USDA Natural Resources
Conservation Service

Ecological site R242XY406AK
Arctic scrub loamy frozen floodplain

Last updated: 5/29/2025
Accessed: 12/06/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 242X–Northern Seward Peninsula-Selawik Lowlands

The Northern Seward Peninsula-Selawik Lowlands (MLRA 242X) includes the mosaic of coastal lowlands, river deltas, gently sloping uplands, and isolated hills and low mountains along the northern Seward Peninsula and in the lower Selawik Basin at the head of Kotzebue Sound. To the east, the area extends to the lower slopes of the Purcell Mountains, Zane Hills, and Sheklukshuk Range. MLRA 242X makes up 8,445 square miles. Lakes, ponds, and saturated soils occur throughout most of this area. The MLRA is mostly undeveloped wildland and is sparsely populated. It is in the zone of continuous permafrost.

Land ownership:
MLRA 242X encompasses the northernmost portion of the Bering Land Bridge National Preserve, the westernmost portion of Cape Krusenstern National Monument, and the majority of the Selawik National Wildlife Refuge.

The Bering Land Bridge National Preserve is located on the Seward Peninsula. The preserve is one of the most remote protected areas in the United States. The preserve is used by native Alaskans for subsistence hunting and is home to several archaeological sites. The preserve is around 2.6 million acres.

The Cape Krusenstern National Monument is located in northwestern Alaska, bordering the Chukchi Sea. Beach ridges within the monument safeguard evidence of 5,000 years of occupation by the Inupiat people, and more than 9,000 years of human occupation (NPS 2025). The Inupiat people maintain subsistence camps within the monument to this day. The monument is around 650,000 acres in size.

The Selawik National Wildlife Refuge is locating in the Waring Mountains of northwestern Alaska and comprises a transitional zone marking the opening of boreal forests into Arctic tundra (USFWS 2025). Selawik Refuge is an important migratory and wintering habitat for the Western Arctic Caribou herd, one of four herds found across Arctic Alaska. The refuge is around 2.1 million acres, with 240,000 of that set aside as federally designated wilderness.

The majority of MLRA 242X is private lands or those managed by the USFWS, NPS, BLM, and State of Alaska. The USFWS manages 1,604,744 acres, around 36 percent of the MLRA. The National Park Service manages 1,350,544 acres, around 30 percent of the MLRA. The BLM manages 606,464 acres, around 14 percent of the MLRA. The State of Alaska has a patent on 55,675 acres of the MLRA, around 1 percent of the MLRA. Much of the MLRA is within Alaska Native allotments or patents around 832,328 acres, or 19 percent of the MLRA.

Climate:
The arctic climate of MLRA 242X is characterized by brief, cool summers and long, very cold winters. The average annual precipitation ranges from 11 to 12 inches. Average annual snowfall ranges from about 40 to 100 inches. The average annual temperature ranges from 18 to 25 degrees Fahrenheit. The average freeze-free period is between 98 to 104 days.

Geology:
The western part of this MLRA was unglaciated during the Pleistocene Epoch. Most of the eastern part was covered by glacial ice originating in the Waring Mountains and Brooks Range to the north. Sediments across the vast majority of the area consist of fine textured, Holocene and Pleistocene deltaic and fluvial deposits on coastal lowlands, Holocene fluvial deposits on flood plains and stream terraces, and mixed colluvium and slope alluvium on mountain foot slopes. The underlying bedrock geology consists primarily of stratified sedimentary rocks and volcanic rocks of Cretaceous, Tertiary, and Quaternary age.

Soils:

The dominant soil orders in this MLRA are Gelisols, with Histosols and Entisols covering a comparatively minor extent in coastal or estuarine zones. These Gelisols are shallow or moderately deep to permafrost and are typically poorly to very poorly drained. Miscellaneous (non-soil) areas make up about 25 percent of this MLRA. The most common are water and beaches.

Gelisols are soils that have permafrost within 100 cm of the soil surface and/or have gelic materials within 100 cm of the soil surface and have permafrost within 200 cm. Gelic materials are mineral or organic soil materials that have evidence of cryoturbation (frost churning) and/or ice segregation in the active layer (seasonal thaw layer) and/or the upper

part of the permafrost (NRCS 2024). The common suborders of Gelisols within this MLRA are Turbels, Histels, and Orthels.

The Histels have thick accumulations of surface organic material and are associated with high-center polygons. The Orthels and Turbels have comparably thinner surface organic material and occur on high floodplains, stream terraces, low-center polygons, and the slopes of hills and plains. Turbels show signs of cryoturbation while Orthels do not.

Histosols have a high content of organic matter and no permafrost. Most are saturated year-round, but a few are freely drained. The most common suborder of Histosols in this MLRA are Fibrists. Fibrists are wet, slightly decomposed Histosols. Most of the soils support natural vegetation of widely spaced small trees, shrubs, forbs, and grasses and grass-like plants (NRCS 2025).

Entisols are soils that show little or no evidence of pedogenic horizon development and in this MLRA are associated with recently deposited sediments. The most common suborder of Entisols in this MLRA are Aquents, which are widely distributed throughout this MLRA. They are common in low lying estuarine areas bordering the Chukchi Sea and Kotzebue Sound.

Fire Dynamics and Succession:
Reported fire history in this MLRA spans 1957 to 2021. During this time period, there were 67 recorded fires. The mean fire size was approximately twelve thousand acres. The largest fire was the 1977 AUGUS fire, burning 235,584 acres (AICC 2025). The number of fires that burn in tundra systems are limited by ignitions, prevalence of atmospheric moisture, and fuel moisture content or fuel availability. Fires in the tundra happen less often than in boreal systems (NPS 2024). Fires can be sporadic and widely distributed. The fire return intervals vary widely in tundra systems, from 30 years to over 1,000 years. In the past, fires have burned more frequently on the Seward Peninsula and in the Noatak Valley than in other tundra regions. This is due to slightly warmer and drier conditions and higher amounts of plants and shrubs above ground such as tussock cottongrass (NPS 2024).

There are over 143 million acres of arctic and subarctic tundra in Alaska, most of which is designated in a limited fire management option. A limited fire management option is one of four fire management options outlined in the Alaska Interagency Wildland Fire Management Plan (AICC 2024). A ‘limited’ approach is the most hands-off management option, meaning the fire will be left to behave naturally and fill its natural ecological role (AICC 2024).
Arctic tundra areas are experiencing warmer temperatures and an increase in fire activity over the past twenty years. Climate model forecasts show more warming in the future, particularly in the high northern areas. This could affect the length of the growing season, how well plants and shrubs grow, and rain and snowfall. A longer and more robust growing season could likely impact trends regarding number and intensity of fires in the arctic tundra.

Vegetation dynamics:
Uplands are not common in this MLRA but where present they generally support dwarf scrub dominated by tussock tundra. On shallow, rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Bare soil and bedrock generally are extensive. On mesic sites, halophytic sedges and grasses dominate. Depressions, drainageways, and other saturated areas support wet sedge meadows and wet sedge-moss meadows. The vegetation on flood plains consists of a mixture of wet sedge meadows and of tall scrub dominated by various willows and shrub birch.

Vascular and non-vascular plant succession dynamics vary in post-fire environments. Data collected in the footprint of the abnormally severe Anaktuvuk River fire shows that four years after the burn, above-ground net primary productivity of vascular plants was equal in burned and unburned areas, though total live biomass was less (Bret-Harte et al 2013). Graminoid biomass had recovered to unburned levels, but shrubs had not. Most of the vascular plant biomass had resprouted from surviving underground parts. Much greater changes were observed in the biomass and composition of the non-vascular plant community (Bret-Harte et al 2013). Lichen biomass appears to take decades to centuries to recover from the disturbances of fires, particularly under a warming climate (Racine et al 2004).

Tussock cottongrass is the primary tussock forming plant species in arctic tundra. Tussock cottongrass burns easily yet is very hardy. It grows quickly and is very productive, forming a tussock made of fine dead fuels from the previous year. These fine fuels burn quickly and easily. Tundra fires are usually wind driven and move rapidly, burning through years of accumulated tussock grass thatch. The tussock growth protects the cottongrass roots and plant tissues from fire. These plants and shrubs recover and grow vigorously after fire, benefitting from nutrients and warmer soils after a fire (NPS 2024).

Fire impacts soil composition and structure (Li et al 2021). Fires will often partially or completely consume the organic material layer, depending on the severity of the fire. Fire can also impact permafrost. On average, forest fires reduce the permafrost extent by up to 9-16 percent and accelerate permafrost thaw by five years. The effects of wildfire on permafrost are much larger in forested areas than in tundra, bogs, and fens (Li et al 2021).

Classification relationships

Landfire Biophysical Settings –
6717150 – Alaska Arctic Floodplain
(Landfire, 2009)

Viereck Communities:
Closed Tall Willow Shrub -- II.B.1.a (Viereck et al. 1992)

Ecological site concept

• Arctic climate
• Associated landforms are high flood plains on foothills.
• Soils are derived from organic material and loamy alluvium.
• Soils are considered poorly drained and rarely floods.
• Soils are underlain by permafrost at 16 inches
• The reference plant community is characterized as a closed tall willow shrub (Viereck et al 1992) with the dominant plants being willows, dwarf fireweed, and arctic lupine.

Associated sites

R242XY405AK	**Arctic scrub loamy floodplain** Site 405 is located in a similar landscape position as site 406 but is located on troughs on flood plains as opposed to terraces.

Similar sites

R242XY403AK	**Arctic scrub frozen drainageways and mounds complex** Site 403 is similar to site 406 in that they are both shrublands. Site 403 is an ericaceous shrubland located on a mosaic of drainageways and mound on plains, while site 406 is a willow dominated shrubland located on floodplain terraces.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix alaxensis* (2) *Salix richardsonii*
Herbaceous	(1) *Chamerion latifolium* (2) *Lupinus arcticus*

Physiographic features

The Arctic scrub loamy frozen floodplains ecological site occurs on terraces on floodplains. Elevation ranges between 10 and 450 feet. Slope is nearly level on associated terraces. This ecological site occurs on all aspects, showing no preference for north-facing or south-facing aspects. This site rarely floods for brief durations and ponds briefly on occasion.

Table 2. Representative physiographic features

Landforms	(1) Plains > Flood plain
Runoff class	Medium
Flooding duration	Brief (2 to 7 days)

Flooding frequency	Rare
Ponding duration	Brief (2 to 7 days)
Ponding frequency	Occasional
Elevation	3–137 m
Slope	0–2%
Ponding depth	0–30 cm
Water table depth	0–25 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Sea ice strongly influences the climate of MLRA 242X. A protective barrier of sea ice has typically formed along the Chukchi coast and Kotzebue sound by early November and often lasting until April. The Kotzebue sound and Chukchi sea moderate diurnal and monthly temperatures resulting in a maritime climate. Summer temperatures (June through August) are relatively stable with mean maximum monthly temperatures ranging between 50 to 58 degrees Fahrenheit. As sea ice forms on the coastline, temperatures decrease significantly with the area shifting to a continental climate. The coldest months (January through March) have mean monthly temperatures ranging from 4 to 7 degrees Fahrenheit. The coverage and formation of sea ice has been decreasing due to rising atmospheric temperatures (USDA Climate Hub 2025).

The Northern Seward Peninsula-Selawik Lowlands have summers that are short and cool and winters that are long and cold. Strong winds are common throughout the year. Mean annual air temperatures typically range from 18 to 25 degrees Fahrenheit. The warmest months are June, July, and August. During these summer months, the typical freeze free period for the area ranges from 103 to 99 days. The coldest months are January, February, and March.

This area is semi-arid with mean annual precipitation typically around 12 inches. The warmest months have overcast skies with frequent fog and precipitation while the coldest months have clear skies. The three wettest months are July, August, and September where the area may receive half of its total annual precipitation.

Table 3. Representative climatic features

Frost-free period (characteristic range)	59-75 days
Freeze-free period (characteristic range)	99-103 days
Precipitation total (characteristic range)	279-305 mm
Frost-free period (actual range)	54-80 days

Freeze-free period (actual range)	98-104 days
Precipitation total (actual range)	279-305 mm
Frost-free period (average)	67 days
Freeze-free period (average)	101 days
Precipitation total (average)	305 mm

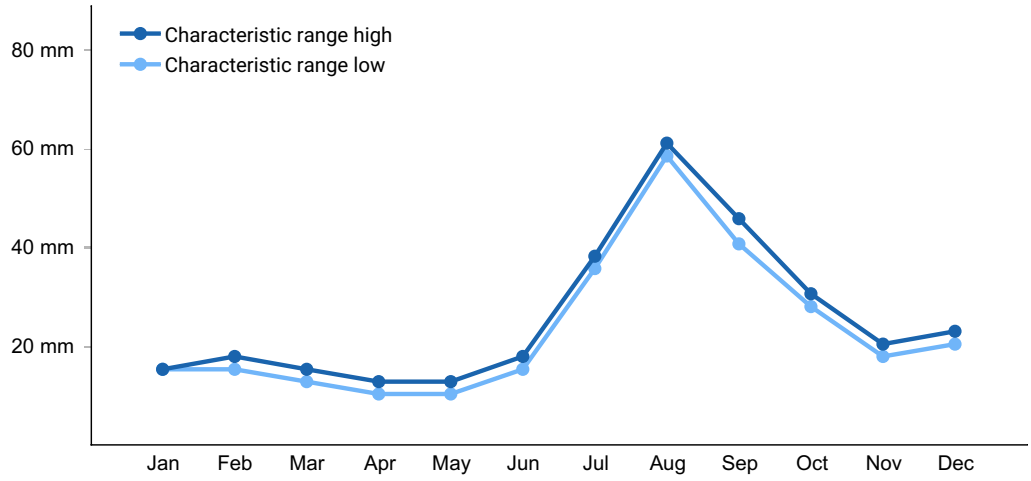


Figure 1. Monthly precipitation range

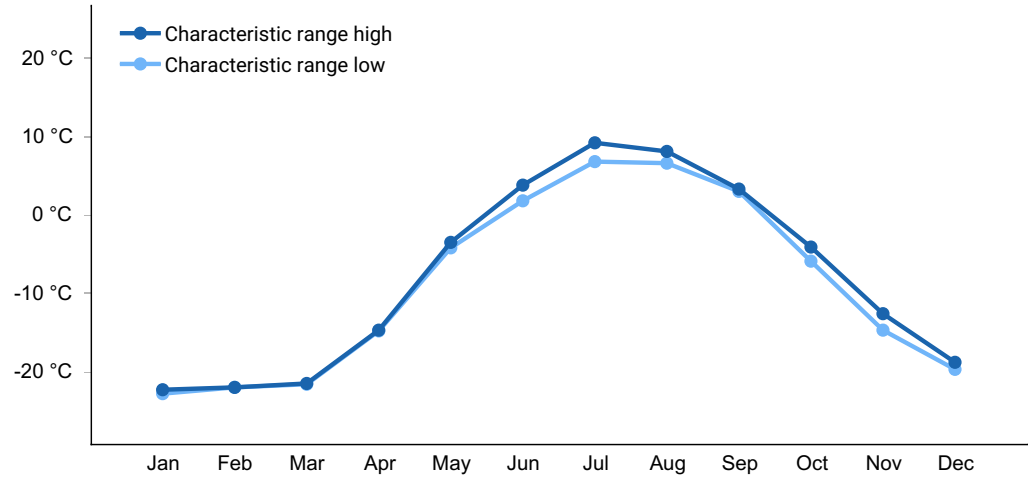


Figure 2. Monthly minimum temperature range

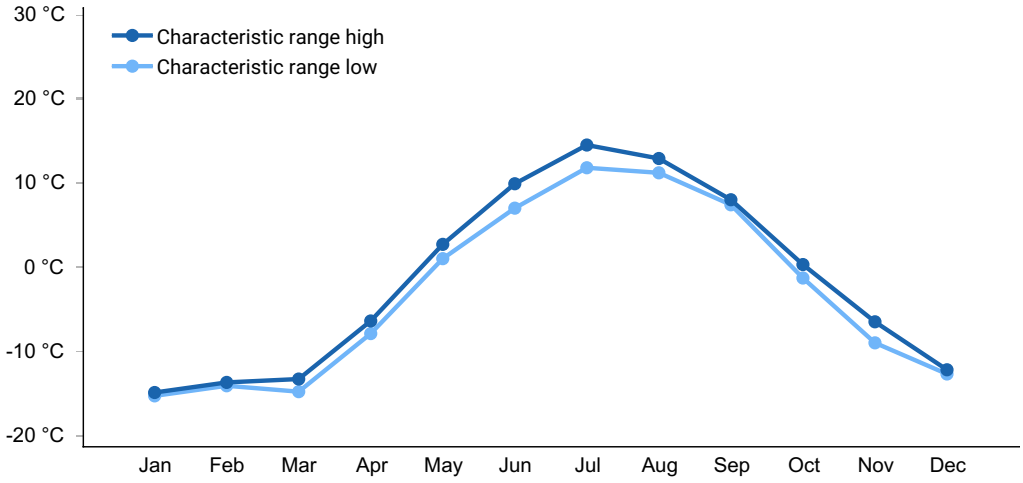


Figure 3. Monthly maximum temperature range

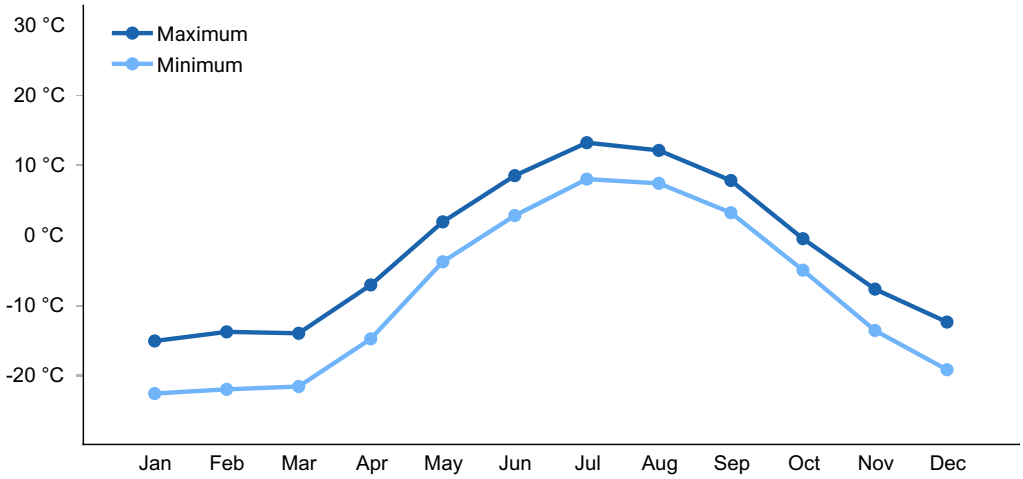


Figure 4. Monthly average minimum and maximum temperature

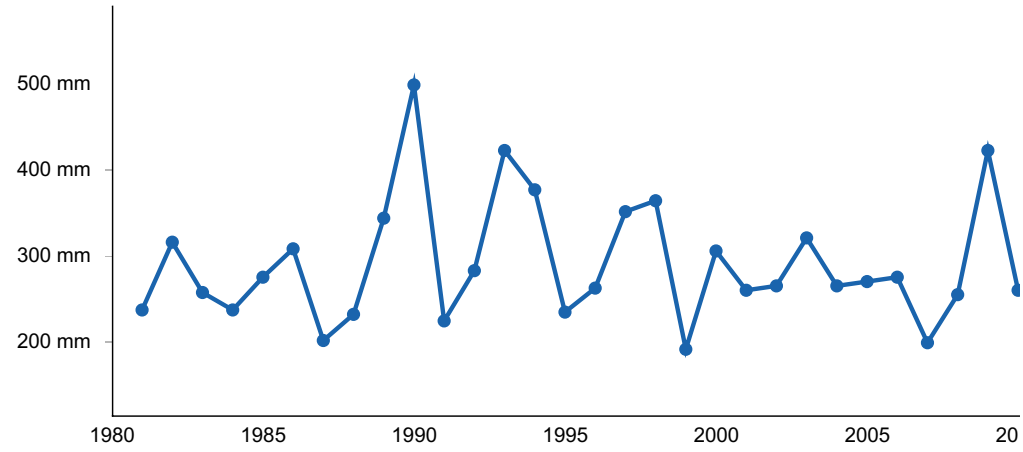


Figure 5. Annual precipitation pattern

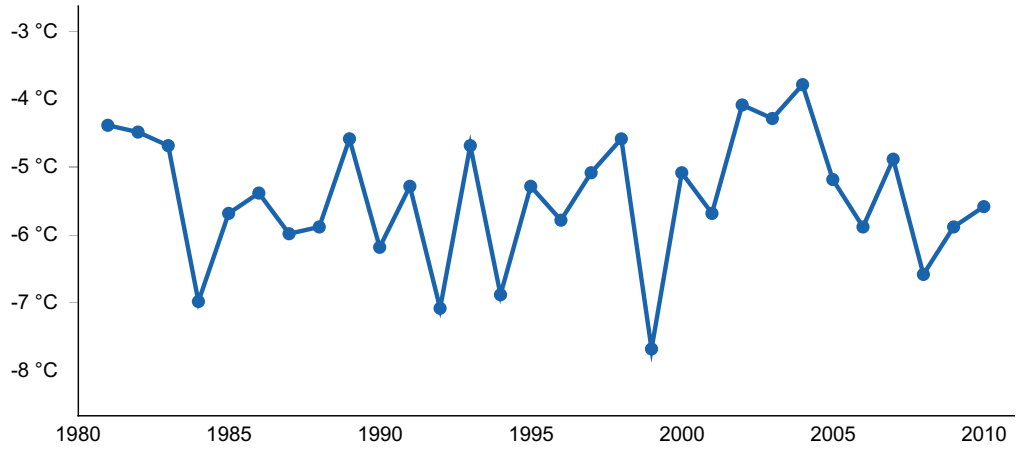


Figure 6. Annual average temperature pattern

Climate stations used

- (1) WALES [USW00026618], Wales, AK
- (2) KOTZEBUE RALPH WEIN AP [USW00026616], Kotzebue, AK

Influencing water features

This ecological site is considered a riverine wetland. Dominant water sources are often overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands.

Wetland description

This ecological site is classified as a riverine wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

• Soils formed in alluvium and organic materials
• Rock fragments do not occur on the soil surface
• The surface mineral horizon is a mucky silt loam. This layer is very thin.
• Soils are very deep
• Permafrost is a restriction that occurs at moderate depths (16 inches)
• The pH of the soil profile ranges from very strongly acidic to neutral
• These are wet soils that are considered poorly drained

Table 4. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Mucky silt loam
Family particle size	(1) Coarse-loamy

Drainage class	Poorly drained
Permeability class	Very slow
Depth to restrictive layer	41–84 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	8.13–14.99 cm
Subsurface fragment volume <=3" (0-152.4cm)	0–5%
Subsurface fragment volume >3" (0-152.4cm)	0–5%

Ecological dynamics

The Northern Seward Peninsula-Selawik Lowlands MLRA has a harsh climate and cold soils and occurs in the zone of continuous permafrost. This MLRA occurs in the arctic biome and has a growing season that is both short and cold. As a result, the vertical and horizontal structure of vegetation is severely limited. Vegetation within the arctic biome is typically restricted to dwarf shrubs, mosses, and lichens.

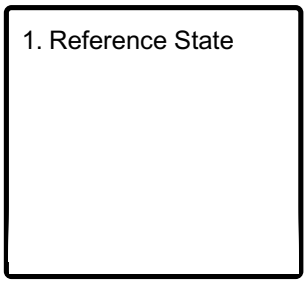
The ecological site (R242XY406AK) represents a dense willow shrub ecosystem, which is typical across Alaska, with the exception of the Aleutian Islands and narrow strips of land in the Arctic Coastal Plains (MLRA 246X). Soils are typically well to moderately drained, with substrate compositions varying from loamy to gravelly. Notably, permafrost is either non-existent or positioned at a significant depth of 20 inches or more below the surface (Viereck et al 1992).

Closed tall willow communities on flood plains are successional. Typically preceded by a seral herb community and, in some instances, succeeded by a mixed stand forest. In tundra regions, closed tall willow stands slowly degenerate as the permafrost table rises. The willow stands become lower and more open and are eventually replaced by a sedge meadow or dryas tundra (Viereck et al 1992).

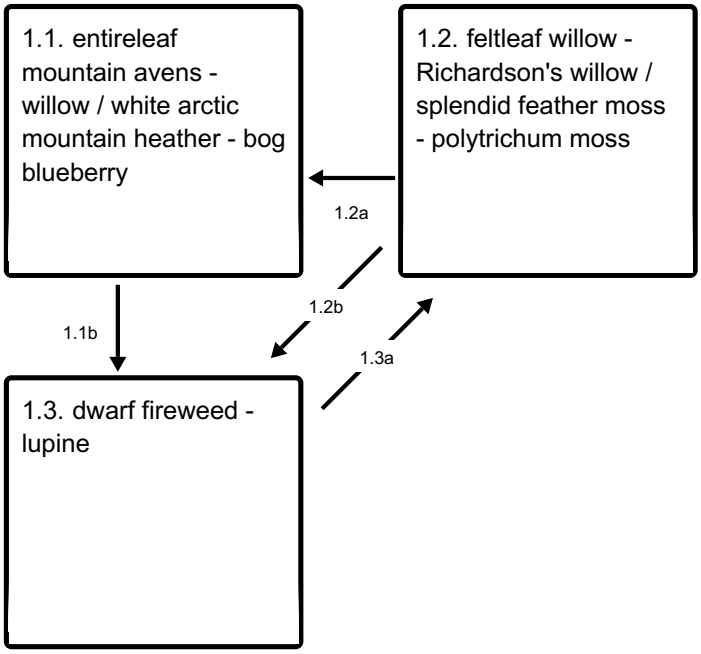
Flooding
Flooding is the main disturbance at this site. Frequency or intermittence between flooding results in three distinct plant communities. Bare gravels are common directly adjacent to the active flood plain channel. Colonizing these bare gravels is a pioneering plant community largely composed of forbs (community 1.3). As time passes without flooding low and tall shrubs start to gain dominance over herbaceous species (community 1.2) and a distinct moss component form. The reference plant community (community 1.1) is a closed tall willow shrub community and occurs when the shrub canopy closes.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1b - Flooding

1.2a - Time without flood

1.2b - Flooding

1.3a - Time without flood

State 1
Reference State

There are three plant communities within the reference state. Flooding is the main form of disturbance. The reference plant community supports vegetation that can be characterized as closed tall willow shrub (Viereck et al 1992). All plant communities associated with this ecological site have limited data, so the state-and-transition model is provisional.

Dominant plant species

- bog blueberry (*Vaccinium uliginosum*), shrub
- white arctic mountain heather (*Cassiope tetragona*), shrub
- entireleaf mountain-avens (*Dryas integrifolia*), shrub

- willow (*Salix*), shrub
- lupine (*Lupinus*), other herbaceous

Community 1.1
entireleaf mountain avens - willow / white arctic mountain heather - bog blueberry

Community 1.1 supports vegetation that can be characterized as closed tall willow shrub (Viereck et al 1992). The dominant plant species in community 1.1 are entireleaf mountain-avens (*Dryas integrifolia*) and willows (Salix spp.) (Landfire BpS 2024). Community 1.1 is the reference plant community.

Dominant plant species

- entireleaf mountain-avens (*Dryas integrifolia*), shrub
- willow (*Salix*), shrub
- white arctic mountain heather (*Cassiope tetragona*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub

Community 1.2
feltleaf willow - Richardson's willow / splendid feather moss - polytrichum moss

Community 1.2 occurs in the early stages of post-flood succession, once low and tall shrubs start to gain dominance over herbaceous species. The dominant plant species in community 1.2 are feltleaf willow (*Salix alaxensis*), Richardson's willow (*Salix richardsonii*), splendid feather moss (*Hylocomium splendens*), and polytrichum moss (Viereck et al 1992, Landfire BpS 2024).

Dominant plant species

- feltleaf willow (*Salix alaxensis*), shrub
- Richardson's willow (*Salix richardsonii*), shrub
- grayleaf willow (*Salix glauca*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- polytrichum moss (*Polytrichum*), other herbaceous

Community 1.3
dwarf fireweed - lupine

Community 1.3 occurs in the early stages of post-flood succession, once herbaceous vegetation begins to colonize bare ground (Landfire BpS 2024).

Dominant plant species

- lupine (*Lupinus*), other herbaceous
- dwarf fireweed (*Chamerion latifolium*), other herbaceous

Pathway 1.1b
Community 1.1 to 1.3

Flooding

Pathway 1.2a
Community 1.2 to 1.1

Time without flood

Pathway 1.2b
Community 1.2 to 1.3

Flooding

Pathway 1.3a
Community 1.3 to 1.2

Time without flood

Additional community tables

Animal community

Mammals common to the area include brown bear, caribou, moose, musk ox, black bear, wolf, red fox, a variety of other furbearers, and rodents. Many species of migratory waterfowl and shore birds' nest in the ponds and wetlands. Raptors include gyrfalcon, peregrine falcon, golden eagle, hawks, and owls. Arctic char and Arctic grayling are in most of the rivers. Lake trout and northern pike are common in many lakes.

Hydrological functions

n/a

Recreational uses

Local residents use this remote area primarily for subsistence hunting, fishing, and gathering. Hunting and other kinds of wildland recreation are increasingly important. Most visitors are served by air taxi, guiding, and outfitting companies operating out of the major Alaska communities. Most of the communities are along the major rivers or lakes or on the coast.

Wood products

n/a

Other products

n/a

Other information

The major soil resource concern is disturbance of the fragile permafrost-affected soils. Disturbance of the insulating organic material at the surface results in thawing of the upper soil layers. This thawing can lead to ponding, soil subsidence, erosion, and disruption of surface drainage. All management activities need to include protection of the organic surface material and the thermal balance of the soils.

Inventory data references

The vegetation modeled for this site has limited data and is considered provisional. The associated model was largely developed from NRCS staff with working knowledge of the area and literature review.

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Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	12/06/2025
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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

   _____

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:**
