USDA Natural Resources Conservation Service

Ecological site F236XY152AK
Boreal Forest Volcanic Loamy Swales

Last updated: 2/13/2024
Accessed: 05/21/2025

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.

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 boreal ecological site is on swales on forested plains. Site elevation ranges from 30 to 600 feet above sea level. Slopes are nearly level to gentle (0 - 6 percent). Soil hydrology and tree propagule pressure shape the vegetation on this landform. Closed swales are collection sites for precipitation and snow melt. Soils are somewhat poorly drained and wet soil conditions restrict vegetation during the important early growing season.

The reference state supports two communities. The reference plant community is characterized as a mixed forest (Viereck et al., 1992). It is composed of a white spruce and birch in the overstory with an understory of low shrubs, ferns and bluejoint. Areas of increased wetness typically cannot support trees. These areas are most commonly found in the center of swales. Both communities can coexist in a single swale and are relatively stable unless shifts to water inputs or ponding depth change.

Associated sites

F236XY115AK	**Boreal Forest Loamy Moist Slopes** F236XY115AK describes the forested plains and hill backslopes. The swales described by this site (F236XY152AK) are features on the forested plain.

Similar sites

R236XY151AK	**Subarctic Open Willow Loamy Plain Swales** R236XY151AK describes swales in the maritime climate zone of MLRA 236. While underlying hydrological processes are the same in both sites, R236XY151AK is noted for the lack of trees.

Table 1. Dominant plant species

Tree	(1) *Picea glauca* (2) *Betula papyrifera*
Shrub	(1) *Rubus pedatus* (2) *Spiraea stevenii*
Herbaceous	(1) *Dryopteris expansa* (2) *Calamagrostis canadensis*

Physiographic features

This site is in swales on plains. Elevation ranges from 30 to 600 feet above sea level. Slope gradients are nearly level to gentle (0 – 6 percent). Run off is negligible to low and a seasonal water table is present. Ponding is occasional and very brief in the reference plant community. Ponding may be longer and more frequent in the lowest areas described by community 1.2. This site is found at all aspects.

Table 2. Representative physiographic features

Landforms	(1) Plains > Swale
Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	Occasional
Elevation	9–183 m
Slope	0–6%
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	Very brief (4 to 48 hours)
Ponding frequency	Occasional
Elevation	9–183 m
Slope	0–6%
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

Due to its landscape position, this site is not influenced by wetland or riparian water features. Precipitation and snow melt are the main sources of water.

Soil features

Soils are relatively young Andisols of volcanic origin (Soil Survey Staff, 2013). Soils are very deep and somewhat poorly drained. They support a cryic temperature regime and an udic moisture regime. Parent material is comprised of organic material over volcanic ash atop slope alluvium.

Soil hydrology is the major soil factor affecting vegetation. Closed swales are collection sites for precipitation and snow melt. Soil is somewhat poorly drained. A water table is

present at the soil surface from December through May. Wet soil restricts the vegetation that can grow here during the important early growing season. Other soil characteristics of note include extreme to strong acidity (4.2 – 4.7 pH) in the top 10 inches and the presence of volcanic ash in the soil profile. It's currently unknown what effects these factors have on the vegetation of this site.

Correlated soil components in MLRA 236: Terlak

Table 5. Representative soil features

Parent material	(1) Alluvium (2) Volcanic ash
Surface texture	(1) Highly organic silt loam
Drainage class	Somewhat 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)	6.35–7.37 cm
Soil reaction (1:1 water) (0-25.4cm)	4.2–4.7
Subsurface fragment volume <=3" (Depth not specified)	0–44%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Table 6. Representative soil features (actual values)

Drainage class	Somewhat 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)	6.35–7.37 cm
Soil reaction (1:1 water) (0-25.4cm)	4.2–4.7

Subsurface fragment volume <=3" (Depth not specified)	0–44%
Subsurface fragment volume >3" (Depth not specified)	0–1%

Ecological dynamics

This site is in boreal swales on plains. Local factors such as site hydrology and propagule pressure create two co-occurring vegetative communities. The reference plant community is a mixed birch and white spruce forest.

A vegetative pattern is evident in these swales. Trees are most common along swale edges. Tree presence is a direct effect of the relatively small size of the swales and swale proximity to surrounding forests. Edge effects and tree propagule pressure allow a forest community to grow on a landform and soil that is not commonly associated with trees. Low spots in the swale center are typically too wet for trees and host a dense willow community.

Willows and regenerating trees are browsed by moose. This does not appear to affect the ecological processes or vegetative composition 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

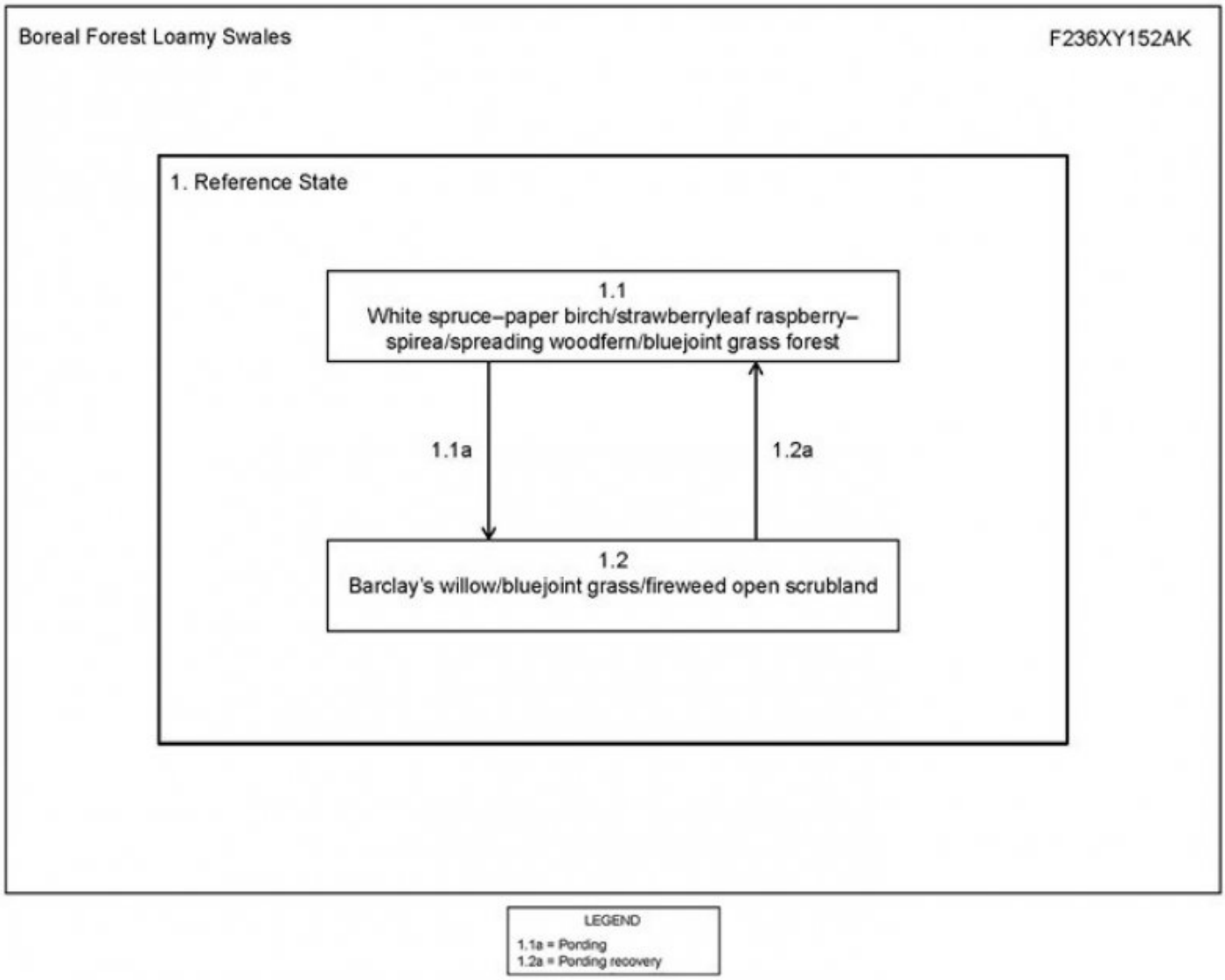

Figure 8. State-and-transition model.

State 1
Reference State

The reference state supports two community phases, which are grouped by the structure and dominance of the vegetation (e.g., trees, shrubs, graminoids, and forbs) and by their ecological function and stability. The presence of the communities is temporally dictated by the ponding regime associated with the upland swales. The reference community phase is characterized by an open forest that has various shrubs, graminoids, and forbs in the understory. No alternate states have been observed.

Community 1.1
White spruce-paper birch/strawberryleaf raspberry-spirea/woodfern/bluejoint grass forest

Figure 9. 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)
T	White spruce	*Picea glauca*	PIGL	175*	15^
T	Paper birch	*Betula papyrifera*	BEPA	75	20^
S	Black crowberry	*Empetrum nigrum*	EMNI	75	15
S	Beauverd spirea	*Spiraea stevenii*	SPST3	75	15
S	Strawberryleaf raspberry	*Rubus pedatus*	RUPE	75	15
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	75	15
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	100	9
F	Arctic starflower	*Trientalis europaea*	TREU	100	4
F	Spreading woodfern	*Dryopteris expansa*	DREX2	50	35
M	Feathermosses	Includes 3 genera		50, 50, 50#	10, 40, 9

* Trees may be present in multiple strata within one plot; therefore, it is possible for species of this plant group to have a constancy value of more than 100 percent.

^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.

Feathermosses are represented by three species—*Hylocomium splendens*, *Pleurozium schreberi*, and *Ptilium crista-castrensis*, respectively.

Figure 10. Constancy and canopy cover of plants in community 1.1.

The reference community phase is characterized by an open forest that has various shrubs, graminoids, and forbs in the understory. Typically, the community consists of a mixed, open canopy of white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*) and a variety of understory species, including strawberryleaf raspberry (*Rubus pedatus*), spirea (*Spiraea stevenii*), black crowberry (*Empetrum nigrum*), lingonberry (*Vaccinium vitis-idaea*), bluejoint grass (*Calamagrostis canadensis*), and arctic starflower (*Trientalis europaea*). Other species that may be present include Sitka alder (*Alnus viridis* ssp. sinuata), Lapland cornel (*Cornus suecica*), bog blueberry (*Vaccinium uliginosum*), spreading woodfern (*Dryopteris expansa*), and Kenai birch (*Betula papyrifera* var. kenaica). Mosses commonly make up a large percentage of the ground cover (about 60 percent total mean cover). Sphagnum mosses (Sphagnum spp.) and feathermosses may be included. Other ground cover commonly includes herbaceous litter (about 35 percent total mean cover) and woody litter (about 20 percent).

Community 1.2
Barclay's willow/bluejoint grass/fireweed open scrubland

Figure 11. 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	Barclay's willow	*Salix barclayi*	SABA3	100	25
S	Beauverd spirea	*Spiraea stevenii*	SPST3	100	5
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	100	70
F	Fireweed	*Chamerion angustifolium*	CHAN9	100	15
F	Common ladyfern	*Athyrium filix-femina*	ATFI	100	2

Figure 12. Constancy and canopy cover of plants in community 1.2.

The early ponding community phase is characterized by open scrubland that has grass and forbs throughout. Typically, the community consists of clusters of Barclay's willow (*Salix barclayi*) and areas of bluejoint grass (*Calamagrostis canadensis*), spirea (*Spiraea stevenii*), and fireweed (*Chamerion angustifolium*). Other species may include cloudberry (*Rubus chamaemorus*), strawberryleaf raspberry (*Rubus pedatus*), red elderberry (*Sambucus racemosa*), and common ladyfern (*Athyrium filix-femina*). Trees that survived periods of ponding and regenerative individual trees from treed areas surrounding the swales may be present. Mosses may be in the ground cover, but few, if any, lichens are present. The ground cover commonly includes herbaceous and woody litter. Note: The vegetation and soils for this community were sampled at one location. Due to the limited data available, personal field observations were used to aid in describing the plant community.

Pathway 1.1a
Community 1.1 to 1.2

White spruce-paper birch/strawberryleaf raspberry-spirea/woodfern/bluejoint grass forest

Barclay's willow/bluejoint grass/fireweed open scrubland

Ponding. Ponding of the reference plant community likely will drown many of the species, particularly extant trees. The resulting decrease in competition for space and light will allow existing hydrophilic species to spread and facultative or obligate wetland pioneer species to be recruited. Occasional, very brief periods of ponding occur in April through October. A much longer period of ponding likely is required to drown sufficient extant trees and shrubs in the reference community phase to support an early ponding community phase.

Pathway 1.2a
Community 1.2 to 1.1

Barclay's willow/bluejoint grass/fireweed open scrubland

White spruce-paper birch/strawberryleaf raspberry-spirea/woodfern/bluejoint grass forest

Natural succession: Normal time and growth without disruptive ponding. As ponding subsides over time, facultative or obligate species become less competitive. This allows existing species that are less water tolerant to increase in abundance, commonly including an increase in the rates of colonization and growth of trees. The addition of a canopy increases the number of niches, particularly among shade-tolerant species; therefore, the abundance and richness of shrubs and forbs typically increase and those of bluejoint grass decrease. The period needed for this transition currently is unknown. It likely begins after active ponding ceases and is partially determined by the rate of propagule spread and growth rate of trees and shrubs.

Additional community tables

Inventory data references

Modal points for Community 1.1
08LL10406
11SS01201
11SS02503
11SS02905

Modal points for community 1.2
11SS00705

References

Viereck, L.A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station General Technical Report PNW-GTR-286..

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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	05/21/2025
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:**

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

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

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

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

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

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

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

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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:**
