

Ecological site R246XY050AK

Arctic Sedge Loamy Tidal Marsh

Last updated: 5/22/2025

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): 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 glacial 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 – 17110 - Alaska Arctic Tidal Marsh (Landfire 2009)

Landfire BpS – 17120 - Alaska Arctic Coastal Brackish Meadow (Landfire 2009)

Halophytic Sedge Wet Meadow (Vioreck et al. 1992)

Halophytic Sedge-Grass Wet Meadow (Vioreck et al. 1992)

Ecological site concept

- Occurs on tidal flats, estuaries, and tidal marsh. Areas flooded daily or monthly with saltier water are in the reference state, while areas flooded less frequently or with brackish water are in an alternate state.
- Soils formed in silty and clayey marine deposits. Soils are capped with up to two inches of peat and the surface mineral textures are very fine sands and silty clays.
- Soils have a water table near the soil surface throughout the growing season and are considered very poorly drained.
- Soils are very deep without restrictions like permafrost.
- The reference plant community is halophytic sedge wet meadow (Vioreck et al. 1992) dominated by Hoppner's sedge. Two plant communities occur within the reference state related to the frequency and duration of tidal inundation. The alternate state is also characterized as halophytic sedge wet meadow (Vioreck et al. 1992) with the dominant plant being looseflower alpine sedge.

Associated sites

R246XY004AK	Arctic Shrub Sandy Flood Plains Occurs upstream of estuaries on large floodplains. Associated with open and closed low scrub willow vegetation.
R246XY008AK	Arctic Sedge Peat Frozen Drainageways Occurs upstream of estuaries on low-gradient drainageway and streams. Associated with wet sedge meadow plant communities.
R246XY051AK	Arctic Shrub Loamy Frozen Tidal Marsh Occurs on the same landforms but in higher positions that are much less commonly inundated by tides. Soils have thicker organic caps, permafrost, and support shrub dominant communities.

Similar sites

R239XY050AK	Arctic Grass Sandy Dunes Ecological site R239XY050AK occurs on the same landforms with similar soils and vegetation but occurs to the West in the Northern Bering Sea Islands MLRA.
-------------	---

R246XY008AK	<p>Arctic Sedge Peat Frozen Drainageways</p> <p>The wet sedge meadows found directly adjacent to these drainageways and small streams grade into the freshwater marshes and uppermost portions of estuaries.</p>
R246XY014AK	<p>Arctic Sedge Peat Frozen Depressions</p> <p>Occurs in lake basins and other depressions across this area with freshwater sedge dominant vegetation like water sedge and tall cottongrass.</p>



Figure 1. Landforms on shore complex that do not periodically flooded with tidal water (in Macander et al. 2020)).

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) <i>Carex subspathacea</i> (2) <i>Carex rariflora</i>

Physiographic features

- Occurs on the shore complex. Associated landforms receive salt spray and frequent tidal flooding and include estuaries, tidal flats, and the lower tidal marsh.
- Elevation ranges between 0 and 10 feet above sea level.
- Slope is nearly level. Given the low relief, aspect is not relevant for this ecological site concept.
- Tidal flooding occurs frequently for very long to brief durations of time.
- Soil pond frequently for brief to very long durations of time. Ponding ranges from 8 to 60 inches over the soil profile.
- A water table occurs at the soil surface throughout the growing season.
- Associated with negligible amounts of runoff to adjacent ecological sites.

Table 2. Representative physiographic features

Landforms	(1) Shore complex > Coastal plain (2) Shore complex > Estuary (3) Shore complex > Tidal flat (4) Shore complex > Tidal marsh
Runoff class	Negligible to low
Flooding duration	Brief (2 to 7 days) to very long (more than 30 days)
Flooding frequency	Frequent
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	0–3 m
Slope	0%
Ponding depth	20–152 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	Not specified
Slope	0–2%
Ponding depth	0–165 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

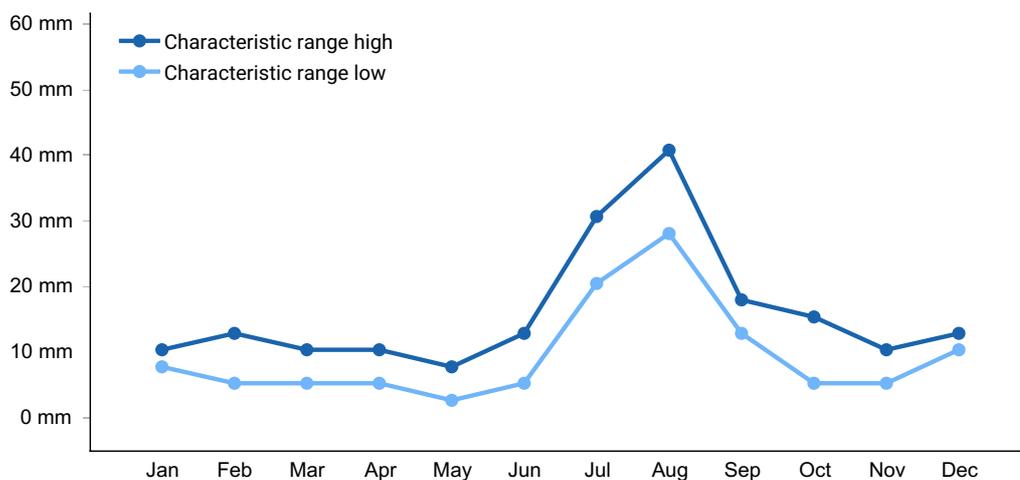


Figure 2. Monthly precipitation range

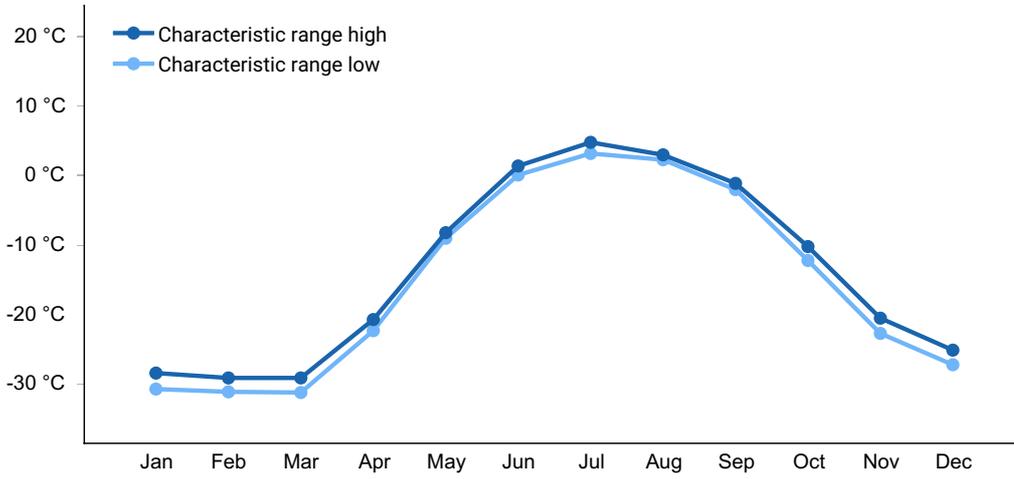


Figure 3. Monthly minimum temperature range

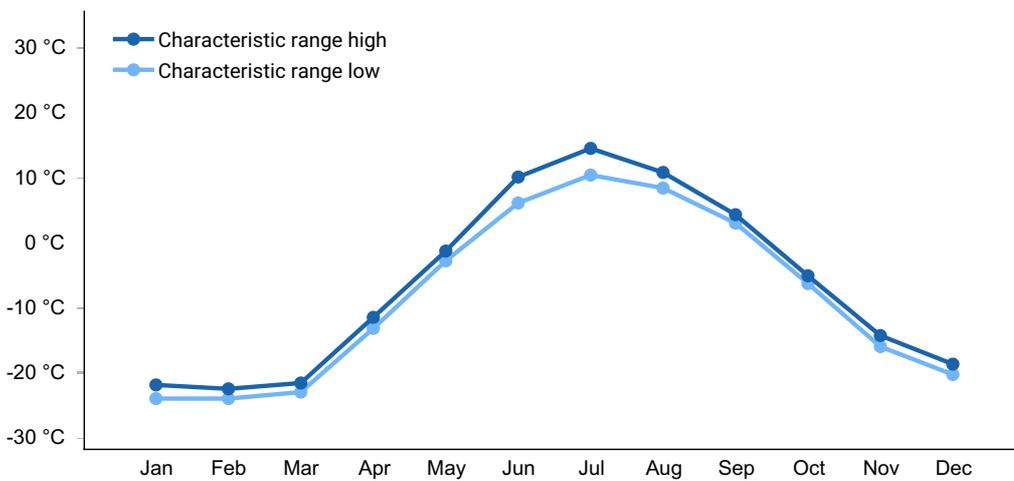


Figure 4. Monthly maximum temperature range

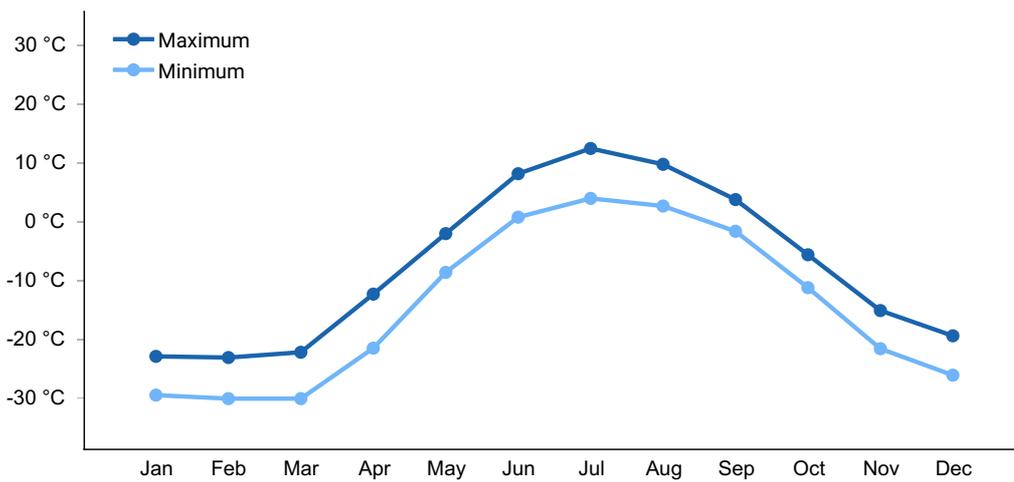


Figure 5. Monthly average minimum and maximum temperature

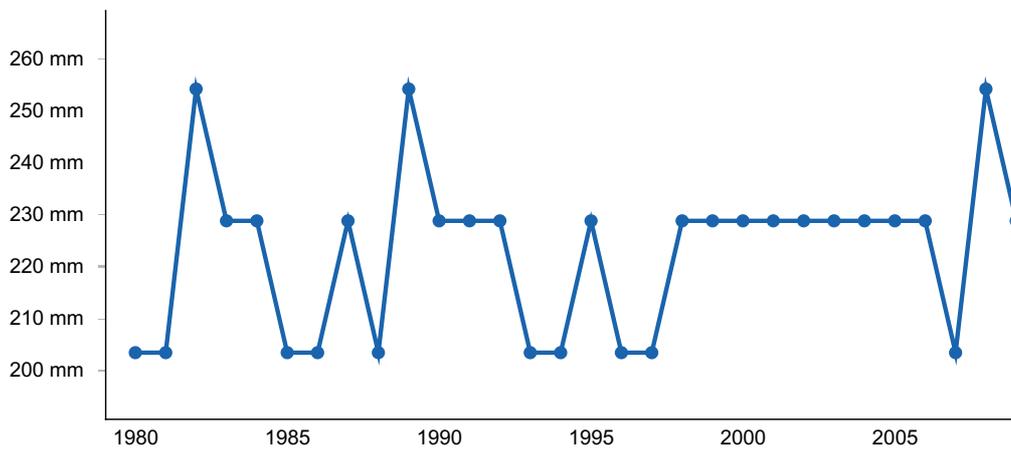


Figure 6. Annual precipitation pattern

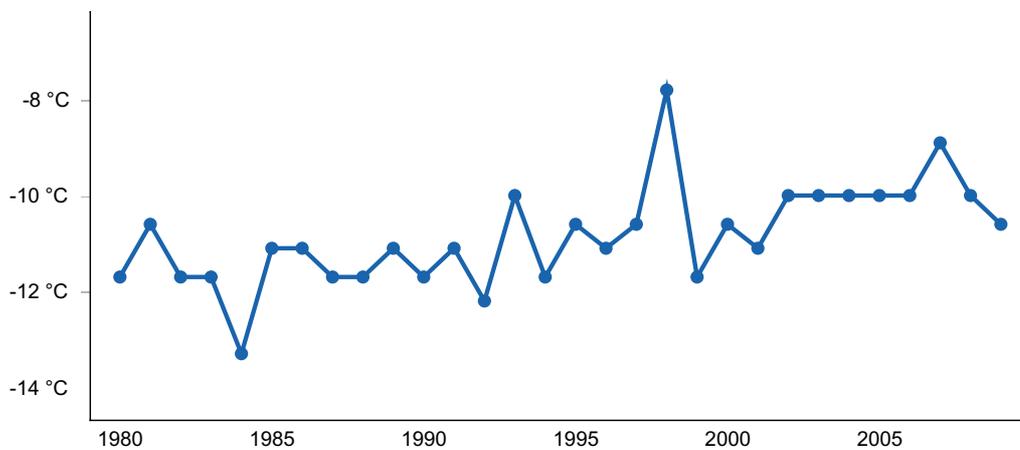


Figure 7. Annual average temperature pattern

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 shore complex, periodic tidal flooding, precipitation, and groundwater discharge are the main sources of water (Smith et al. 1995; 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

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

Soil features

- Soils are derived from silty and clayey marine deposits.
- Rock fragments do not occur on the soil surface and typically do not occur in soil profile.
- Soils lack an organic cap in estuaries, tidal flats, and other areas tidally inundated each day. Soils have a thin organic cap of up to two inches in associated tidal marshes.
- The surface mineral horizon is composed of stratified very fine sands and silty clays.
- Soils are very deep without restrictions like permafrost.
- Soils are salty with a sodium absorption ratio between 1 and 12 and electrical conductivity ranging between 4 and 20 mmhos/cm.
- The pH of the soil profile ranges from neutral to moderately alkaline.

Table 5. Representative soil features

Parent material	(1) Marine deposits
Surface texture	(1) Very fine sand (2) Silty clay
Family particle size	(1) Fine-silty
Drainage class	Very poorly drained
Permeability class	Moderately rapid
Soil depth	152 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	4.06–20.07 cm
Calcium carbonate equivalent (25.4-101.6cm)	5–30%
Clay content (0-50.8cm)	25–35%
Electrical conductivity (25.4-101.6cm)	4–20 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	1–12
Soil reaction (1:1 water) (25.4-101.6cm)	6.6–8
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
Soil depth	Not specified
Surface fragment cover ≤3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified
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)	6.4–8
Subsurface fragment volume ≤3" (0-152.4cm)	0–10%
Subsurface fragment volume >3" (0-152.4cm)	0%

Ecological dynamics

Saltwater Influences and vegetative succession

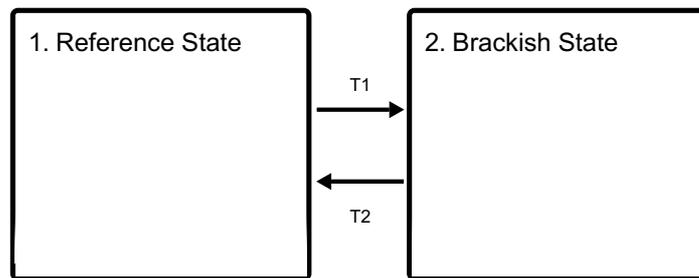
Within the shore complex, there are multiple landforms such as tidal flats, foredunes, estuaries, tidal marshes, and backshores each with unique tidal influences. Tidal flats, foredunes, lower levels of tidal marshes, and estuaries are all proximal to the ocean and receive frequent salt spray and/or routine tidal flooding. Backshores and upper levels of tidal marshes are comparatively distal landforms that receive tidal flooding only during exceptionally severe storms. Based on the associated soils and vegetation, this ecological site occurs on proximal landforms within the shore complex.

Tidal flats are largely unvegetated but portions of them are first colonized by plants like creeping alkali grass (Landfire 2009). As elevation and distance increases, tidal surges become less severe, less frequent, and less deep allowing graminoids to cover much of the frequently inundated coastal landforms. Landforms like lower tidal marsh that receive daily to monthly flooding are dominated by Hoppner's sedge and to a lesser extent

Ramensk's sedge. Landforms that only receive flooding from the strongest tidal surges and/or occur in brackish portions of estuaries are dominated by mixtures of looseflower alpine sedge, Fisher's tundra grass, tall cottongrass, and water sedge (Viereck et al. 1992; Landfire 2009; Macander et al. 2020). These plant communities are provisionally thought to dominate the lower tidal marshes and estuaries across this MLRA. As tidal influences decrease, such as in the upper portions of estuaries, wetlands will grade towards dominance of freshwater graminoids like water sedge, tall cottongrass, and pendantgrass. These freshwater sedge and grass meadows are captured by the arctic sedge peat frozen drainageways (R246XY003AK) ecological site concept.

State and transition model

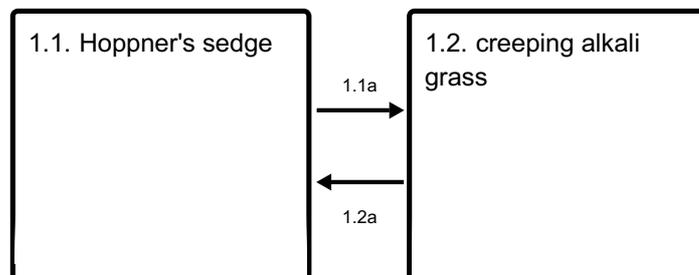
Ecosystem states



T1 - decreased tidal influences and/or increased freshwater inputs

T2 - increased tidal influences and/or decreased freshwater inputs

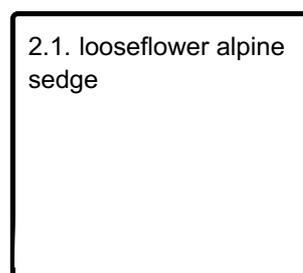
State 1 submodel, plant communities



1.1a - more frequent and longer duration tidal inundation

1.2a - less frequent and shorter duration tidal inundation

State 2 submodel, plant communities



State 1

Reference State



Figure 8. Photo of periodically flooded areas on the shore complex (in Macander et al. 2020).

The reference plant community is halophytic sedge wet meadow (Vioreck et al. 1992) dominated by Hoppner's sedge and at times Ramensk's sedge. Two plant communities occur within the reference state related to the frequency and duration of tidal inundation. The vegetation modeled for this ecological site has limited data and is considered provisional.

Dominant plant species

- Hoppner's sedge (*Carex subspathacea*), grass
- Ramensk's sedge (*Carex ramenskii*), grass

Community 1.1

Hoppner's sedge



This community is characterized as halophytic sedge wet meadow (Vioreck et al. 1992) with the dominant plant being Hoppner's sedge. This community is associated with tidal marshes and cover and production are high (Vioreck et al. 1992). Other commonly observed species include Ramensk's sedge and Fisher's tundra grass. The binomial name of these and other associated plants can be found in the below dominant plant species table.

Dominant plant species

- Hoppner's sedge (*Carex subspathacea*), grass
- Ramensk's sedge (*Carex ramenskii*), grass
- Fisher's tundra grass (*Dupontia fisheri*), grass
- looseflower alpine sedge (*Carex rariflora*), grass
- bear sedge (*Carex ursina*), grass
- spoonwort (*Cochlearia officinalis*), other herbaceous
- saltmarsh starwort (*Stellaria humifusa*), other herbaceous

Community 1.2 creeping alkali grass

This pioneering community is characterized as halophytic grass wet meadow (Vioreck et al. 1992) with the dominant plant being creeping alkali grass. This community is associated with tidal flats and cover and production are low (Vioreck et al. 1992). The binomial name of these and other associated plants can be found in the below dominant plant species table.

Dominant plant species

- creeping alkaligrass (*Puccinellia phryganodes*), grass

Pathway 1.1a Community 1.1 to 1.2

More frequent and longer duration tidal inundation. Sedge cover decreases.

Pathway 1.2a Community 1.2 to 1.1

Less frequent and shorter duration tidal inundation. Sedge cover increases.

State 2 Brackish State

The reference plant community is halophytic sedge wet meadow (Vioreck et al. 1992) with the dominant plant being alpine looseflower sedge. One plant community was identified within this alternate state. Compared to the reference state, vegetation and soils

experience comparably less frequent tidal flooding and/or are flooded with brackish water in estuaries. The vegetation modeled for this ecological site has limited data and is considered provisional.

Dominant plant species

- looseflower alpine sedge (*Carex rariflora*), grass

Community 2.1

looseflower alpine sedge

This community is characterized as halophytic sedge wet meadow (Viereck et al. 1992) with the dominant plant being looseflower alpine sedge. This community is associated with higher levels of tidal marshes and brackish estuaries. Other commonly observed species include Fisher's tundra grass, tall cottongrass, and water sedge. The binomial name of these and other associated plants can be found in the below dominant plant species table.

Dominant plant species

- oval-leaf willow (*Salix ovalifolia*), shrub
- looseflower alpine sedge (*Carex rariflora*), grass
- Fisher's tundra grass (*Dupontia fisheri*), grass
- water sedge (*Carex aquatilis*), grass
- tall cottongrass (*Eriophorum angustifolium*), grass
- Hoppner's sedge (*Carex subspathacea*), grass

Transition T1

State 1 to 2

Decreased tidal influences and/or increased freshwater inputs.

Transition T2

State 2 to 1

Increased tidal influences and/or decreased freshwater inputs.

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 and is considered provisional. The associated model was largely developed from NRCS staff with working knowledge of the area and literature review.

Other references

Alaska Interagency Coordination Center (AICC). 2022. <http://fire.ak.blm.gov/>. CAVM 2022.

Landfire. 2009. Biophysical Setting. In: LANDFIRE National Vegetation Dynamics Models. USDA Forest Service and US Department of Interior. Washington, DC.

Macander, M.J. Well, A.F., McNown R.W., Christopherson T. 2020. Land cover mapping, north slope of the arctic national wildlife refuge, Alaska, 2019. ABR, Inc. – Environmental Research and Services, Fairbanks, AK.

PRISM Climate Group. 2018. Alaska – average monthly and annual precipitation and minimum, maximum, and mean temperature for the period 1981-2010. Oregon State University, Corvallis, Oregon. <https://prism.oregonstate.edu/projects/alaska.php>. (Accessed 4 September 2019).

Scenarios network for Alaska and arctic planning (SNAP). Historical Monthly Temperature – 1km, 1901-2009. <http://ckan.snap.uaf.edu/dataset/>. (Accessed 5 May 2021).

SNAP. Historical monthly and derived precipitation products downscaled from CRU TS data via the delta methods – 2km, 1901-2009. <http://ckan.snap.uaf.edu/dataset/>. (Accessed 5 May 2021).

United States Department of Agriculture, . 2022. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin.

Contributors

Blaine Spellman

Tyler Annetts

Acknowledgments

Thanks to Marji Patz for her quality control review of these provisional ecological sites in this MLRA.

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:**

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):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

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:**

17. **Perennial plant reproductive capability:**
