USDA Natural Resources
Conservation Service

Ecological site R240XY710AK
Arctic Scrub Wet Drainages

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 low scrubland (II.C.2 - level III) / Willow open scrubland (II.C.2.i - level IV)

(Viereck et al., 1992)

BioPhysical Settings:
6816830 – Alaska Arctic Mesic Sedge – Willow Tundra
(Landfire, 2009)

Circumpolar Arctic Vegetation Map:
S2.1 – Low-shrub community (comm 45)
G4.1 – Tussock-sedge, dwarf-shrub, moss communities (comm 41)
(CAVM Team, 2003)

Ecological site concept

• Occurs on organic and mineral drainages on plains, hills and mountains slopes
• Soils are classified as somewhat poorly to very poorly drained with aquic conditions
• The reference plant community is an open willow scrubland
• Fire is a major disturbance, resulting in a unique post-fire community.
• Ponding in closed swales and at organic drainage centers supports an emergent herbaceous community that is unlikely to burn

Associated sites

R240XY720AK	**Arctic Tussock Tundra Frozen Plains** R240XY720AK describes the tussock tundra plain. R230XY710AK is in plain depressions and swales and is often surrounded by the tussock tundra.
R240XY731AK	**Subalpine Ericaceous Scrub Loamy Slopes** R240XY731AK describes the low ericaceous scrub subalpine community. R230XY710AK is in slope depressions and swales in the subalpine and these ecological sites often border each other.

Similar sites

R240XY731AK	**Subalpine Ericaceous Scrub Loamy Slopes** The wetter range of R240XY731AK supports willows that can appear similar to this ecological site. Differences in site and soil hydrology and the lack of a ponded community in R240XY731AK distinguish these ecological sites.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix pulchra* (2) *Salix barclayi*
Herbaceous	(1) *Calamagrostis canadensis*

Physiographic features

This ecological site occurs on swales and drainages on hills and plains. Elevation ranges from 100 to 1600 feet above sea level. Slope gradients are nearly level to gentle (0 to 5 percent) and occurs on all aspects. A water table is typically present throughout the growing season. Ponding occurs at low centers of closed swales and level organic drainages.

Table 2. Representative physiographic features

Slope shape across	(1) Concave (2) Linear
Slope shape up-down	(1) Concave (2) Linear
Landforms	(1) Plains > Drainageway (2) Plains > Swale (3) Hills > Drainageway (4) Plains > Swale
Runoff class	Negligible to low
Flooding duration	Not specified
Flooding frequency	None
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to frequent
Elevation	30–488 m
Slope	0–5%
Ponding depth	3 cm
Water table depth	0–25 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to frequent
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 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)	80-105 days
Freeze-free period (characteristic range)	100-130 days
Precipitation total (characteristic range)	330-508 mm
Frost-free period (actual range)	30-120 days
Freeze-free period (actual range)	90-135 days
Precipitation total (actual range)	254-584 mm
Frost-free period (average)	90 days
Freeze-free period (average)	115 days
Precipitation total (average)	356 mm

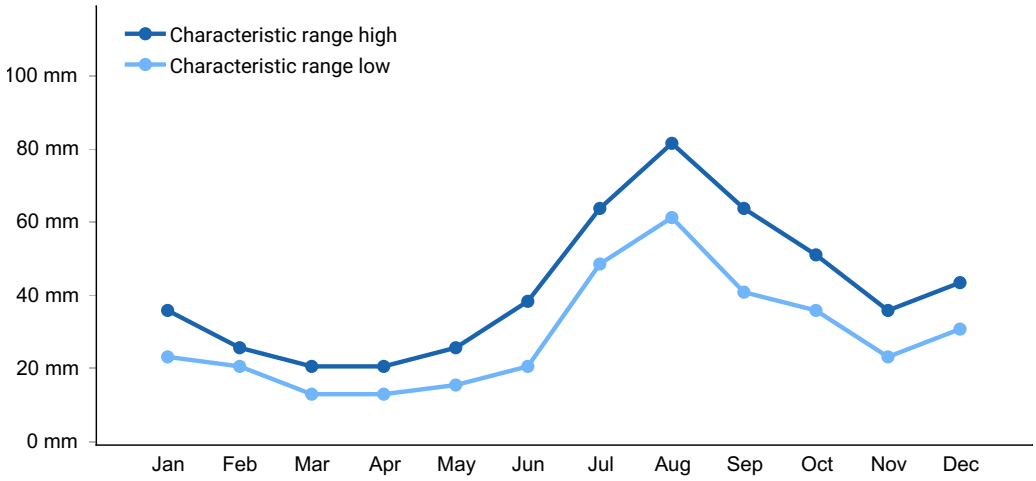


Figure 1. Monthly precipitation range

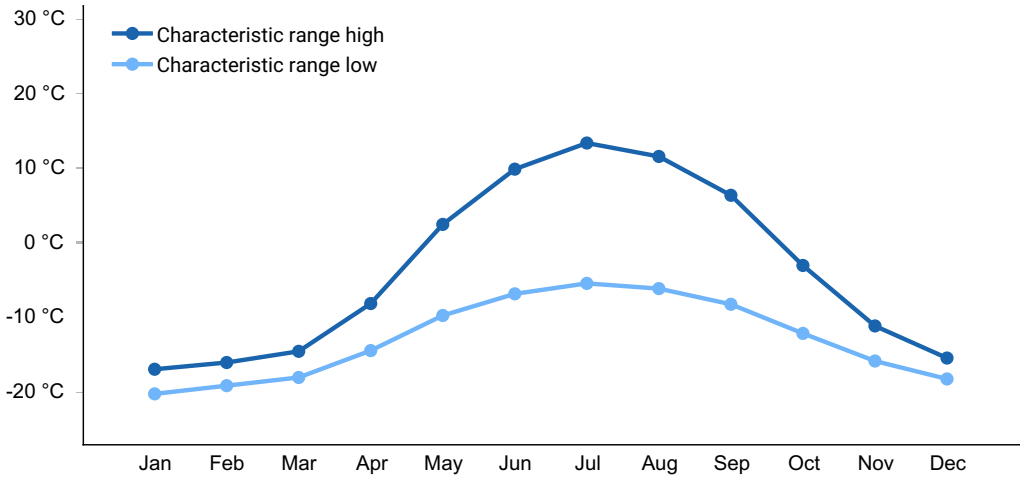


Figure 2. Monthly minimum temperature range

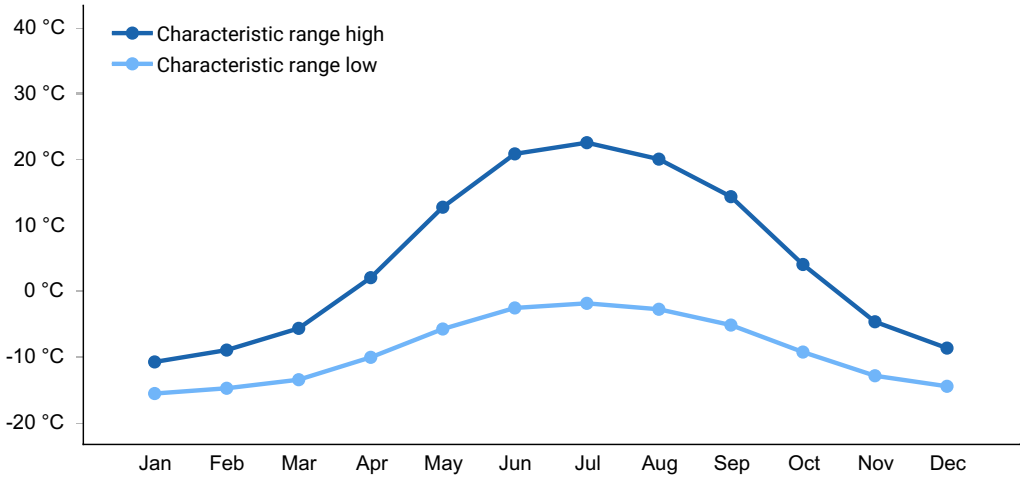


Figure 3. Monthly maximum temperature range

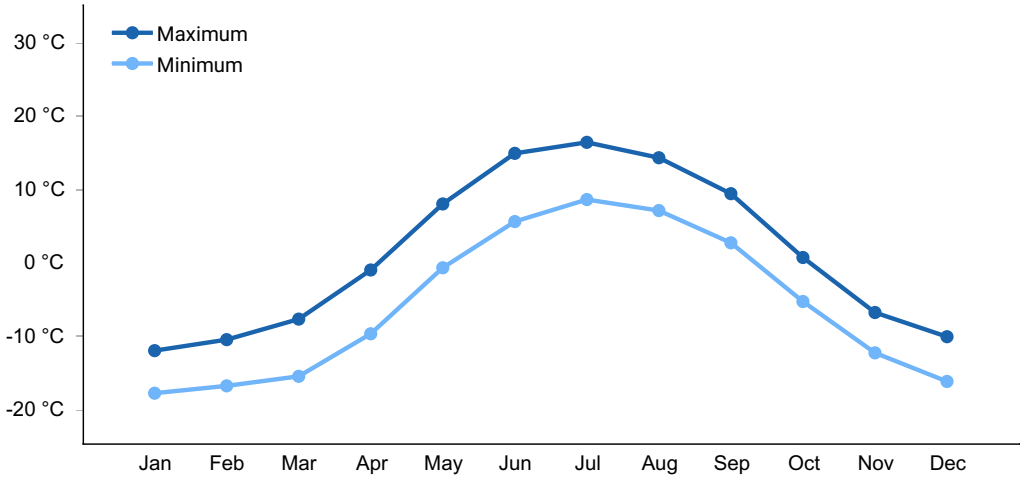


Figure 4. Monthly average minimum and maximum temperature

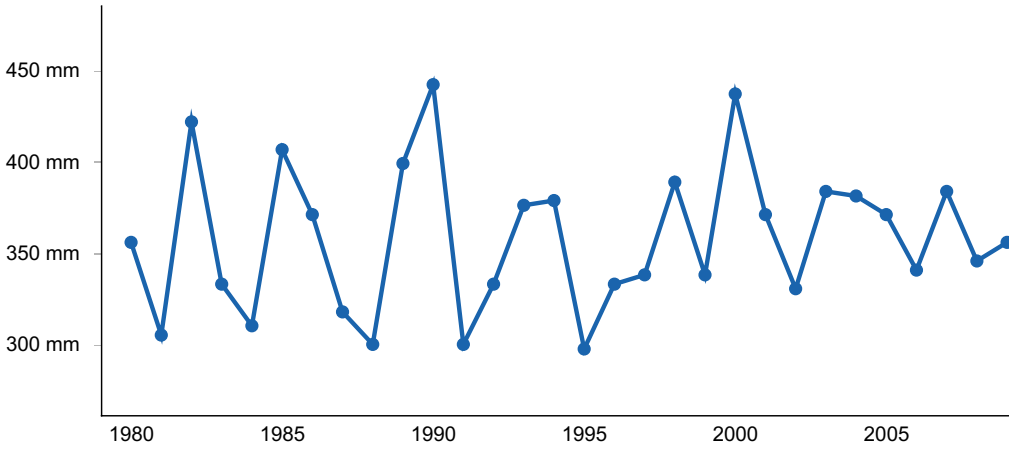


Figure 5. Annual precipitation pattern

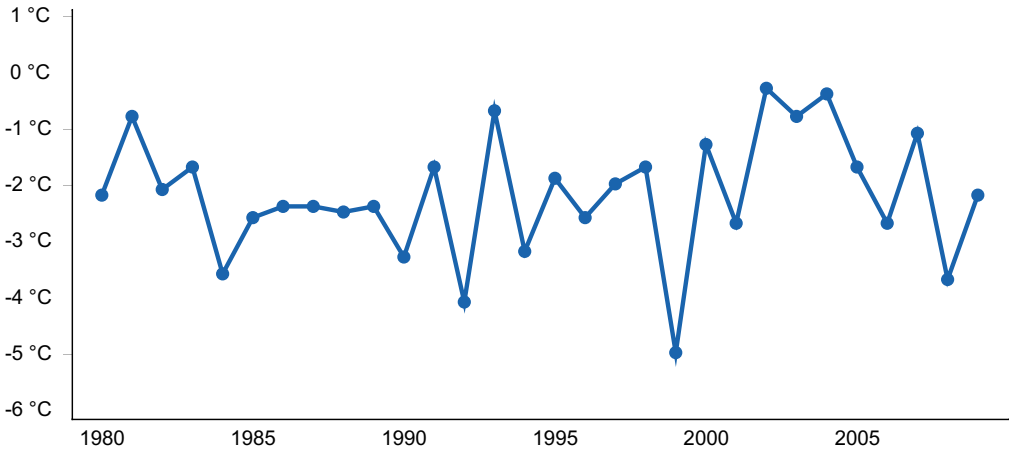


Figure 6. Annual average temperature pattern

Influencing water features

Some drainages flood and have a defined water flow path. Water is contained within the defined drainage, and there is no associated flood plain. Precipitation and seasonal snow melt are the main sources of water.

Wetland description

This ecological site is a depressional wetland under the Hydrogeomorphic (HGM) classification system (Brinson, 1993; USDA-NRCS 2008). Water sources include precipitation, throughflow, overflow and discharge. Closed concavities and level-sloped organic drainages allow support surface ponding.

Soil features

Soils are wet with aquic soil conditions. Soils formed in organic material over loess and/or alluvium. Rock fragments are absent from the soil surface but comprise up to approximately twenty percent of the subsurface volume. Soils have a thick, 7-to-24-inch

organic cap and are very deep. Moderately deep permafrost may be present, restricting roots and perching water. Soil pH is very strongly to slightly acidic. Soils are somewhat poorly to very poorly drained.

Table 5. Representative soil features

Parent material	(1) Loess (2) Alluvium
Surface texture	(1) Silt (2) Peat (3) Mucky peat
Drainage class	Somewhat poorly drained to very poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	Not specified
Soil depth	201 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	14.48–31.5 cm
Soil reaction (1:1 water) (0-25.4cm)	4.7–6
Subsurface fragment volume <=3" (0-152.4cm)	0–10%
Subsurface fragment volume >3" (0-152.4cm)	0–9%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	66–152 cm
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" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

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 reference plant community is shaped by local factors including aquic soils and slope concavity. Vegetation in concave drainages and swales are not exposed to harsh winds. While available water capacity is adequate to support hydrophytic species such as willows and sedges.

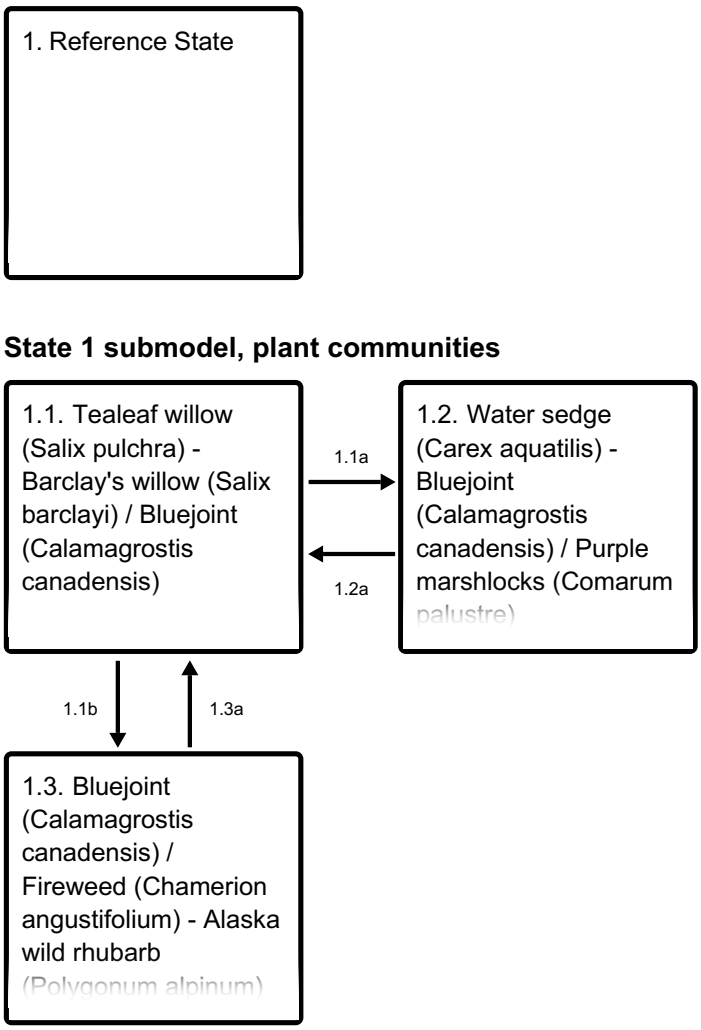
Site and soil hydrology result in two communities. Soils that do not pond support the willow reference plant community. Ponded soils are in the center of closed swales and level organic drainages. Ponded soils support obligate and emergent herbaceous wetland species.

Fire is a major disturbance and results in one distinct post-fire community. Lightning strikes are the dominant ignition source. The willow scrubland and edges of organic depressions burn, while ponded wet soils do not. Fire dynamics are poorly understory on this ecological site, but it is hypothesized that they are dependent on fire severity and frequency. A major contributor to the reference plant community canopy, tealeaf willow (*Salix pulchra*) is a fire-adapted species and will quickly grow back if the below ground rootstock is not destroyed (Uchytil, 1991). One likely fire effect after a severe fire is the creation of open areas where fast growing, herbaceous species colonize. Without fire, site vegetation appears to be more influenced by shifts in site hydrology (Viereck et al., 1992), as described by the ponded community (1.2).

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



1.1a - Increased hydrologic input

1.1b - Fire

1.2a - Decreased hydrologic input

1.3a - Fire recovery

State 1
Reference State

The reference state describes three distinct vegetative communities grouped by the structure and dominance of the vegetation (e.g., shrubs, forbs, and graminoids) and their ecological function and stability. Soil hydrology and fire are the major factors influencing vegetation, though other factors may be of concern. This 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

- willow (*Salix*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- Barclay's willow (*Salix barclayi*), shrub

- bluejoint (*Calamagrostis canadensis*), grass

Community 1.1
Tealeaf willow (Salix pulchra) - Barclay's willow (Salix barclayi) / Bluejoint (Calamagrostis canadensis)

This community is an open tall shrub scrubland (Viereck et al., 1992). The major plant groups are tall shrubs, medium shrubs, tall graminoids, and tall forbs. This community supports a mix of willow species in the canopy. Alder may be present. The shaded understory is comprised of bluejoint and ferns, while unshaded areas support bluejoint (*Calamagrostis canadensis*) and diverse mix of forbs. Ground cover is predominantly herbaceous litter but also contains mosses and lichens.

Dominant plant species

- willow (*Salix*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- Barclay's willow (*Salix barclayi*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- Altai fescue (*Festuca altaica*), grass
- woodland horsetail (*Equisetum sylvaticum*), other herbaceous

Community 1.2
Water sedge (Carex aquatilis) - Bluejoint (Calamagrostis canadensis) / Purple marshlocks (Comarum palustre)

This community is a mesic to wet graminoid herbaceous meadow (Viereck et al., 1992). The major plant groups are tall graminoids, medium forbs, and low forbs. This community supports a mix of obligate to facultative species, often depending on how large the ponded area is. Willows may encroach but are not often emergent. Ground cover is a mix of mosses, water, and herbaceous litter.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- water sedge (*Carex aquatilis*), grass
- silvery sedge (*Carex canescens*), grass
- purple marshlocks (*Comarum palustre*), other herbaceous
- seacoast angelica (*Angelica lucida*), other herbaceous

Community 1.3
Bluejoint (Calamagrostis canadensis) / Fireweed (Chamerion angustifolium) - Alaska wild rhubarb (Polygonum alpinum)

This community is a mesic graminoid herbaceous meadow (Viereck et al., 1992). The major plant groups are tall graminoids, medium forbs, and low forbs. Community composition generally 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. Extant species from the pre-fire community may be present. Ground cover is mostly herbaceous litter.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- Alaska wild rhubarb (*Polygonum alpinum*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

Tealeaf willow (Salix pulchra) - Barclay's willow (Salix barclayi) / Bluejoint (Calamagrostis canadensis)

Water sedge (Carex aquatilis) - Bluejoint (Calamagrostis canadensis) / Purple marshlocks (Comarum palustre)

Increased ponding is caused by increases in precipitation and run in. Run-in from neighboring areas usually increases after a burn. Water stress caused by ponding kills susceptible species, allowing for the colonization by quick growing, herbaceous obligate to facultative wet wetland species.

Pathway 1.1b
Community 1.1 to 1.3

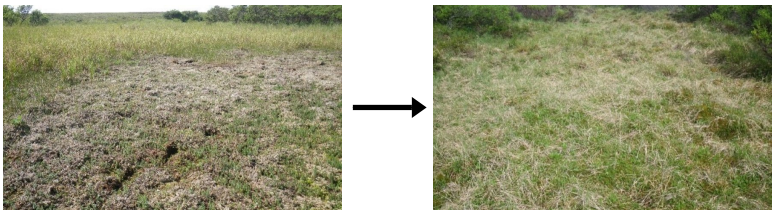
Tealeaf willow (Salix pulchra) - Barclay's willow (Salix barclayi) / Bluejoint (Calamagrostis canadensis)

Bluejoint (Calamagrostis canadensis) / Fireweed (Chamerion angustifolium) - Alaska wild rhubarb (Polygonum alpinum)

Fire can occur on this site, but fire characteristics such as frequency and intensity are unknown. It is hypothesized that fire effects are dependent on fire severity and frequency. *Salix pulchra* is a fire-adapted species and will quickly grow back if the below ground

rootstock is not destroyed (Uchytil, 1991). One likely fire effect is the creation of open areas where fast growing, herbaceous species colonize. Without fire, site vegetation appears to be more influenced by shifts in site hydrology (Viereck et al., 1992).

Pathway 1.2a
Community 1.2 to 1.1



Water sedge (Carex aquatilis) - Bluejoint (Calamagrostis canadensis) / Purple marshlocks (Comarum palustre)

Tealeaf willow (Salix pulchra) - Barclay's willow (Salix barclayi) / Bluejoint (Calamagrostis canadensis)

Improved site drainage or decreases in run-in can alleviate anoxic conditions caused by ponding. Slower growing, less hydrophytic species colonize and can further shade out obligate and facultative wet wetland species.

Pathway 1.3a
Community 1.3 to 1.1

Bluejoint (Calamagrostis canadensis) / Fireweed (Chamerion angustifolium) - Alaska wild rhubarb (Polygonum alpinum)

Tealeaf willow (Salix pulchra) - Barclay's willow (Salix barclayi) / Bluejoint (Calamagrostis canadensis)

Post fire recovery includes the establishment of shrubs and slow-spreading herbaceous species. These species overshadow and out compete fast-growing, seed-dispersed annuals.

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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Acknowledgments

Some or all of the soil – ecological site correlations described in this document were first constructed by the Homer SSO staff members working on initial surveys in the Nulato Hills

(AK630 and AK728). Many thanks are given to the NRCS staff who have provided feedback regarding the MLRA 240X ecological site key and ESDs.

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:**
