Ecological site R246XY002AK
Arctic Sedge Loamy Frozen Terraces

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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 – 16840 – Alaska Arctic Mesic Sedge-Dryas Tundra (Landfire, 2009)

Ecological site concept

-Associated with stream terraces that lack well-formed ice-wedge polygons and that do not flood. -Soils formed in windblown eolian deposits over alluvium. -Soils do not pond. A water table occurs at very shallow to shallow depths and soils are considered poorly and somewhat poorly drained. -Soils are considered very deep but have permafrost at shallow to moderate depths. -The reference plant community is characterized as sedge-willow tundra (Viereck et al. 1992). Common plants include entireleaf mountain-avens, netleaf willow, water sedge, variegated scouringrush, and Tomentypnum moss. One plant community was identified within the reference state.

Associated sites

R246XY004AK	**Arctic Shrub Sandy Flood Plains** Occurs on adjacent flood plain. Associated with seral herbaceous communities and low willow thickets.
R246XY005AK	**Arctic Ice-Wedge Polygon Complex** Occurs upslope on older stream terraces that have a mosaic of vegetation related to ice-wedge polygons.
R246XY012AK	**Arctic Dwarf Scrub Sandy Coastal Plain** Occurs upslope on active and stabilized dunes with scrubby vegetation.
R246XY014AK	**Arctic Sedge Peat Frozen Depressions** Occurs on adjacent depressions. Associated with wet sedge meadow tundra.

Similar sites

R246XY012AK	**Arctic Dwarf Scrub Sandy Coastal Plain** Ecological site 12 commonly has entireleaf mountain-avens but at much higher cover and wetland sedges at much lower cover.

Figure 1. Photo of floodplain, dunes, younger stream terraces, and older stream terraces adjacent to Judy Creek in the National Petroleum Reserve.

Figure 2. The Arctic Ice-Wedge Polygon Complex is an associated ecological site on older stream terraces.

Table 3. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix reticulata* (2) *Dryas integrifolia*
Herbaceous	(1) *Carex aquatilis* (2) *Tomentypnum nitens*

Physiographic features

-Associated with areas on stream terraces without ice-wedge polygon. In the National Petroleum Reserve soil survey area, associated vegetation was occasionally observed on interdunes.

-Elevation occurs between 30 and 330 feet.
-Slopes are nearly level. Given the low relief, aspect is not relevant for this ecological site concept.
-Soils do not pond or flood. During the growing season, a water table occurs at shallow to moderate depths.
-Associated with negligible to very low runoff to adjacent and downslope, ecological sites.

Table 4. Representative physiographic features

Landforms	(1) River valley > Stream terrace (2) River valley > Interdune
Runoff class	Negligible to low
Flooding frequency	None
Ponding frequency	None
Elevation	10 – 100 m
Slope	0 %
Water table depth	0 – 50 cm
Aspect	Aspect is not a significant factor

Table 5. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	0 – 250 m
Slope	0 %
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 6 Representative climatic features

Frost-free period (characteristic range)	10-30 days
Freeze-free period (characteristic range)	40-80 days
Precipitation total (characteristic range)	100-200 mm
Frost-free period (actual range)	0-50 days
Freeze-free period (actual range)	20-90 days
Precipitation total (actual range)	80-230 mm
Frost-free period (average)	20 days
Freeze-free period (average)	60 days
Precipitation total (average)	150 mm

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

Influencing water features

Precipitation is the main source of water (USDA-NRCS 2008).

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

Wetland description

The poorly drained soils associated with this ecological site are classified as a mineral soils flats wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

- Soils formed in eolian deposits over stratified sandy and silty alluvium.
- Rock fragments do not occur on the soil surface.
- Soils are capped with 2 to 9 inches of peat. The surface mineral horizon texture is silt loam.
- Soils are considered very deep but have permafrost at shallow to moderate depths.
- Rock fragments do not typically occur in the soil subsurface. On rare occasion, rock fragments range up to 10 percent of the soil profile by volume.
- The pH of the soil profile ranges from strongly acidic to neutral.

- Soils are considered poorly and somewhat poorly drained.

This Arctic Sedge Loamy Frozen Terraces ecological site is correlated to two soil components: Atigaru and E46-Arctic sedge-scrub-loamy frozen terraces. These soils are classified as Gelisols. The great group for poorly drained soils are Historthels and the great group for somewhat poorly drained soils are Haplorthels.

Figure 7. Photo of an Atigaru soil that was mapped on stream terraces in the National Petroleum Reserve-Beaufort Coastal Plain soil survey.

Table 7. Representative soil features

Parent material	(1) Loess (2) Eolian deposits (3) Alluvium
Surface texture	(1) Peat (2) Silt loam
Family particle size	(1) Coarse-loamy (2) Sandy
Drainage class	Poorly drained to somewhat poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	50 – 80 cm
Soil depth	150 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	15.75 – 24.64 cm
Calcium carbonate equivalent (25.4-101.6cm)	Not specified

Clay content (0-50.8cm)	0 – 10 %
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)	5.1 – 7.2
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Table 8. 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)	6.1 – 24.64 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)	0
Soil reaction (1:1 water) (25.4-101.6cm)	10 – 7.8
Subsurface fragment volume <=3" (0-152.4cm)	0 – 10 %
Subsurface fragment volume >3" (0-152.4cm)	0 %

Ecological dynamics

The flood plains and stream terraces of rivers in the Arctic Coastal Plain MLRA have a mosaic of vegetation with multiple ecological sites largely based on differences in flood regime and landform position.

One ecological site is associated with flood plain depressions related to oxbow lakes and other meanders (R246XY014AK) that typically support wet graminoid herbaceous vegetation. One ecological site occurs on floodplains and drainageways that are frequently flooded (R246XY004AK) and support open and closed willow scrub. Dunes are common on larger rivers (R246XY012AK) and support dwarf scrub and low willow scrub. Stream terraces no longer flood. This Arctic Sedge Loamy Frozen Terraces ecological site is associated with younger stream terraces that lack ice-wedge polygons. Older stream terraces have well developed ice-wedge polygons (R246XY005AK) with a unique mosaic of vegetation related to ice-wedge microtopography. The transition from bare alluvium on flood plains to polygons on stream terraces can take 1500-3000 years (Jorgenson et al. 1998).

Ice-wedge polygon transitions

Transecting the stream terrace, younger surfaces lack apparent ice-wedges. As distance and elevation increase, small incipient ice-wedges become apparent. The highest and oldest levels of stream terrace have well-formed ice-wedge polygons. These polygons have multiple microtopographic positions such as the center, rim, and ice-wedge trough of low-center polygons. Large differences exist in site and soil properties between these positions and that results in a mosaic of vegetation described in the Arctic Ice-Wedge Polygon Complex. Only the flat lands on younger surfaces and between incipient ice-wedges are associated with this ecological site. As ice-wedge microtopography becomes well-formed, the lands transition to the Arctic Peat Ice-Wedge Polygon Complex.

State and transition model

Additional community tables

Table 9. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

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 2021AK185200, 2021AK185201, 2021AK185206, 2021AK185217, 2021AK185425, 2024AK185015, and 2024AK185016.

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Contributors

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Approval

Blaine Spellman, 5/22/2025

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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	09/15/2026
Approved by	
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:**

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

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

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

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

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

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

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

14. **Average percent litter cover (%) and depth (in):**

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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:**
