Ecological site R246XY012AK
Arctic Dwarf Scrub Sandy Coastal Plain

Last updated: 5/22/2025
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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 – 16890 - Alaska Arctic Non-Acidic Dryas Dwarf- Shrubland Landfire BpS – 17130 – Alaska Arctic Active Inland Dune (Landfire 2009)

Ecological site concept

-Associated with well drained and excessively drained soils on inland dunes. The reference state is associated with stabilized dunes, while an alternate state is associated with active dunes, blowouts, and eroded bluffs. -Soils formed in sandy eolian deposits. -Soils do not pond. While inland dunes typically do not flood, active dunes close to rivers flood frequently. During the growing season, a water table does not occur in the soil profile. -Soils are considered very deep without restrictions in the soil profile. -The reference plant community is dwarf scrub (Viereck et al. 1992) with a diverse assembled of vegetation. Common plants include entireleaf mountain-avens, white arctic mountain heather, alpine sweetgrass, and Flavocetraria lichen. The alternate state is sparsely vegetated and commonly characterized as open low scrub (Viereck et al. 1992) with willow and grass pioneering species. Common species include feltleaf willow, grayleaf willow, barrenground willow, American dunegrass, and Pumpelly's brome.

Associated sites

R246XY002AK	**Arctic Sedge Loamy Frozen Terraces** Occurs on stream terraces without a mosaic of vegetation associated with ice-wedge polygons. Associated with sedge-Dryas tundra.
R246XY004AK	**Arctic Shrub Sandy Flood Plains** Occurs on low floodplain of rivers and incised drainageways. Associated with seral herbaceous communities and low willow thickets.
R246XY005AK	**Arctic Ice-Wedge Polygon Complex** Occurs downslope on adjacent depressions with a mosaic of vegetation related to both low- and high-center, ice-wedge polygons.
R246XY008AK	**Arctic Sedge Peat Frozen Drainageways** Occurs downslope on adjacent drainageways. Associated with low willow thickets and wet sedge meadow vegetation.
R246XY009AK	**Arctic High-Center Polygon Complex** Occurs on the same slopes and stream terraces but in lower positions with a mosaic of vegetation associated with high-center, ice-wedge polygons. Dominant vegetation is tussock tundra.
R246XY014AK	**Arctic Sedge Peat Frozen Depressions** Occurs downslope on adjacent depressions without a mosaic of vegetation related to ice-wedge polygons. Associated with wet sedge meadow tundra.

Similar sites

R246XY002AK	**Arctic Sedge Loamy Frozen Terraces** Ecological site 002 commonly has entireleaf mountain-avens but at much lower cover and wetland sedges at much higher cover.

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

Table 2. Dominant plant species

Tree	Not specified
Shrub	(1) *Dryas integrifolia* (2) *Cassiope tetragona*
Herbaceous	(1) *Anthoxanthum monticola* (2) *Flavocetraria cucullata*

Physiographic features

-Associated with inland dunes. These dunes occur on flood plains, meander scrolls, stream terraces, and eolian plains. Active dunes are most prevalent directly adjacent to flood plains that bisect eolian plains, while stabilized dunes occur on stream terraces and slopes of eolian plains. Portions of stabilized dunes occasionally have blowouts. River and lake bluffs share similar soils and vegetation as dunes.
-Elevation occurs between 10 and 330 feet.
-While most dunes are gently sloping, some active dunes can be moderately steep. Given the low relief, aspect is not relevant for this ecological site concept.
-Active dunes on flood plains flood frequently for very brief durations. Stabilized dunes do not flood.
-Stabilized dunes have a water table at deep depths, while active dunes have no water table in the soil profile.
-Associated with negligible to low amounts of runoff to adjacent, downslope ecological sites.

Figure 1. Photo on a stabilized dune on the eolian plains in the National Petroleum Reserve.

Figure 2. Photo of stabilized dunes with small blowouts on stream terraces and meanders scroll in the National Petroleum Reserve.

Figure 3. The greyed in portion of this figure indicates where a high concentration of stabilized dunes occur in the Arctic Coastal Plain MLRA (Carter 1981).

Table 3. Representative physiographic features

Landforms	(1) Coastal plain > Plain (2) Coastal plain > Dune (3) Coastal plain > Dune (4) Coastal plain > Blowout (5) Coastal plain > Bluff (6) River valley > Stream terrace (7) River valley > Flood plain (8) River valley > Meander scroll
Runoff class	Negligible
Flooding duration	Very brief (4 to 48 hours)
Flooding frequency	None to frequent
Ponding frequency	None

Elevation	0 – 100 m
Slope	0 %
Water table depth	100 – 150 cm
Aspect	Aspect is not a significant factor

Table 4. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	0 – 250 m
Slope	0 – 20 %
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 5 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

Due to its landscape position, this ecological site is neither associated with or influenced by streams or wetlands. Precipitation and throughflow are the main source of water for this ecological site.

Moist to wet depressions can occur between active and stabilized dunes in the MLRA, which are termed interdunes. The vegetation on moist soils was observed to be a willow-sedge shrub tundra and is associated with ecological site R246XY002AK. The vegetation on wet soils was observed to be wet sedge meadow tundra and is associated with ecological site R246XY014AK.

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

Wetland description

Not a wetland.

Soil features

-Soils formed in sandy eolian deposits. On flood plain and stream terraces, parent material is commonly reworked alluvium blown in from exposed riverbanks and point bars.
-Rock fragments do not occur on the soil surface or in the soil profile.
-Surface mineral horizon textures are fine sands.
-Soils are considered very deep and typically without restrictions in the soil profile. On occasion, permafrost occurs in stabilized dunes ranging from moderate to deep depths (37 to 51 inches).
-The pH of the soil profile ranges from neutral to moderately alkaline.

Reference State
-Associated with stabilized dunes.
-Mineral soils are capped with up to one inch of organic material.
-These mesic soils are considered well drained.

Alternate State
-In the National Petroleum Reserve – Beaufort Coastal Plain soil survey area, alternate state soils on active dunes, blowouts, and eroded bluffs are commonly the Arrakis soil series. These are Entisols in the soil suborder of Udipsamments.
-Mineral soils are exposed and lack an organic cap.
-These dry soils are considered excessively drained.

This Arctic Dwarf Scrub Sandy Coastal Plain ecological site is correlated to two soil components: Arrakis and Teshekpuk. Arrakis is associated with active dunes and blowouts and classifies as an Entisol in the great group Udipsamments. Teshekpuk is associated with stabilized dunes and classifies as an Inceptisol in the great group Humigelepts.

Figure 10. Photo of an Arrakis soil that was mapped on active dunes on a flood plain in the National Petroleum Reserve-Beaufort Coastal Plain soil survey.

Figure 11. Photo of a Teshekpuk soil that was mapped on stabilized dunes on the eolian plains in the National Petroleum Reserve-Beaufort Coastal Plain soil survey.

Table 6. Representative soil features

Parent material	(1) Eolian deposits (2) Alluvium
Surface texture	(1) Fine sand
Family particle size	(1) Sandy
Drainage class	Well drained to excessively drained
Permeability class	Very rapid
Depth to restrictive layer	Not specified
Soil depth	150 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	4.06 – 6.1 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)	6.6 – 8.4
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Table 7. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	90 cm
Soil depth	Not specified
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified
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

Longitudinal and parabolic dunes are common on an eolian plain that covers an approximate 4,350 square mile expanse of the Arctic Coastal Plain MLRA (figure 3; Carter 1981). These dunes were formed by deposition of windblown sandy deposits during the Pleistocene with these deposits being up to 65 feet thick (Carter 1981). These dunes are often 0.5 miles in length and occur on flood plain, stream terraces, and plains. Active dunes are common on bluffs and floodplains that bisect this eolian plain. On occasion, stabilized dunes experience severe wind erosion resulting in blowouts, which are saucer-, cup-, or trough-shaped depressions.

Dunes and bluffs have excessively drained soils and vegetation experiences droughty conditions. Precipitation on dunes and bluffs are the major hydrologic input. After a rain event, available water is rapidly drained through the porous sandy soil profile. During most of the growing season, depth to internal free water in the profile is thought to be below the rooting zone of plants, which results in droughty conditions.

These droughty conditions result in unique assemblages of vegetation in the MLRA. The vegetation on stabilized dunes is primarily composed of dwarf shrubs dominated by entireleaf mountain-avens, white arctic mountain heather, and alpine bearberry. While having much less cover, a diverse array of graminoids, forbs, moss, and lichen species co-occur on dunes. Several species are considered rare (i.e. Eurasian Junegrass, Drummond’s bluebells, and buff fleabane; Cortes-Burns et al. 2009).

Dune Succession

On active dunes and blowouts, grasses and willows invade the sandy soils but with low cover. Feltleaf willow is common on flood plains, while grayleaf willow is common on terraces and slopes of plains. American dunegrass is common closer to the coast (Peterson and Billings 1978), while Pumpelly’s brome, Eurasian Junegrass, and red fescue are common further from the coast. These early successional species catch and stabilize shifting sands and eventually dwarf scrubs, forbs, lichens, and moss invade and increase in cover. On the Meade River in this MLRA, this secondary wave of plant establishment was dominated by entireleaf mountain-avens, white arctic mountain heather, mountain harebell, Flavocetraria lichen, and Racomitrium moss (Peterson and Billings 1978). These species were also dominant on many of the stabilized dunes common across the National Petroleum Reserve. As vegetation cover increases, permafrost aggrandizes deep and often below the soil profile. Dunes are then further stabilized. The transition from active dunes and blowouts to stabilized dunes can take hundreds of years (Peterson and Billings 1978; Landfire 2009).

State and transition model

Additional community tables

Table 8. Community 1.1 plant community composition

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

Table 9. Community 2.1 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 plant community. Community 1.1 2021AK185681, S2021AK185694, 2021AK185703, 2021AK185714, 2021AK185104, 2021AK185300, 2021AK185315, 2021AK185316, 2021AK185318, 2021AK185319, 2021AK185320, 2021AK185409, 2021AK185415, 2021AK185426, 2023AK185401, 2023AK185822, 2023AK185115, 2023AK185100 Community 2.1 2024AK185013, 2024AK185018 Additional Observations of a blowout in the National Petroleum Reserve: https://www.inaturalist.org/observations?nelat=70.01839779867433&nelng=-153.03615689935012&place_id=any&subview=map&swlat=70.01653526521382&swlng=-153.04504037560744&user_id=blainespellman&verifiable=any

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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	07/12/2026

Approved by	
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:

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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:**
