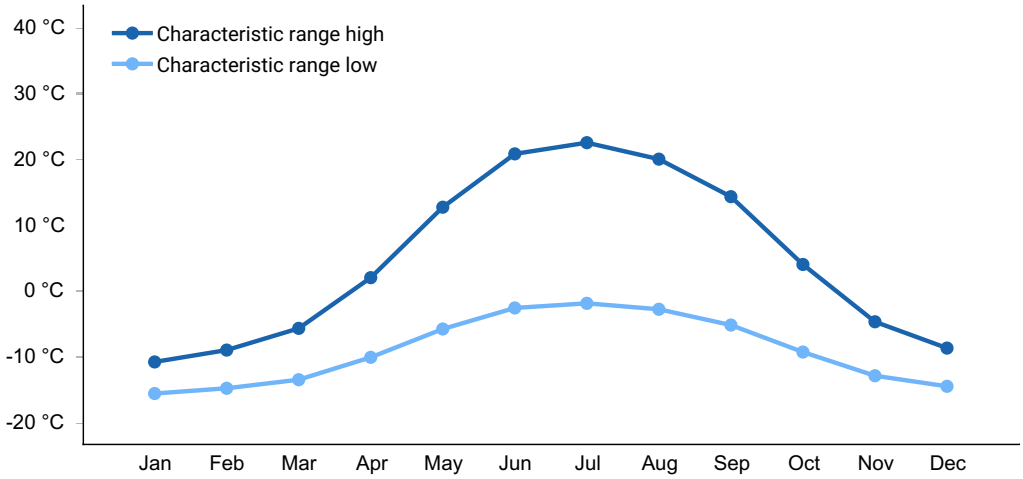


Figure 3. Monthly maximum temperature range

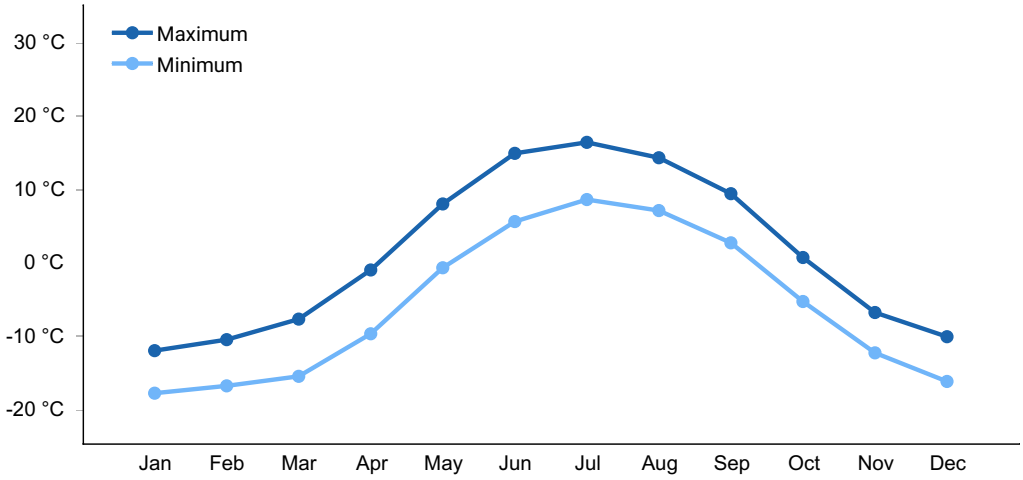


Figure 4. Monthly average minimum and maximum temperature

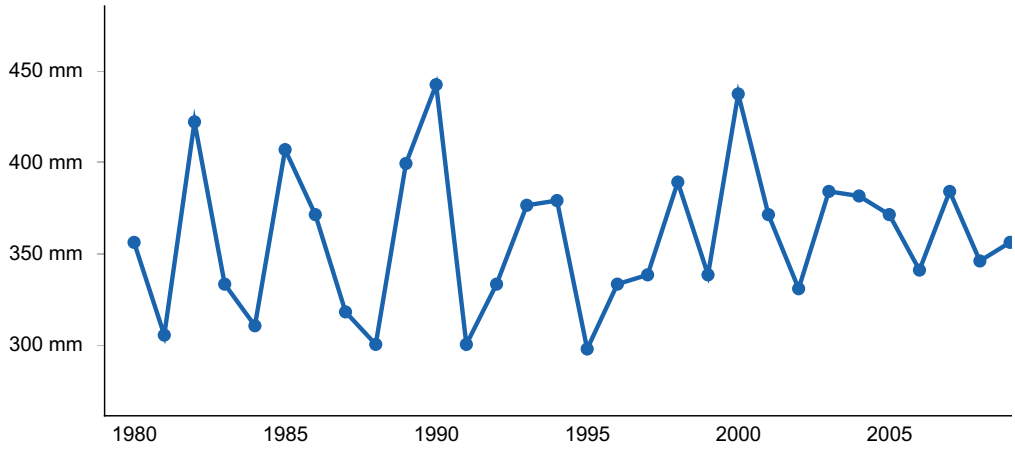


Figure 5. Annual precipitation pattern

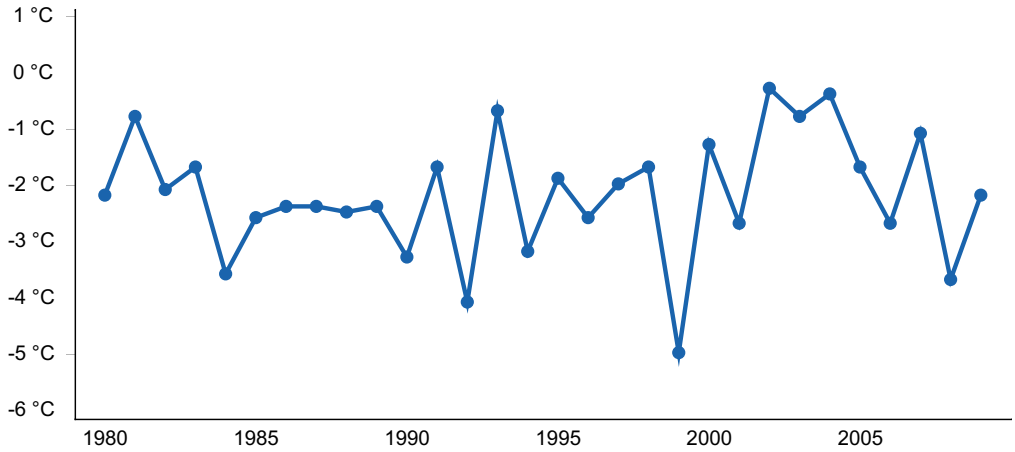


Figure 6. Annual average temperature pattern

Influencing water features

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 and cold Inceptisols (Gelepts and Cryepts) formed in gravelly colluvium, sometimes atop residuum (Soil Survey Staff, 2013). Rock fragments are mostly absent on the soil surface. When present, the organic cap is thin. Soils are very deep but can have a moderate to deep lithic or paralithic bedrock layer. Subsurface rock fragment volume ranges from 15 to 40 percent. Soil pH is extremely to slightly acidic. Soils are well drained and dry during the growing season.

Table 5. Representative soil features

Parent material	(1) Colluvium
Surface texture	(1) Silt loam (2) Highly organic silt loam
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	89–152 cm
Soil depth	119–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–1%
Available water capacity (0-101.6cm)	3.56–12.19 cm
Soil reaction (1:1 water) (0-25.4cm)	4.2–6.5
Subsurface fragment volume <=3" (0-152.4cm)	15–40%
Subsurface fragment volume >3" (0-152.4cm)	0–31%

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.

This ecological site describes tall shrub slopes. Site and soil conditions support a community that is relatively stable, changing little over time (Landfire, 2009). Air and soil temperatures are warm enough during the growing season to support taller shrubs in the arctic climate.

Fire is the major disturbance on this ecological site. It is responsible for one unique post-disturbance community. Post-fire community composition depends on fire factors such as frequency and severity. Low-severity 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. In this instance, post-fire vegetation consists of fast-growing herbaceous species.

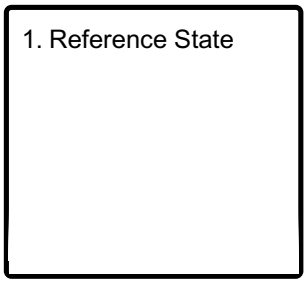
There is no alternate state in this ecological site. Of note, increased annual temperatures

during the growing season facilitate the spread of alder into other ecological sites that have not historically supported alder (Lara et al., 2018; Salmon et al., 2019). The causes and effects of this “greening” are still being studied and are not represented by any ecological site descriptions in MLRA 240X.

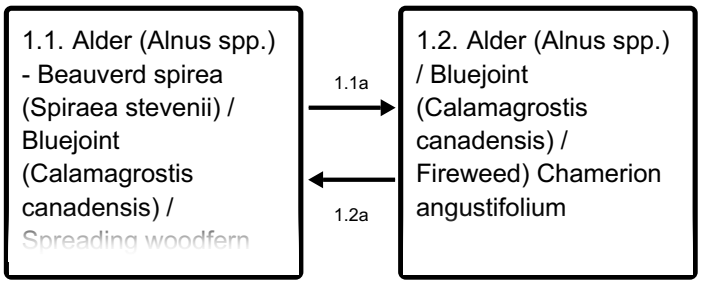
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant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

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1a - Fire

1.2a - Fire recovery

State 1
Reference State

The reference state describes two distinct vegetative communities grouped by the structure and dominance of the vegetation (e.g., shrubs, forbs, and graminoids) and their ecological function and stability. Fire is the major disturbance on this ecological site. Soil and site factors including drainage class and, mean annual air temperature influence the vegetation in the reference state. 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

- alder (*Alnus*), shrub
- beauverd spirea (*Spiraea stevenii*), shrub
- dwarf birch (*Betula nana*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- spreading woodfern (*Dryopteris expansa*), other herbaceous
- stiff clubmoss (*Lycopodium annotinum*), other herbaceous

Community 1.1
Alder (Alnus spp.) - Beauverd spirea (Spiraea stevenii) / Bluejoint (Calamagrostis canadensis) / Spreading woodfern (Dryopteris expansa)

This community is a tall open shrub scrubland (Viereck et al., 1992). The major plant groups are tall shrubs, medium shrubs, low shrubs, tall graminoids, and tall forbs. Community vegetation occurs on a moisture gradient. Wetter soils support more

ericaceous shrub cover, while drier soils typically support more alder. White spruce and paper birch may be present at lower elevations. Willow may be present. The shaded understory is comprised of graminoids, ferns, and forbs. Open areas are home to medium and low shrubs and more diverse graminoids and forbs than under the alder canopy. Ground cover is predominantly herbaceous litter but also contains woody litter, mosses, and lichens.

Dominant plant species

- beauverd spirea (*Spiraea stevenii*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- sedge (*Carex*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- Altai fescue (*Festuca altaica*), grass
- spreading woodfern (*Dryopteris expansa*), other herbaceous
- stiff clubmoss (*Lycopodium annotinum*), other herbaceous
- violet (*Viola*), other herbaceous

Community 1.2
Alder (Alnus spp.) / Bluejoint (Calamagrostis canadensis) / Fireweed) Chamerion angustifolium

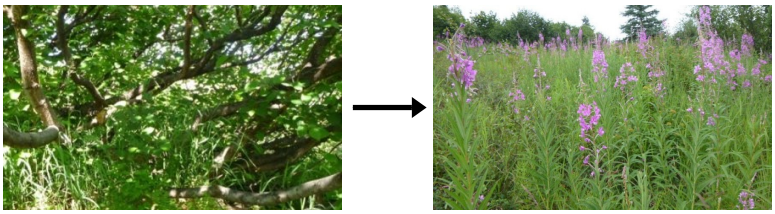
This community is a mesic graminoid herbaceous meadow or open tall shrubland, depending on fire severity (Viereck et al., 1992). The major plant groups are usually tall graminoids, medium graminoids and tall forbs. Community composition depends on fire disturbance characteristics. A more intense fire will alter a community to a higher degree than a less intense fire. Fast-growing herbaceous species with wind-dispersed seeds are

the most common species after a severe fire. Extant species from the pre-fire community may be present, particularly after a low-severity fire. Ground cover is mostly herbaceous litter.

Dominant plant species

- alder (*Alnus*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- sedge (*Carex*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

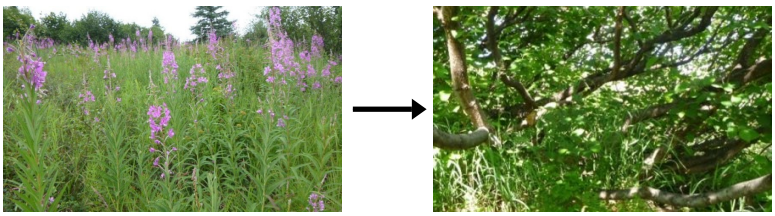


Alder (Alnus spp.) - Beauverd spirea (Spiraea stevenii) / Bluejoint (Calamagrostis canadensis) / Spreading woodfern (Dryopteris expansa)

Alder (Alnus spp.) / Bluejoint (Calamagrostis canadensis) / Fireweed) Chamerion angustifolium

Fire is the major disturbance on this site. Drier areas may ignite directly from lightning strikes, while wetter areas are more likely to catch fire from neighboring vegetation. The fire return interval is hypothesized to be very long (Landfire, 2009). A severe fire burns the organic layer and can destroy rootstocks and the seed bank. Alder is fire-adapted and can either grow quickly from rootstock or colonize bare mineral soil with wind-dispersed seeds (Matthews, 1992). Other post-fire vegetation includes disturbance-loving, fast-growing, seed-dispersing herbaceous species. Absent fire, the vegetative composition of this community is stable and unlikely to change over time (Viereck et al., 1992; Landfire, 2009).

Pathway 1.2a
Community 1.2 to 1.1



Alder (Alnus spp.) / Bluejoint (Calamagrostis canadensis) / Fireweed) Chamerion angustifolium

Alder (Alnus spp.) - Beauverd spirea (Spiraea stevenii) / Bluejoint (Calamagrostis canadensis) / Spreading woodfern (Dryopteris expansa)

Fire recovery occurs regularly quickly following low intensity fires. Recovery is slower after

high-intensity fires. Several shrubs, such as alder, are fire-adapted and can either grow quickly from rootstock or colonize bare mineral soil with wind-dispersed seeds (Matthews, 1992). Fire severity and frequency will determine how fast the shrub overstory redevelops. As this occurs, fast-growing herbaceous species such as bluejoint and fireweed will be shaded out.

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)

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Western Regional Climate Center. 2024. Unalakleet WSO Airport, Alaska ‘Freeze Free’

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Acknowledgments

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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	03/22/2026
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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6. **Extent of wind scoured, blowouts and/or depositional areas:**

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7. **Amount of litter movement (describe size and distance expected to travel):**

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):**

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:**

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11. **Presence and thickness of compaction layer (usually none; describe soil profile**

features which may be mistaken for compaction on this site):

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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

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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:**
