USDA Natural Resources Conservation Service

Ecological site R236XY127AK
Subarctic Sedge Peat Plain Depressions

Last updated: 2/13/2024
Accessed: 05/18/2024

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.

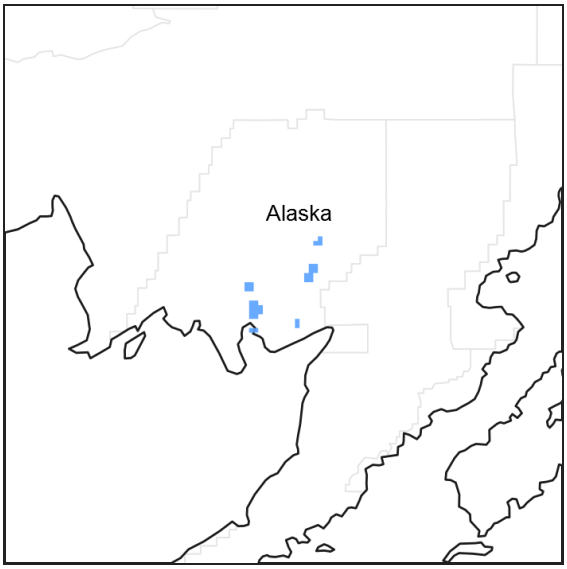


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

Major Land Resource Area (MLRA): 236X–Bristol Bay-Northern Alaska Peninsula Lowlands

The Bristol Bay-Northern Alaska Peninsula Lowland Major Land Resource Area (MLRA 236) is located in Western Alaska. This MLRA covers approximately 19,500 square miles and is defined by an expanse of nearly level to rolling lowlands, uplands and low to moderate hills bordered by long, mountain footslopes. Major rivers include the Egegik, Mulchatna, Naknek, Nushagak, and Wood River. MLRA 236 is in the zone of discontinuous permafrost. It is primarily in areas with finer textured soils on terraces, rolling uplands and footslopes. This MLRA was glaciated during the early to middle Pleistocene. Moraine and glaciofluvial deposits cover around sixty percent of the MLRA. Alluvium and coastal deposits make up a large portion of the remaining area (Kautz et al., 2012; USDA, 2006).

Climate patterns across this MLRA shift as one moves away from the coast. A maritime climate is prominent along the coast, while continental weather, commonly associated with Interior Alaska, is more influential inland. Across the MLRA, summers are general short and warm while winters are long and cold. Mean annual precipitation is 13 to 50 inches, with increased precipitation at higher elevations and areas away from the coast. Mean annual temperatures is between 30 and 36 degrees F (USDA, 2006).

The Bristol Bay-Northern Alaska Peninsula MLRA is principally undeveloped wilderness. Federally managed land includes parts of the Katmai and Aniakchak National Parks, and the Alaska Peninsula, Becharof, Togiak and Alaska Maritime National Wildlife Refuges. The MLRA is sparsely populated. Principal communities include Dillingham,

Naknek, and King Salmon. Commercial fishing in Bristol Bay and the Bering Sea comprises a major part of economic activity in the MLRA. Other land uses include subsistence activities (fishing, hunting, and gathering) and sport hunting and fishing (USDA, 2006).

Ecological site concept

This site is in concave plain dips and depressions. Elevation ranges from 30 to 190 feet above sea level. Slopes are nearly level (0 – 3 percent). Site hydrology, frost heave, and microtopography shape the vegetation on this landform. Soils are organic, very poorly drained, and aquic with a water table present at the soil surface throughout the year. Frost heave produces raised mounds that support drier shrub communities, while inter-mound areas contain more obligate wetland species.

The reference state supports three communities. The reference plant community is characterized as a grassland of hydrophytic vegetation (Viereck et al., 1992). It is composed of a mix of sedges and cottongrasses, with hydrophytic forbs and shrubs throughout.

Associated sites

R236XY140AK	**Subarctic Tussock Tundra Wet Loamy Plains** R236XY140AK describes linear plain talfs, which differ in site and soil characteristics and associated vegetation from that described by this site.
F236XY117AK	**Boreal Forest Wet Loamy Plain Drainageways** F236XY117AK describes woodlands that develop in plain drainageways. These drainageways dissect the plains described by this site
R236XY131AK	**Subarctic Tussock-Scrub Frozen Plains** R236XY131AK described convex plain talfs that do not pond. Areas described than that site are dryer than this site and support different communities in the reference state.
F236XY171AK	**Subarctic Woodland Loamy Slopes** F236XY171AK describes forest plain talfs. Site and soil characteristics, include slope shape, water table depth, and drainage class, differ between the sites. This site is too wet to support trees.

Similar sites

R236XY109AK	**Subarctic Low Scrub Peat Drainages** Both sites are on concave locations on upland plains. Frost heave creates microtopography in this site that is not found in R236XY109AK.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Betula nana* (2) *Andromeda polifolia*
Herbaceous	(1) *Carex aquatilis* (2) *Carex pluriflora*

Physiographic features

This site is on plain dips and depressions. Elevation ranges from 30 to 190 feet above sea level. Slopes are nearly level (0 – 3 percent). This site does not flood but experiences frequent, very long periods of ponding during the growing season, particularly in inter-mount areas. This site is found at all aspects.

Table 2. Representative physiographic features

Geomorphic position, flats	(1) Dip (2) Talf
Landforms	(1) Plains > Depression (2) Plains > Plain

Runoff class	Low
Flooding frequency	None
Ponding duration	Very long (more than 30 days)
Ponding frequency	Frequent
Elevation	9–58 m
Slope	0–3%
Water table depth	0 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Long (7 to 30 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	0–299 m
Slope	0–98%
Water table depth	0 cm

Climatic features

The climate of this site reflects that of the MLRA, which is described as maritime polar (EPA, 2013). Temperatures are moderated by the nearby Bristol Bay and norther Pacific bodies of water. Annual precipitation ranges from 21 – 34 inches with approximately 40 percent occurring during the June-September growing season (PRISM, 2018).

Table 4. Representative climatic features

Frost-free period (characteristic range)	75-100 days
Freeze-free period (characteristic range)	65-90 days
Precipitation total (characteristic range)	533-864 mm
Frost-free period (actual range)	75-100 days
Freeze-free period (actual range)	65-90 days
Precipitation total (actual range)	381-1,041 mm
Frost-free period (average)	90 days
Freeze-free period (average)	75 days
Precipitation total (average)	737 mm

Influencing water features

This site is wet throughout the growing season. Lower areas of the landform, usually found in the depression or dip center, are prone to surface ponding. Community 1.3 is most commonly associated with this area and supports obligate and emergent wetland species. Precipitation is the main source of water.

Soil features

Soils are highly organic Histosols (Soil Survey Staff, 2013). Soils are very deep and very poorly drained. They support a cryic temperature regime and an aquic moisture regime. Parent material is comprised of organic material or organic material over loess or glaciolacustrine deposits.

Soil characteristics affecting vegetation include hydrology, low pH, and high organic matter content. A water table is present at the soil surface throughout the year, which restricts plants to mostly facultative wet to obligate wetland species. Very strong to strong acidity levels (pH of 4.6 to 5.4) and high organic composition (75 – 95%) further restricts the plant growth and community composition.

Correlated soil components in MLRA 236: Mosquitopoint, Pellernarquq, Wearyriver

Table 5. Representative soil features

Parent material	(1) Loess (2) Organic material
Surface texture	(1) Peat
Drainage class	Very poorly drained
Permeability class	Moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-25.4cm)	7.62–14.99 cm
Soil reaction (1:1 water) (0-25.4cm)	4.6–5.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Table 6. Representative soil features (actual values)

Drainage class	Very poorly drained
Permeability class	Moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-25.4cm)	7.62–14.99 cm
Soil reaction (1:1 water) (0-25.4cm)	4.2–6.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site is on concave dips and depressions of upland plains. Local site factors including site hydrology, area topology, and frost heave support three vegetative communities. The reference plant community is a grassland of hydrophytic sedges and cottongrasses with wetland shrubs throughout. Wetter areas, often found in the center of the dip or depression, contain primarily obligate wetland and emergent herbaceous species. Hypoxic or anoxic conditions caused by ponding are a major abiotic stress that shapes community composition (Vartapetian and Jackson, 1996). Mounds caused by frost heave support a drier community with more shrubs and lichen and less graminoids and moss.

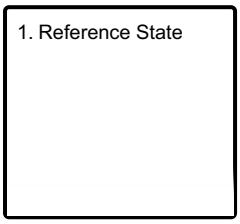
Frost heave supports a unique shrub community. Available water capacity is high due to the ability of Sphagnum mosses to hold water. Under certain conditions, water will freeze and the associated organic soil will heave into mounds. The convex shape and drop in water table changes local site conditions, allowing less hydrophytic species to colonize the area.

This site is slightly browsed by moose. This does not appear to affect the ecological processes of the site.

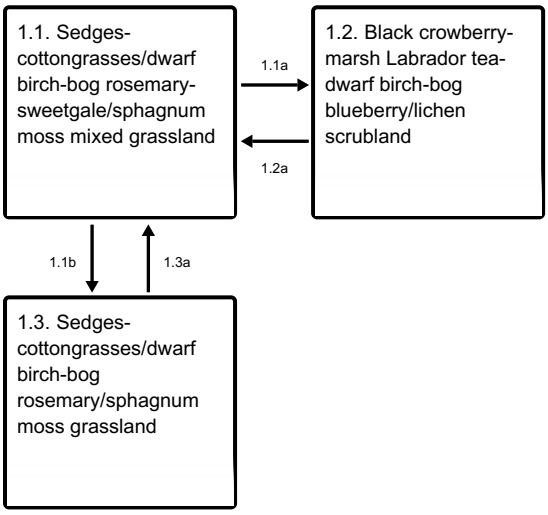
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1a - Frost heave.

1.1b - Increased surface ponding period and depth

1.2a - Frost heave collapse.

1.3a - Decreased surface ponding period and depth

State 1
Reference State

The reference state supports three community phases, which are grouped by the structure and dominance of the vegetation (e.g., graminoids, shrubs, forbs, mosses, and lichens) and by their ecological function and stability. The reference community phase is characterized by grassland consisting of hydrophilic graminoids and low shrubs and sphagnum mosses (Sphagnum spp.). The presence of the plant communities is dictated temporally and spatially by the influences of frost heave and ponding. No alternate states have been observed.

Community 1.1
Sedges-cottongrasses/dwarf birch-bog rosemary-sweetgale/sphagnum moss mixed grassland

Figure 8. Typical area of community 1.1.

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Dwarf birch	*Betula nana*	BENA	97	8
S	Bog rosemary	*Andromeda polifolia*	ANPO	69	2
S	Sweetgale	*Myrica gale*	MYGA	36	25
G	Water sedge	*Carex aquatilis*	CAAQ	59	15
G	Manyflower sedge	*Carex pluriflora*	CAPL6	46	9
G	White cottongrass	*Eriophorum scheuchzeri*	ERSC2	33	7
F	Water horsetail	*Equisetum fluviatile*	EQFL	41	4
F	Roundleaf sundew	*Drosera rotundifolia*	DRRO	51	Trace
M	Sphagnum moss	*Sphagnum spp.*	SPHAG2^	97	75

^ Sphagnum mosses are identified at the genus level.

Figure 9. Constancy and canopy cover of plants in community 1.1.

The reference community phase is characterized by facultative or obligate wetland graminoids with low and dwarf shrubs interspersed throughout. Typically, this community consists of a wide variety of water-tolerant species, including water sedge (*Carex aquatilis*), manyflower sedge (*Carex pluriflora*), white cottongrass (*Eriophorum scheuchzeri*), dwarf birch (*Betula nana*), sweetgale (*Myrica gale*), bog rosemary (*Andromeda polifolia*), water horsetail (*Equisetum fluviatile*), and roundleaf sundew (*Drosera rotundifolia*). Myriad other facultative or obligate wetland species that may be present include small cranberry (*Vaccinium oxycoccos*), longawn sedge (*Carex macrochaeta*), creeping sedge (*Carex chordorrhiza*), Chamisso's cottongrass (*Eriophorum chamissonis*), and red cottongrass (*Eriophorum russeolum*). Sphagnum mosses (Sphagnum spp.) are nearly ubiquitous, and they make up a majority of the ground cover (about 80 percent total mean cover). Other ground cover commonly includes lichens (about 5 percent cover) and herbaceous litter (about 30 percent). Commonly, about 3 percent of the surface is covered with water.

Community 1.2
Black crowberry-marsh Labrador tea-dwarf birch-bog blueberry/lichen scrubland

Figure 10. Typical area of community 1.2.

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Black crowberry	*Empetrum nigrum*	EMNI	100	20
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100	15
S	Dwarf birch	*Betula nana*	BENA	100	9
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	93	7
S	Bog rosemary	*Andromeda polifolia*	ANPO	80	2
G	Water sedge	*Carex aquatilis*	CAAQ	67	2
L	Reindeer lichens	*Cladina spp.*	CLADI3*	80	35
L	Cup lichens	*Cladonia spp.*	CALDO3#	53	15
M	Sphagnum moss	*Sphagnum spp.*	SPHAG2^	93	45

* Cladina lichens are identified at the genus level.

Cladonia lichens are identified at the genus level.

^ Sphagnum mosses are identified at the genus level.

Figure 11. Constancy and canopy cover of plants in community 1.2.

This community phase is a result of frost heave. It is characterized by low and dwarf scrubland that has various lichens throughout. Typically, this community consists of marsh Labrador tea (*Ledum palustre* ssp. decumbens), dwarf birch (*Betula nana*), black crowberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), cup lichens (Cladonia spp.), and reindeer lichens (Cladina spp.). Other extant species include bog cranberry (*Vaccinium oxycoccos*), cloudberry (*Rubus chamaemorus*), water sedge (*Carex aquatilis*), other sedges (Carex spp.), and cottongrasses (Eriophorum spp.). Mosses (about 55 percent total mean cover) and lichens (about 35 percent) are nearly ubiquitous. Other ground cover commonly includes herbaceous litter (about 20 percent). About 1 percent of the surface commonly is covered with water.

Community 1.3
Sedges-cottongrasses/dwarf birch-bog rosemary/sphagnum moss grassland

Figure 12. Typical area of community 1.3.

Community Phase Canopy Cover

(Vegetation data in the table are provided as constancy (percent) and average canopy cover (percent) of the most dominant and ecologically relevant species for this community phase.)

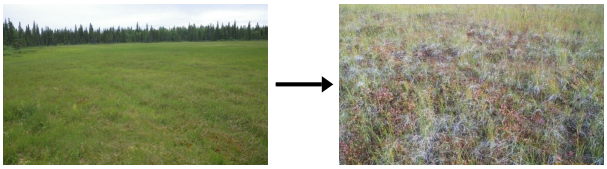
Plant group	Common name	Scientific name	USDA plant code	Constancy (percent)	Average canopy cover (percent)
S	Dwarf birch	*Betula nana*	BENA	83	3
S	Bog rosemary	*Andromeda polifolia*	ANPO	76	2
S	Bog cranberry	*Vaccinium oxycoccos*	VAOX	62	1
G	Water sedge	*Carex aquatilis*	CAAQ	83	7
G	Round sedge	*Carex rotundata*	CARO7	45	7
G	Red cottongrass	*Eriophorum russeolum*	ERRU2	45	25
G	Manyflower sedge	*Carex pluriflora*	CAPL6	38	8
F	Roundleaf sundew	*Drosera rotundifolia*	DRRO	62	1
F	Purple marshlocks	*Comarum palustre*	COPA28	28	9
M	Sphagnum moss	*Sphagnum spp.*	SPHAG2^	93	85

^ Sphagnum mosses are identified to the genus level.

Figure 13. Constancy and canopy cover of plants in community 1.3.

This early ponding community phase is characterized by hydrophilic grassland that has some low and dwarf shrubs and an abundant mat of sphagnum moss (Sphagnum spp.). Typically, this community consists of water sedge (*Carex aquatilis*), red cottongrass (*Eriophorum russeolum*), round sedge (*Carex rotundata*), manyflower sedge (*Carex pluriflora*), purple marshlocks (*Comarum palustre*), roundleaf sundew (*Drosera rotundifolia*), dwarf birch (*Betula nana*), and bog rosemary (*Andromeda polifolia*). Other facultative or obligate wetland species may include water horsetail (*Equisetum fluviatile*), small cranberry (*Vaccinium oxycoccos*), bog blueberry (*Vaccinium uliginosum*), and buckbean (*Menyanthes trifoliata*). The ground cover is dominantly sphagnum mosses (about 85 percent total mean cover). Other ground cover may include herbaceous litter (about 25 percent). Commonly, about 4 percent of the surface is covered with water and 3 percent is bare soil.

Pathway 1.1a
Community 1.1 to 1.2

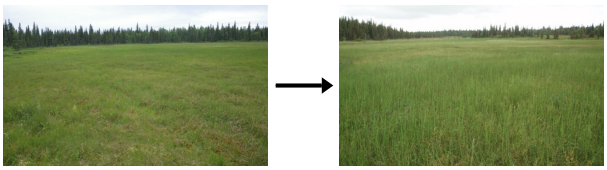


Sedges-cottongrasses/dwarf birch-bog rosemary-sweetgale/sphagnum moss mixed grassland

Black crowberry-marsh Labrador tea-dwarf birch-bog blueberry/lichen scrubland

The mechanisms between mounding are not fully understood, but are likely the result of freezing activity in the soil. Sphagnum mosses hold large amounts of water, which is reflected in the soil available water capacity. Under ideal conditions, this water will freeze and heave the surrounding area into mounds. The convex shape and drop in water table changes; local site conditions, allowing less hydrophytic species to colonize the area.

Pathway 1.1b
Community 1.1 to 1.3



Sedges-cottongrasses/dwarf birch-bog rosemary-sweetgale/sphagnum moss mixed grassland

Sedges-cottongrasses/dwarf birch-bog rosemary/sphagnum moss grassland

Areas with surface ponding throughout the growing season are more likely to contain emergent and obligate wetland species. Increased inflow to an area due to a shift in precipitation or site hydrology may cause ponding to increase.

Pathway 1.2a

Community 1.2 to 1.1

Black crowberry-marsh Labrador tea-dwarf birch-bog blueberry/lichen scrubland

Sedges-cottongrasses/dwarf birch-bog rosemary-sweetgale/sphagnum moss mixed grassland

The collapse of a frost heave will typically raise the water table and increase hydrologic pressure on the vegetation. The community is likely to shift back to the reference plant community.

Pathway 1.3a
Community 1.3 to 1.1

Sedges-cottongrasses/dwarf birch-bog rosemary/sphagnum moss grassland

Sedges-cottongrasses/dwarf birch-bog rosemary-sweetgale/sphagnum moss mixed grassland

Decreased surface ponding and a relative drop in the water table allows less hydrophytic species to colonize. This change may be due to build up of the top organic soil horizon or a decrease in hydrologic input due to lower precipitation and snow melt.

Additional community tables

Inventory data references

Modal points for Community 1.1
07MM00303
07CS02104
07AO20304
07SS05804
07CS16703
08LL10301
09SS03705
07CS10506
07CS15002
07SS07901

Modal points for community 1.2
07MM00404
07AO01601
07SS07501
07SS07602
07CS12503

Modal points for community 1.3
07AO01905
07MM02204
08SS08702
08LL07003
08LL11410
07SS02903
07SS03206

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Approval

Kirt Walstad, 2/13/2024

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	05/18/2024
Approved by	Kirt Walstad
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:**