USDA Natural Resources
Conservation Service

Ecological site R236XY151AK
Subarctic Open Willow Loamy Plain Swales

Last updated: 2/13/2024
Accessed: 05/11/2025

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): 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).

Classification relationships

Alaska Vegetation Classification:
Open tall scrubland (II.B.2 - level III) / Willow scrubland (II.B.2.a - level IV)
(Viereck et al., 1992)

Ecological site concept

This ecological site is in concave swales on hills and plains. Site elevation is between 450 and 1,820 feet above sea level. Slope gradients are nearly level to strong (0 - 12 percent). Soil hydrology, soil acidity, and microtopography shape the vegetation on this landform. Occasional, brief ponding during the growing season, along with somewhat poorly drained soils with aquic conditions, restricts vegetation to predominantly facultative wet to obligate wetland species.

The reference state supports one stable community. The reference plant community is characterized as an open, tall willow scrubland (Viereck et al., 1992). It is composed of one or more willow species in the overstory with an understory of bluejoint, diverse forbs, and ericaceous shrubs.

Associated sites

R236XY105AK	**Subarctic Scrub Mosaic Gravelly Hillslopes** Both sites are on hills. R236XY151AK describes concave swales features on the shrub hillslopes described by R236XY105AK.
R236XY106AK	**Subarctic Dwarf Scrub Dry Loamy Slopes** Both sites are on hills and plains. R236XY151AK describes concave swales features on the ericaceous shrub hills and plains described by R236XY106AK.

Similar sites

F236XY152AK	**Boreal Forest Volcanic Loamy Swales** Both sites are swale features on plains. F236XY152AK is distinguished by its ability to support a boreal forest on its soil. R236XY151AK does not support trees.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix pulchra* (2) *Salix barclayi*
Herbaceous	(1) *Equisetum* (2) *Calamagrostis canadensis*

Physiographic features

This site is in concave swales on hills and plains. Elevation typically ranges from 450 feet to 1,820 feet above sea level. Slopes are generally nearly level to strongly sloped (0 – 12 percent). Ponding is occasional and brief and ponding is absent. This site is found at all aspects.

Table 2. Representative physiographic features

Slope shape up-down	(1) Linear
Slope shape across	(1) Concave
Geomorphic position, flats	(1) Dip
Landforms	(1) Hills > Hill > Swale (2) Plains > Plain > Swale
Runoff class	Negligible to medium
Flooding frequency	None
Ponding duration	Brief (2 to 7 days)
Ponding frequency	Occasional
Elevation	450–1,820 ft
Slope	0–12%
Water table depth	10–20 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to high
Flooding frequency	None
Ponding duration	Brief (2 to 7 days)
Ponding frequency	Occasional

Elevation	10–3,260 ft
Slope	0–50%
Water table depth	10–20 in

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)	21-34 in
Frost-free period (actual range)	75-100 days
Freeze-free period (actual range)	65-90 days
Precipitation total (actual range)	15-41 in
Frost-free period (average)	90 days
Freeze-free period (average)	75 days
Precipitation total (average)	29 in

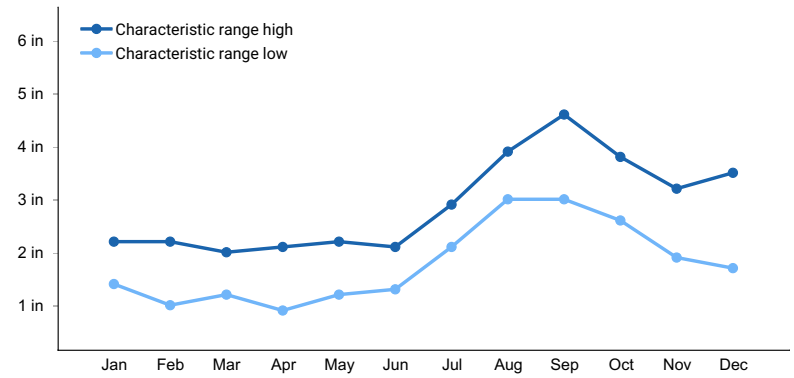

Figure 1. Monthly precipitation range

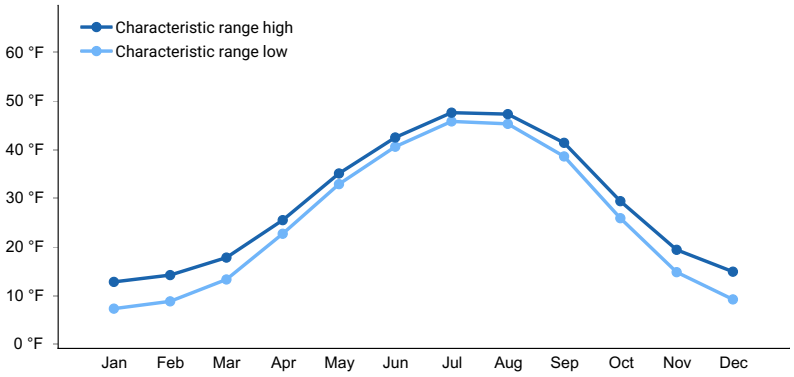

Figure 2. Monthly minimum temperature range

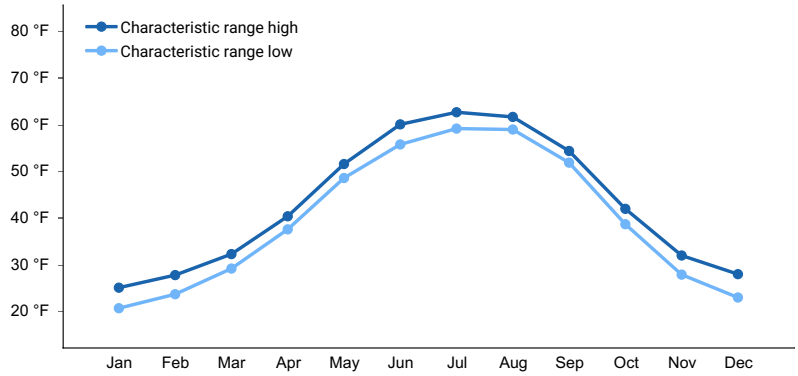

Figure 3. Monthly maximum temperature range

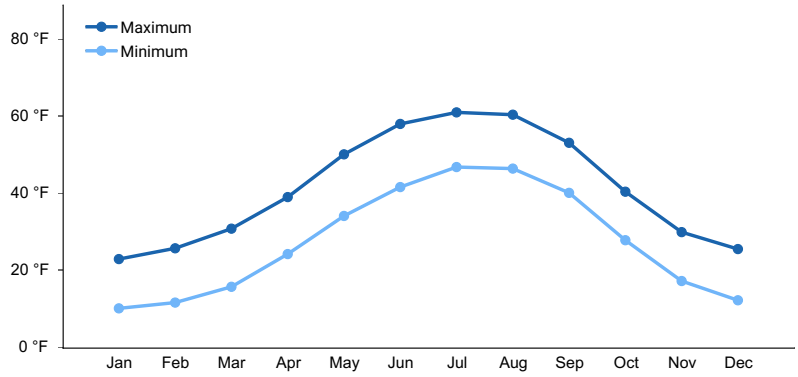

Figure 4. Monthly average minimum and maximum temperature

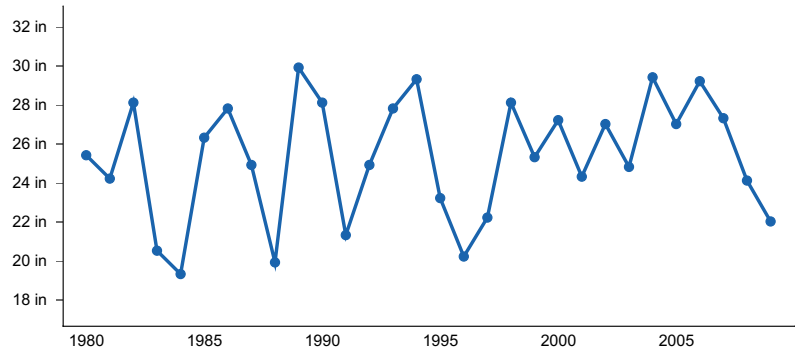

Figure 5. Annual precipitation pattern

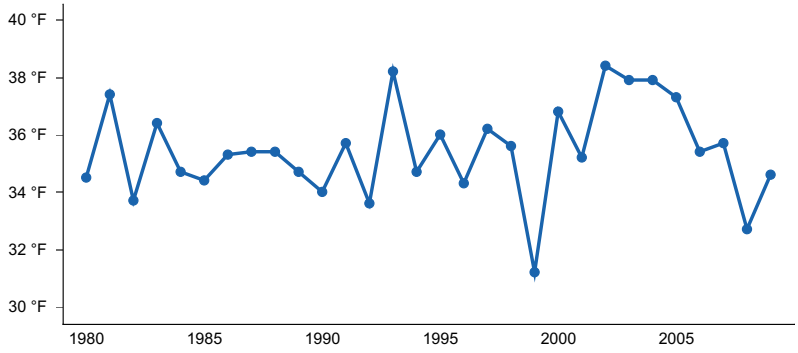

Figure 6. Annual average temperature pattern

Influencing water features

This site attracts inflow from surrounding slopes. Ponding is occasional and brief. Site hydrology is reflected in the vegetation, which is comprised of hydrophytic willows and graminoids. Precipitation, snow melt, and inflow are the main sources of water.

Soil features

Soils are Inceptisols or Spodosols. Soils are very deep and range from somewhat poorly to well drained. All soils contain a minimally developed cambic horizon, andic soil properties within the top 17 inches, and are very strong to moderately acidic. They support a cryic temperature regime. Parent material is colluvium or slope alluvium.

Soil characteristics and position within the swale affect the patchiness of vegetation within these swales. Inceptisols are more poorly drained with aquic soil conditions and a reduced matrix. These soils coincide with swale low points and swale edge positions where snowpack is deepest. These soils support more willows and graminoids. Spodosols in these swales are acidic and minimally developed, suggesting low fertility. These soils typically support more ericaceous shrubs.

Correlated soil components in MLRA 236:
Cryaquepts, D36-Western maritime scrub loamy swales, Fluventic Dystrocryepts, E36-Maritime tall scrub/meadow-gravelly swales

Table 5. Representative soil features

Parent material	(1) Organic material (2) Slope alluvium (3) Colluvium
Surface texture	(1) Highly organic silt loam (2) Silt
Drainage class	Somewhat poorly drained to well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	2.2–2.9 in
Soil reaction (1:1 water) (0-10in)	4.6–6.1
Subsurface fragment volume <=3" (Depth not specified)	32–40%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Table 6. Representative soil features (actual values)

Drainage class	Somewhat poorly drained to well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	0.8–3 in
Soil reaction (1:1 water) (0-10in)	4.6–6.1
Subsurface fragment volume <=3" (Depth not specified)	32–40%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

This site is on concave swales on hills and plains. Local site factors, including microtopographic elevation, drainage, and soil characteristics support one stable vegetative community. The reference plant community is an open, tall willow scrubland.

This site is stable and there is no known early sere. This community is likely to persist well beyond the typical human management scale (Landfire, 2009; Viereck et al., 1992). Slope gradients are too shallow and soils too stable for erosion. There is no evidence of fire in this community.

Vegetative patchiness is present within this site. Wetter areas are more likely to support willow and other hydrophytic vegetation. These wet areas are typically in topographic lows within the swale and in areas of deep snowpack along the swale edges. Drier soils are more likely to support low and dwarf shrubs. The pattern of patchiness within any swale is determined by distinct local factors.

Willows and herbaceous plants are moderately browsed by moose throughout the year. 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

1. Reference State

State 1 submodel, plant communities

1.1. Tealeaf willow-Barclay's willow/blujoint/spreading woodfern-Canadian burnet

State 1
Reference State

The reference state supports one community phase. The reference plant community is characterized by an open tall scrubland comprised of one or more willow species with bluejoint and very diverse forbs throughout. Areas without willow are dominated by ericaceous shrubs. This community is stable. All community phases in this report are characterized using the Alaska vegetation classification system (Viereck et al., 1992).

Dominant plant species

- tealeaf willow (*Salix pulchra*), shrub
- Barclay's willow (*Salix barclayi*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- horsetail (*Equisetum*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.1
Tealeaf willow-Barclay's willow/blujoint/spreading woodfern-Canadian burnet

Figure 7. Typical area of community 1.1.

Community Phase 1.1 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
S	Tealeaf willow	*Salix pulchra*	SAPU15	100	40
S	Barclay's willow	*Salix barclayi*	SABA3	56	30
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	56	15
G	Bluejoint	*Calamagrostis canadensis*	CACA4	89	25
F	Spreading woodfern	*Dryopteris expansa*	DREX2	89	5
F	Canadian burnet	*Sanguisorba canadensis*	SACA14	89	4
F	Fireweed	*Chamerion angustifolium*	CHAN9	78	4
F	Horsetails	*Equisetum spp.*	EQUIS	56, 33, 22^	8, 1, 7

^ Horsetails (*Equisetum spp.*) are represented by three species—*E. arvense*, *E. pratense*, and *E. sylvaticum*, respectively.

The sample plots are distributed across the survey area and are independent of one another.

Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens

Canopy cover data is rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover is rounded to the nearest integer. Data ranging from 10 to 100 percent cover is rounded to the nearest factor of 5.

Figure 8. Frequency and canopy cover of plants in community 1.1.

The reference plant community is an open tall scrubland (Viereck et al., 1992). It consists of an overstory of tealeaf willow (*Salix pulchra*) and Barclay's willow (*S. barclayi*) in the medium or tall stratum and an understory of bluejoint (*Calamagrostis canadensis*) with diverse forbs throughout. Understory and open areas are dominated by low and dwarf shrubs, including black crowberry, spirea, and bog blueberry. Ground cover includes mosses, lichens, herbaceous litter, and woody litter.

Dominant plant species

- tealeaf willow (*Salix pulchra*), shrub
- Barclay's willow (*Salix barclayi*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- horsetail (*Equisetum*), other herbaceous

Additional community tables

Inventory data references

Modal points for Community 1.1
08AO06402
08LL06802
09SS15510

09SC00503

References

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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	05/11/2025
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):**

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

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17. **Perennial plant reproductive capability:**
