USDA Natural Resources Conservation Service

# Ecological site F236XY113AK
# Boreal Forest Loamy Steep Slopes

Last updated: 2/13/2024
Accessed: 05/16/2024

## 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.

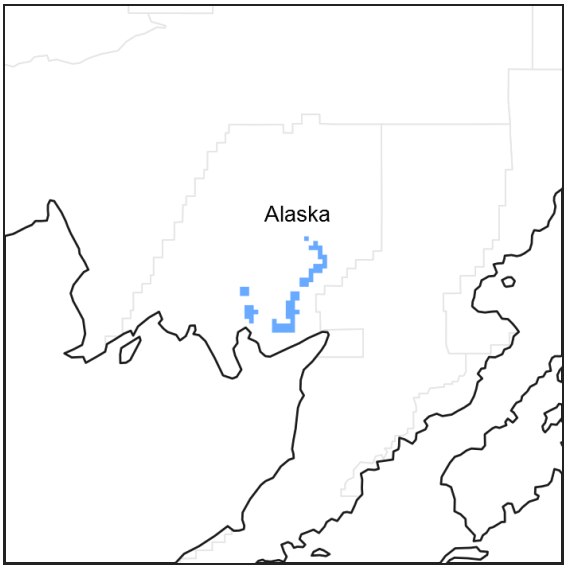



**Figure 1. Mapped extent**

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 boreal site is on linear upland escarpments and bluffs. Slope gradients are steep (30 to 70 percent) and site elevation ranges from sea level to 410 feet. Soils are poorly drained with moderately deep aquic soil conditions and a water table at the start of the growing season. Early growing season understory vegetation is often dominated by water-loving forbs and graminoids. The high slope gradient allows non-wetland species, particularly trees, to colonize these landforms. Erosion is the primary disturbance. Local site and soil factors including soil hydrology, slope, and erosion shape a mixed forest in the reference plant community.

The reference state supports three communities. The reference plant community is characterized as a mixed forest (Viereck et al., 1992). It is composed of birch and white spruce in the canopy with an understory of fast-growing herbaceous species.

## Associated sites

| | |
|---|---|
| F236XY114AK | **Boreal Forest Loamy Wet, Steep Slopes**<br>F236XY114AK is on concave escarpment slopes. Differences in the natural drainage class, runoff potential, and depth to the water table in the soils leads to dissimilarities in the reference states and community phases |
| F236XY115AK | **Boreal Forest Loamy Moist Slopes**<br>F236XY115AK describes mixed forests on hillslopes. This landform abuts the bluffs described by F236XY113AK. Differences in site and soil characteristics including slope and rock fragments result in different reference plant communities and disturbance regimes. |
| F236XY139AK | **Boreal Woodland Loamy Rises**<br>F236XY139AK describes mixed forests on plain rises and low hill slopes. These landforms abut the bluffs described by F236XY113AK. Differences in site and soil characteristics including slope and drainage class result in different reference plant communities and disturbance regimes. |
| F236XY152AK | **Boreal Forest Volcanic Loamy Swales**<br>F236XY152AK describes a woodland community in swales on plains. This landform is spatially linked with the bluffs described by F236XY115AK. These sites are differentiated by slope, landform concavity, soil drainage, and ponding F236Xy152AK, which results in unique reference plant communities. |

## Similar sites

| | |
|---|---|
| F236XY114AK | **Boreal Forest Loamy Wet, Steep Slopes**<br>Both sites are on escarpments. F236XY114AK is associated with wetter soils that support a unique reference plant community. |

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | (1) *Betula*<br>(2) *Picea glauca* |
| Shrub | (1) *Alnus*<br>(2) *Vaccinium vitis-idaea* |
| Herbaceous | (1) *Calamagrostis canadensis*<br>(2) *Equisetum arvense* |

## Physiographic features

This site is on linear slopes of upland bluffs and escarpments. Elevation ranges from sea level to 410 feet. Slopes are steep to very steep (30 – 70 percent). This site is found at all aspects, but is more common on east-facing slopes (0 to 180 degrees).

**Table 2. Representative physiographic features**

| | |
|---|---|
| Landforms | (1) Plains > Bluff<br>(2) Hills > Escarpment |
| Runoff class | High |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 0–125 m |
| Slope | 30–70% |
| Water table depth | 3–20 cm |
| Aspect | W, NW, N, NE, E, SE, S, SW |

**Table 3. Representative physiographic features (actual ranges)**

| | |
|---|---|
| Runoff class | High |
| Flooding frequency | None |
| Ponding frequency | None |
| Elevation | 0–183 m |
| Slope | 30–90% |
| Water table depth | 3–152 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 is the main source of water.

## Soil features

Soils are primarily young and weakly developed Inceptisols (Soil Survey Staff, 2013). Soil is very deep and poorly drained. They support a cryic temperature regime and an aquic moisture regime. Parent material is organic material over glaciofluvial deposits or colluvium. Small areas of well drained, spodic soils also support this site.

Soil hydrology affects vegetation. Aquic conditions are present between nine and twenty-five inches. A water table is present at the beginning of the growing season. Vegetation is restricted to species that can grow in these conditions during the important early growing season months.

Correlated soil components in MLRA 236: D36-Boreal forest gravelly colluvial slopes and Ekvik

**Table 5. Representative soil features**

| | |
|---|---|
| Parent material | (1) Glaciofluvial deposits<br>(2) Outwash |
| Surface texture | (1) Fine sandy loam<br>(2) Silt loam |
| Drainage class | 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) | 4.06–5.84 cm |
| Soil reaction (1:1 water) (0-25.4cm) | 4.2–5.8 |
| Subsurface fragment volume <=3" (Depth not specified) | 5–27% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

**Table 6. Representative soil features (actual values)**

| | |
|---|---|
| Drainage class | Poorly drained to well drained |
| Permeability class | Moderate |
| Soil depth | 152 cm |
| Surface fragment cover <=3" | 0% |
| Surface fragment cover >3" | 0% |
| Available water capacity (0-25.4cm) | 4.06–6.35 cm |
| Soil reaction (1:1 water) (0-25.4cm) | 3.6–5.8 |
| Subsurface fragment volume <=3" (Depth not specified) | 5–27% |
| Subsurface fragment volume >3" (Depth not specified) | 0% |

## Ecological dynamics

This site is on linear upland escarpments and bluffs. Slope gradients are steep (30 to 70 percent) and site elevation ranges from sea level to 410 feet. This site is found at all aspects but is most common on east-facing landforms (0 to 180 degrees). Local site and soil factors including site microclimate, soil hydrology, slope and erosion shape a mixed forest in the reference plant community.

Erosion is the major documented disturbance regime. High water runoff causes soil erosion. This type of erosion is relatively small in scale, but can affect the local vegetative community. Landslides are large scale erosion events

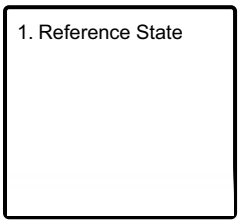
and can partially or fully remove all vegetation from a local area. Various factors can cause landslides, including the steep slopes and wet soils associated with this site. Trees are especially susceptible to windthrow on escarpments, which can lead to further erosion. Windthrow susceptibility is often related to tree age and height, rooting depth, and soil saturation (USDA-FS, 2013). White spruce (*Picea glauca*) are typically 100 years old in the reference community phase, which suggests that large-scale erosion events may occur once a century.

This site is found primarily on easterly aspects. Site microclimate is thought to play an unknown role in determining the presence of this site.

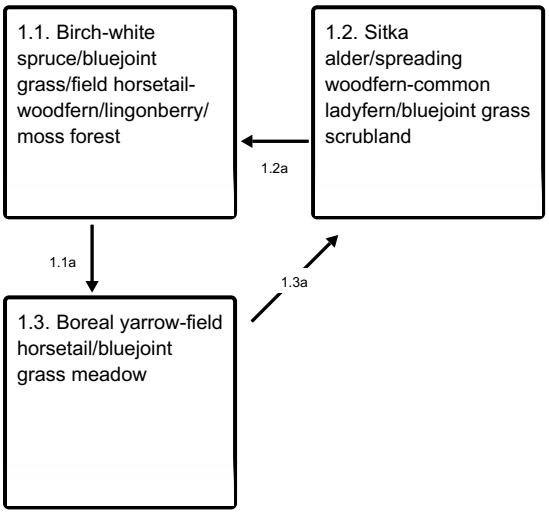
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant 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** - Erosion from landslides or windthrow.

**1.2a** - Natural succession: Time and growth without disruptive erosion.

**1.3a** - Natural succession: Time and growth without disruptive erosion.

## State 1
## Reference State

The reference state supports three community phases, which are grouped by the structure and dominance of the vegetation (trees, shrubs, graminoids, and forbs) and their ecological function and stability. The reference community phase is represented by a mixed forest and very diverse understory consisting of shrubs, forbs, and graminoids. The presence of these communities is dictated temporally by erosion associated with the steep upland escarpments. No alternate states have been observed.

### Community 1.1
### Birch-white spruce/bluejoint grass/field horsetail-woodfern/lingonberry/moss forest

**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) |
|---|---|---|---|---|---|
| T | White spruce | *Picea glauca* | PIGL | 131^ | 10# |
| T | Kenai birch | *Betula papyrifera* var. *kenaica* | BEPAK | 81 | 45# |
| T | Alaska paper birch | *Betula neoalaskana* | BENE4 | 56 | 55# |
| S | Alder | *Alnus spp.* | ALNUS | 31, 25* | 20, 25 |
| S | Lingonberry | *Vaccinium vitis-idaea* | VAVI | 69 | 15 |
| G | Bluejoint grass | *Calamagrostis canadensis* | CACA4 | 94 | 15 |
| F | Field horsetail | *Equisetum arvense* | EQAR | 69 | 10 |
| F | Spreading woodfern | *Dryopteris expansa* | DREX2 | 63 | 15 |

^ 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.

* Alders (*Alnus spp.*) are represented by two species—Sitka alder (*Alnus viridis* ssp. *sinuata*) and thin-leaf alder (*Alnus incana* ssp. *tenuifolia*).

**Figure 9. Constancy and canopy cover of plant species in community 1.1.**

The reference community phase is characterized by a mixed coniferous and deciduous forest and a diverse understory of shrubs, forbs, and bluejoint grass (*Calamagrostis canadensis*). The majority of the trees are in the medium stratum (15 to 40 feet tall), but tall, stunted, and regenerative trees may be present. White spruce (*Picea glauca*) and Kenai birch (*Betula papyrifera* var. kenaica) typically are present. Other species such as paper birch (*Betula papyrifera*), Alaska paper birch (*Betula neoalaskana*), and quaking aspen (*Populus tremuloides*) may be present. The understory is dense in some areas, and it consists of alder (Alnus spp.), lingonberry (*Vaccinium vitis-idaea*), bluejoint grass (*Calamagrostis canadensis*), spreading woodfern (*Dryopteris expansa*), and field horsetail (*Equisetum arvense*). Myriad other understory species may include spirea (*Spiraea stevenii*), black crowberry (*Empetrum nigrum*), fireweed (*Chamerion angustifolium*), and twinflower (*Linnaea borealis*). The ground cover consists dominantly of mosses (about 50 percent total cover), commonly including a mix of feathermosses and sphagnum mosses (Sphagnum spp.). Other ground cover includes lichen (about 4 percent), herbaceous litter (about 55 percent), and woody litter (about 4 percent). About 1 percent is bare soil.

## Community 1.2
## Sitka alder/spreading woodfern-common ladyfern/bluejoint grass 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 | Sitka alder | *Alnus viridis* ssp. *sinuata* | ALVIS | 100 | 85 |
| S | Feltleaf willow | *Salix alaxensis* | SAAL | 67 | 7 |
| G | Bluejoint grass | *Calamagrostis canadensis* | CACA4 | 100 | 15 |
| F | Spreading woodfern | *Dryopteris expansa* | DREX2 | 100 | 30 |
| F | Ladyfern | *Athyrium filix-femina* | ATFI | 67 | 15 |
| F | Arctic starflower | *Trientalis europaea* | TREU | 67 | 2 |

Note: The vegetation and soils for this community were sampled at three separate locations. Due to the limited data available for this community phase, personal field observations were used to aid in describing this plant community.

**Figure 11. Constancy and canopy cover of plant species in community 1.2.**

This late erosional community phase is characterized by dense scrubland. It consists dominantly of Sitka alder (*Alnus viridis* ssp. sinuata) and an understory of bluejoint grass (*Calamagrostis canadensis*), ferns such as spreading woodfern (*Dryopteris expansa*) and ladyfern (*Athyrium filix-femina*), and arctic starflower (*Trientalis europaea*). Other species such as feltleaf willow (*Salix alaxensis*), tealeaf willow (*S. pulchra*), fireweed (*Chamerion angustifolium*), horsetails (Equisetum spp.), and fewflower meadow-rue (*Thalictrum sparsiflorum*) may be present. The ground cover commonly includes mosses (about 9 percent total cover, herbaceous litter (about 80 percent), and woody litter (about 10 percent). Note: The vegetation and soils associated with this community phase were sampled at three separate locations. Due to the limited data available, personal field observations were used to aid in describing the community.

## Community 1.3
## Boreal yarrow-field horsetail/bluejoint grass meadow

**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 | Sitka alder | *Alnus viridis* ssp. *sinuata* | ALVIS | 100 | 4 |
| G | Bluejoint grass | *Calamagrostis canadensis* | CACA4 | 100 | 1 |
| F | Boreal yarrow | *Achillea millefolium* var. *borealis* | ACMIB | 100 | 4 |
| F | Field horsetail | *Equisetum arvense* | EQAR | 100 | 3 |

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

This early erosional community phase is characterized by a mixed open meadow and areas that do not support vegetation. Typically, it consists of clusters of forbs, graminoids, and shrubs, including boreal yarrow (*Achillea millefolium* var. borealis), field horsetail (*Equisetum arvense*), Sitka alder (*Alnus viridis* ssp. sinuata), and bluejoint grass (*Calamagrostis canadensis*). Other species may include fireweed (*Chamerion angustifolium*), arctic bluegrass (*Poa arctica*), and Tilesius' wormwood (*Artemisia tilesii*). Mosses may be in small areas. Areas of bare soil and surface rock fragments are common. Note: The vegetation and soils associated with this plant community phase were sampled at one location. Due to the limited data available, personal field observations were used to aid in describing the community.

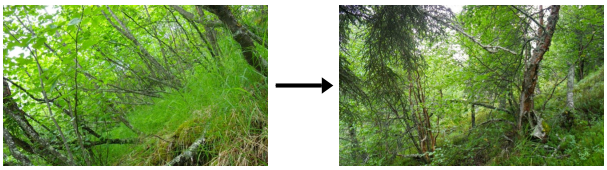
## Pathway 1.1a
## Community 1.1 to 1.3

**Birch-white spruce/bluejoint grass/field horsetail-woodfern/lingonberry/moss forest**

**Boreal yarrow-field horsetail/bluejoint grass meadow**

Erosion from landslides or windthrow. The steep escarpments may be susceptible to landslides, and the medium and tall trees may be susceptible to windthrow. These disturbances can create nonvegetated areas in which fast-growing, pioneer plants may become established. Based on the age of the white spruce trees in the reference community phase, the average period between major landslides is thought to be more than 100 years.

## Pathway 1.2a
## Community 1.2 to 1.1



**Sitka alder/spreading woodfern-common ladyfern/bluejoint grass scrubland**

**Birch-white spruce/bluejoint grass/field horsetail-woodfern/lingonberry/moss forest**

Natural succession: Time and growth without disruptive erosion. As the effect of landslides or windthrow subsides, deciduous and coniferous trees will colonize and reproduce and eventually replace alder as the dominant overstory species. The understory typically will open, allowing for a mix of competitive shrubs, forbs, and graminoids to colonize and thrive. The period needed for this transition currently is unknown, but it likely at least partially depends on the rates of colonization and growth of the trees.

### Pathway 1.3a
### Community 1.3 to 1.2

Boreal yarrow-field horsetail/bluejoint grass meadow

Sitka alder/spreading woodfern-common ladyfern/bluejoint grass scrubland

Natural succession: Time and growth without disruptive erosion. As the period since the last major erosion increases, the soils will stabilize and organic matter from the senescent colonizers will be added to the soils. Nitrogen-fixing alders likely will colonize, and a shaded understory of competitive forbs and graminoids will become established. The period needed for this transition is unknown, but it likely depends partially on the rates of colonization and reproduction of alder and the distance to seed sources.

## Additional community tables

## Inventory data references

Modal points for Community 1.1
09AO10201
10SS05804
10SS08106
10SS11503

Modal points for community 1.2
08MM50301
09AO12502
10SS03601

Modal points for community 1.3
09AO03901

## References

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## Other 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 | 05/16/2024 |
| 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:**