USDA Natural Resources Conservation Service

Ecological site R246XY008AK
Arctic Sedge Peat Frozen Drainageways

Last updated: 5/22/2025
Accessed: 03/23/2026

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): 246X–Arctic Coastal Plain

The Arctic Coastal Plain MLRA (MLRA 246X) consists of level to gently rolling plains along the coast of the Arctic Ocean. This area makes up 22,235 square miles. It is mostly remote, sparsely populated wildland. Numerous rivers, mostly originating in the Brooks Range, drain to the Arctic Ocean. The largest being the Canning, Colville, Jago, Kongakut, Kuk, Utukok, and Sagavanirktok Rivers. Narrow, nearly level flood plains and stream terraces parallel the many rivers. The area is dotted by thousands of small and medium-size lakes and interconnecting wetlands. Many of the lakes are elongated thaw lakes, which are consistently oriented from north to northwest. Small sand dunes occur along the coastline, rivers, and plains. Elevation ranges from sea level to about 655 feet.

Permanent settlements include Point Lay, Wainwright, Utqiagvik, Nuigsut, and Kaktovik. The Prudhoe Bay oil fields and the northern terminus of the Trans-Alaska Pipeline are in the central part of the MLRA. The Dalton Highway and the Trans-Alaska Pipeline bisect the area west of the Sagavanirktok River, terminating at Deadhorse. The community of Deadhorse provides much of the industrial infrastructure and many of the residential facilities associated with the oil fields and pipeline. Parts of the National Petroleum Reserve and Arctic National Wildlife Refuge are in this MLRA.

Geology and Soils

This area was never glaciated (NRCS 2022). The bedrock geology consists of Cretaceous and Tertiary stratified sedimentary rocks and uplifted continental deposits. The modern landscape is mantled with Quaternary deposits of alluvial, eolian, or glaciofluvial origin.

This MLRA is in the zone of continuous permafrost. Areas without permafrost in the soil profile are limited to tidal flats, large sand dunes, and soils directly adjacent to large rivers. Thick layers of permafrost occur in both fine textured and coarse textured deposits across the area. Depth to the base of the permafrost layer ranges between 500 and 2000 feet. Periglacial features, such as beaded drainages, patterned ground (ice-wedge polygons, thaw gullies, pingos, and frost boils) occur throughout the MLRA.

The dominant soil order in this MLRA is Gelisols. Most have an aquic soil moisture regime. The Gelisols are shallow or moderately deep to permafrost, occur on fine and coarse textured sediments, and are generally poorly drained or very poorly drained. Common Gelisol suborders are Histels, Orthels, and Turbels. The Histels have a glacic layer and/or thick accumulations of surface organic material and are associated with ice-wedge troughs of polygons, vegetated lake basins, swales, and low-gradient drainageways. The Orthels and Turbels have comparably thinner surface organic material and occur on flood plains, stream terraces, plains, and the centers of low- and high-center polygons. Miscellaneous (non-soil) areas make up about 20 percent of this MLRA. The most common are water, riverwash, and beaches.

Climate
The average annual precipitation in this area is 4 to 8 inches. Brief, cool summers and long, very cold winters characterize the arctic climate. The average annual snowfall is about 20 to 40 inches. The average annual temperature ranges from 11 to 14 degrees Fahrenheit. The average freeze-free period is between 43 and 76 days but freezing temperatures can occur in any month.

Vegetation
The wet soils prevalent across this MLRA support extensive swaths of tussock tundra and wet sedge meadow tundra (Viereck et al. 1992). The drier sites and low uplands support dwarf scrub dominated by various ericaceous shrubs and dwarf willow. On shallow, rocky soils and exposed sites, lichens and scattered herbs dominate the ground layer. Flood plains support a mixture of low willow scrub and scattered herbs. Fire is not common in this MLRA (AICC 2022).

LRU notes

The bulk of the MLRA is associated with the Circumpolar Arctic Vegetation Mapping (CAVM) subzone D with a small portion of the Northern most lands falling into subzone C (CAVM 2022). Arctic subzone D is associated with vegetation that have herbaceous and dwarf shrub communities that are commonly 4 to 15 inches tall, while subzone C has an herbaceous and dwarf shrub layer that are typically less than 6 inches tall (CAVM 2022). At this time, these differences in community structure are recognized with large differences in annual production expected; but unique ecological sites for each CAVM bioclimate subzone were not developed.

Classification relationships

Landfire BPS – 17050 - Alaska Arctic Sedge Freshwater Marsh
(Landfire 2009)

Ecological site concept

- Occurs in drainageways, swales, and beaded stream with a thick layer of peat and frozen soils.
- Soils formed in organic matter and silty eolian deposits. Soils have up to 25 inches of peat and the surface mineral textures are mucky silt loams and silt loams.
- Because soils both flood and pond, water covers the soil surface for long durations of time and are considered very poorly drained.
- Soils are very deep but have permafrost at shallow to moderate depth.
- The reference plant community is wet sedge meadow tundra (Viereck et al. 1992) with the dominant plants being water sedge and tall cottongrass. Other obligate wetland plant species occur but with low cover such as purple marshlocks and floating marsh marigold. One plant community was identified within the reference state.

Associated sites

R246XY005AK	**Arctic Ice-Wedge Polygon Complex** Occurs in adjacent depressions on the coastal plain with a mosaic of vegetation related to both low- and high-center, ice-wedge polygons.
R246XY009AK	**Arctic High-Center Polygon Complex** Occurs upslope on plains with a mosaic of vegetation associated with high-center, ice-wedge polygons. Dominant vegetation is tussock tundra.
R246XY012AK	**Arctic Dwarf Scrub Sandy Coastal Plain** Occurs upslope on inland dunes. Stabilized dunes support dwarf scrub vegetation.
R246XY014AK	**Arctic Sedge Peat Frozen Depressions** Occurs in adjacent depressions without a mosaic of vegetation related to ice-wedge polygons. Associated with wet sedge meadows.
R246XY050AK	**Arctic Sedge Loamy Tidal Marsh** Occurs near the coast in estuaries and tidal marsh. Associated with halophytic wet sedge meadows.

Similar sites

R246XY014AK	**Arctic Sedge Peat Frozen Depressions** Ecological site 014 has similar reference state vegetation but unique alternate states related to lake drainage and string bogs.

R246XY050AK	**Arctic Sedge Loamy Tidal Marsh** Ecological site 008 and 050 grade into each other near the coast. Freshwater soils support ecological site 008 while brackish soils support ecological site 050.

Figure 1. A drained lake associated with ecological site 14. Depressions have similar reference vegetation but unique alternate states.

Figure 2. Drainageways and other associated landforms with ice-wedge polygons are associated with ecological complex 005.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Carex aquatilis* (2) *Eriophorum angustifolium*

Physiographic features

-Associated with low-gradient drainageways. Field work in the National Petroleum Reserve confirmed this site also occurs in swales and beaded streams.
-Elevation occurs between 10 and 330 feet.
-Slope is nearly level and occurs on all aspects.
-Soils flood frequently for long durations of time.
-Soils pond frequently for long durations of time. Ponding depth is four to eight inches above the soil surface. A water table remains at the soil surface throughout the growing season.
-Associated with negligible amounts of runoff to adjacent, downslope ecological sites.

Drainageways are relatively small, roughly linear depressions that move concentrated water throughout the growing season and have a small defined channel. Swales are shallow, open depressions which lack defined channels but can funnel overland or subsurface flow into a drainageway. Beaded streams have a characteristic pattern associated with areas underlain by ice wedge. The course of the stream channel is controlled by the pattern of the wedges, with bead (pools) occurring at the junctions of the wedges.

Figure 3. Satellite image of a beaded stream in the Arctic Coastal Plains MLRA.

Figure 4. Low-gradient drainageway in the National Petroleum Reserve.

Table 2. Representative physiographic features

Landforms	(1) Coastal plain > Drainageway (2) Coastal plain > Swale (3) Coastal plain > Stream
Runoff class	Negligible
Flooding duration	Long (7 to 30 days)
Flooding frequency	Frequent
Ponding duration	Long (7 to 30 days)
Ponding frequency	Frequent
Elevation	3–101 m
Slope	0–1%
Ponding depth	10–20 cm
Water table depth	0 cm
Aspect	Aspect is not a significant factor

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	0–250 m

Slope	0–4%
Ponding depth	3–30 cm
Water table depth	Not specified

Climatic features

Very short, cool summers and long, very cold winters characterize the arctic climate associated with this ecological site. Given its far North latitude, this Arctic Coastal Plains MLRA experiences long-periods of continuous light in the summer (85 days in Utqiagvik) and continuous darkness in the winter (65 days in Utqiagvik). Mean annual temperature for the Arctic Coastal Plains MLRA typically ranges from 11 to 14 degrees Fahrenheit. The warmest months span June through August with mean normal temperatures ranging from 40 to 47 degrees Fahrenheit (PRISM 2008). The coldest months span December through March with mean normal temperatures ranging from -19 to -9 degrees Fahrenheit (PRISM 2008). This MLRA is arid with mean annual precipitation ranging from 4 to 8 inches. Approximately half of the annual precipitation occurs during the months of July through September. The average annual snowfall ranges from 20 to 40 inches (USDA 2022). The ground is consistently covered with snow from October through May March.

Table 4. Representative climatic features

Frost-free period (characteristic range)	10-28 days
Freeze-free period (characteristic range)	43-76 days
Precipitation total (characteristic range)	102-203 mm
Frost-free period (actual range)	3-48 days
Freeze-free period (actual range)	23-94 days
Precipitation total (actual range)	76-229 mm
Frost-free period (average)	17 days
Freeze-free period (average)	61 days
Precipitation total (average)	152 mm

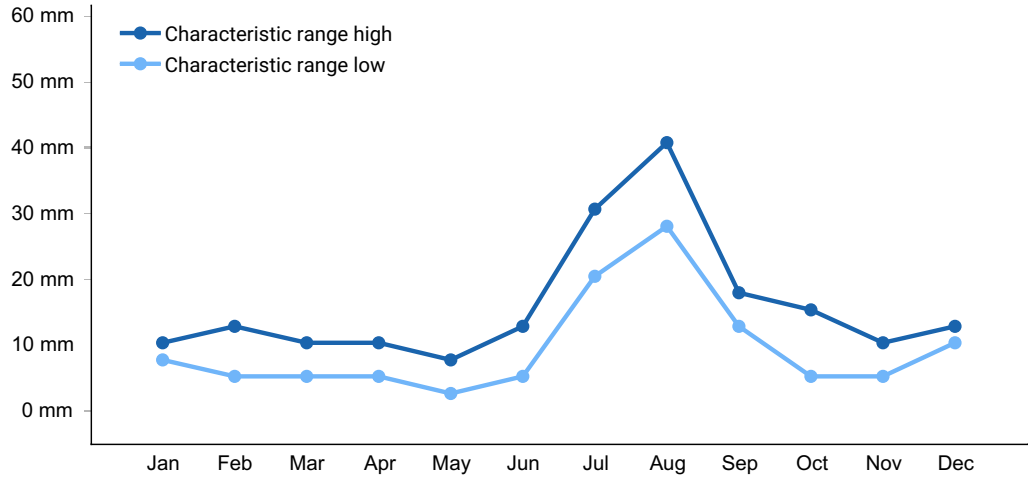

Figure 5. Monthly precipitation range

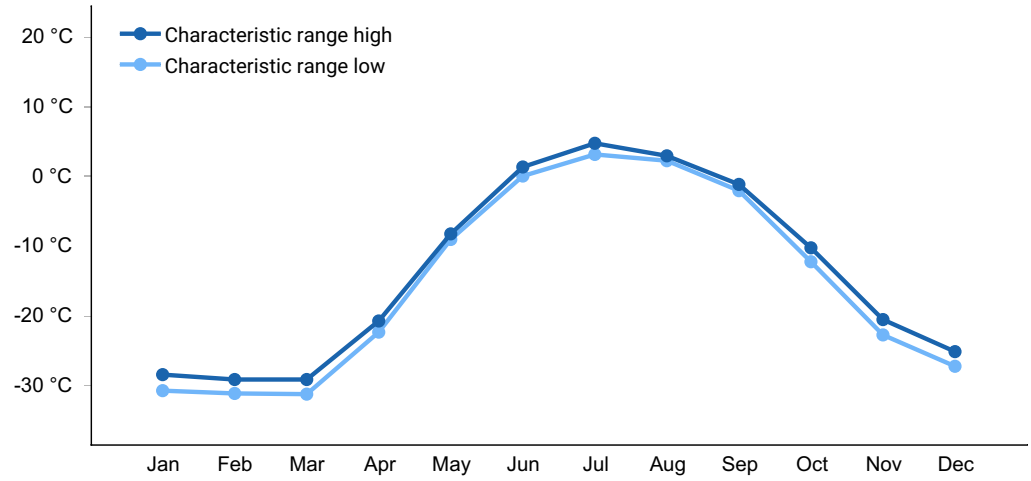

Figure 6. Monthly minimum temperature range

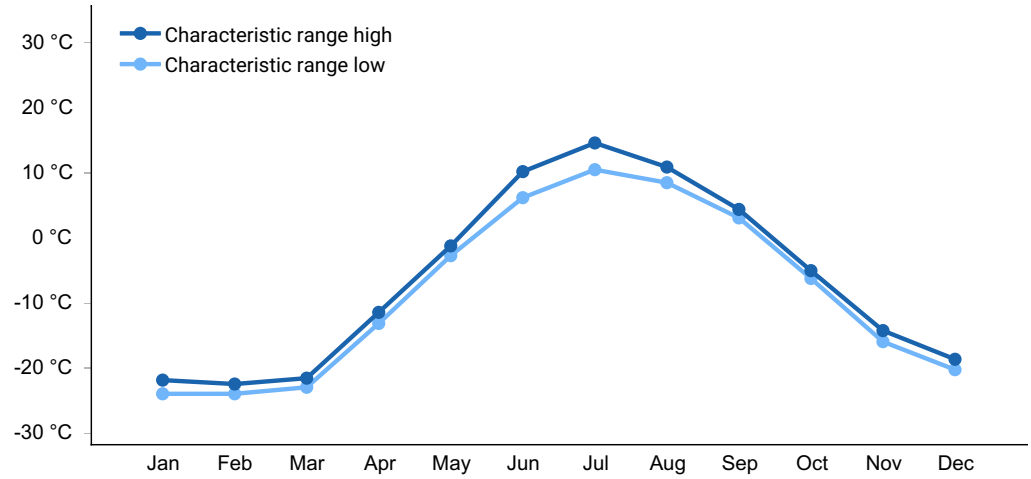

Figure 7. Monthly maximum temperature range

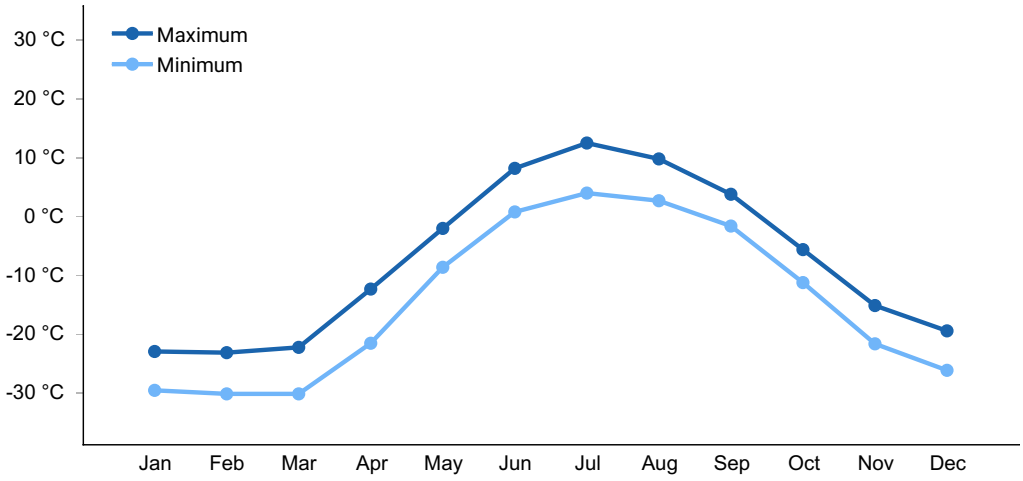

Figure 8. Monthly average minimum and maximum temperature

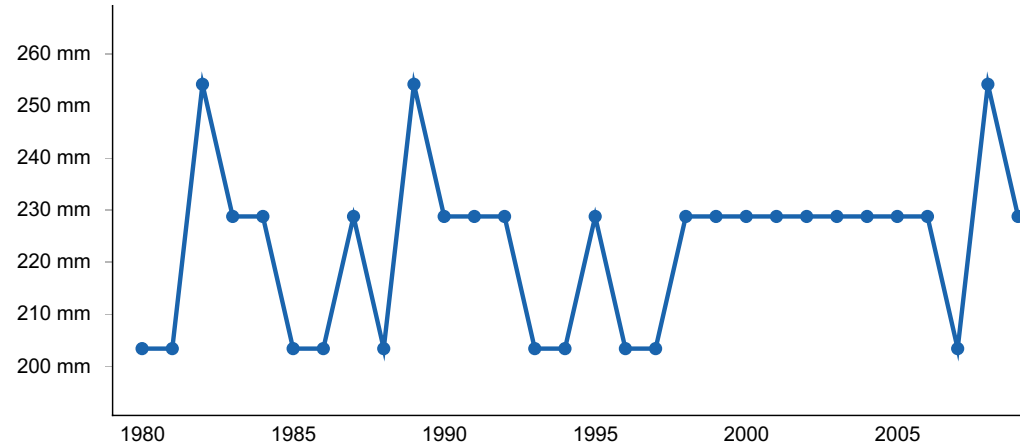

Figure 9. Annual precipitation pattern

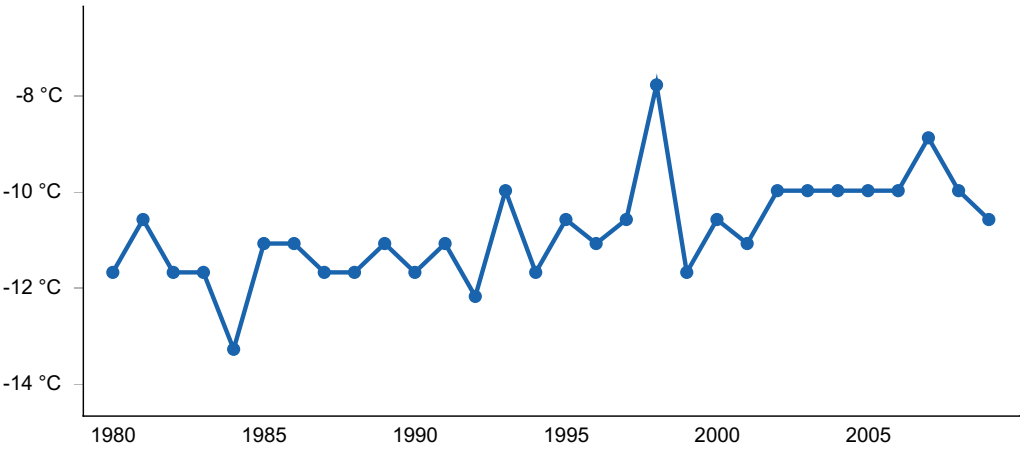

Figure 10. Annual average temperature pattern

Climate stations used

- (1) BARROW POST ROGERS AP [USW00027502], Barrow, AK
- (2) KUPARUK [USC00505136], Prudhoe Bay, AK
- (3) PRUDHOE BAY [USC00507780], Prudhoe Bay, AK

Influencing water features

In the associated drainageways, overbank flow from the channel and subsurface hydraulic connections between the stream and adjacent wetlands are the main sources of water (Smith et al. 1995).

Depth to the water table may decrease following summer storm events or spring snowmelt and increase during extended dry periods

Wetland description

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

Soil features

- Soils formed in organic matter and loess.
- Rock fragments do not occur on the soil surface or in the soil subsurface.
- Mineral soils are capped with 25 inches or more peat. Surface mineral horizon textures are silt loam and mucky silt loam.
- While soils are considered very deep, permafrost is a restriction that occurs at shallow to moderate depth (12 to 25 inches).
- The pH of the soil profile ranges from very strongly acidic to neutral.
- Soils are considered very poorly drained.

This Arctic Sedge Peat Frozen Drainageways ecological site is correlated to three soil components: Nuiqsut (frequently flooded), Poleakoon (frequently flooded), and E46-Arctic sedge-organic frozen drainageways. These soils are classified as Gelisols. The great group for these soils are Historthels, Fibristels, and Hemistels.

Figure 11. Photo of a Nuiqsut (frequently flooded) soil that was mapped in a

drainageway in the National Petroleum Reserve-Beaufort Coastal Plain soil survey.

Table 5. Representative soil features

Parent material	(1) Organic material (2) Eolian deposits
Surface texture	(1) Peat
Family particle size	(1) Loamy
Drainage class	Very poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	30–64 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	26.67–46.74 cm
Calcium carbonate equivalent (25.4-101.6cm)	0%
Clay content (0-50.8cm)	0–1%
Electrical conductivity (25.4-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0–3
Soil reaction (1:1 water) (25.4-101.6cm)	4.9–6.6
Subsurface fragment volume <=3" (0-152.4cm)	0%
Subsurface fragment volume >3" (0-152.4cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	Not specified

Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	10.92–46.74 cm
Calcium carbonate equivalent (25.4-101.6cm)	Not specified
Clay content (0-50.8cm)	Not specified
Electrical conductivity (25.4-101.6cm)	Not specified
Sodium adsorption ratio (25.4-101.6cm)	Not specified
Soil reaction (1:1 water) (25.4-101.6cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

Saltwater Influences

The associated drainageways, swales, and streams meet coastal landforms that border the Chukchi and Beaufort Seas. As soils begin to be influenced with brackish waters, the wet sedge meadow tundra switch to halophytic wetlands. These two wetlands grade into one another sometimes over long distances (Viereck et al. 1992). Indicator species for halophytic wetlands include Hoppner's sedge (Carex subspathecea), Ramensk's sedge (*Carex ramenskii*), Fisher's tundragrass (*Dupontia fisheri*), and looseflower alpine sedge (*Carex rariflora*) (Viereck et al. 1992; Landfire 2009; Macander et al. 2020). These sedge and grass species are provisionally thought to dominate the lower tidal marshes and estuaries across this MLRA. These halophytic wetland communities are captured by the Arctic Sedge Loamy Tidal Marsh (R246XY050AK) ecological site concept.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. water sedge - tall cottongrass

State 1
Reference State

Figure 12. An aerial image of a drainageway draining a lake basin in the Arctic Coastal Plain MLRA.

Figure 13. A satellite image of a beaded stream in the National Petroleum Reserve.

Figure 14. This ecological site is associated with vegetation directly adjacent to the drainageway or beaded stream.

The reference plant community is wet sedge meadow tundra (Viereck et al. 1992) . One plant community was identified within the reference state. The vegetation modeled for this site has limited data and is considered provisional.

Dominant plant species

- water sedge (*Carex aquatilis*), grass
- tall cottongrass (*Eriophorum angustifolium*), grass

Community 1.1
water sedge - tall cottongrass

Figure 15. Typical vegetation associated with community 1.1.

Community 1.1 is characterized as wet sedge meadow tundra (Viereck et al. 1992) with the dominant plants being water sedge and tall cottongrass. The binomial name of these

and other less common associated plants can be found in the below dominant plant species table. Medium graminoids (between 4 and 24 inches) and moss are the vegetative strata that characterize this plant community. The peaty soils are typically covered with several inches of ponded water.

Dominant plant species

- water sedge (*Carex aquatilis*), grass
- tall cottongrass (*Eriophorum angustifolium*), grass
- purple marshlocks (*Comarum palustre*), other herbaceous
- drepanocladus moss (*Drepanocladus*), other herbaceous
- floating marsh marigold (*Caltha natans*), other herbaceous
- marsh grass of Parnassus (*Parnassia palustris*), other herbaceous
- tall Jacob's-ladder (*Polemonium acutiflorum*), other herbaceous

Additional community tables

Animal community

Not available

Hydrological functions

Not available

Recreational uses

Not available

Wood products

Not available

Other information

Not available

Inventory data references

The vegetation modeled for this site has limited data coverage across the MLRA and is considered provisional. The associated model was largely developed from literature review, NRCS staff with working knowledge of the area, and sample plots from the National Petroleum Reserve – Beaufort Coastal Plain soil survey (AK760). Tier 2 sampling plots used to develop the reference state are below:

Tier 2 sampling plots used to develop the grazing state. Plot numbers as recorded in

NASIS with associated community phase.

Community 1.1
2021AK185002, 2023AK185404

References

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Contributors

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Acknowledgments

Marji Patz provided quality control review of these provisional ecological sites.

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	03/23/2026
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:**
