USDA Natural Resources
Conservation Service

Ecological site R224XY304AK
Skeletal Slopes Provisional Ecological Site Group

Last updated: 6/13/2025
Accessed: 04/11/2026

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): 224X–Cook Inlet Lowlands

Major Land Resource Area (MLRA) 224X consists of lowlands and lower mountain slopes of the Susitna and Matanuska Valleys, western Kenai Peninsula, and west side of Cook Inlet. It makes up about 10,965 square miles (28,400 square kilometers). The terrain is a broad expanse of braided flood plains, high gradient rivers, rolling plains, terraces and hills bordered by the surrounding mountains. This MLRA contains a large percentage of Alaska's total population and includes the most extensive road systems in the state. Major rivers include the Susitna, Yentna, Little Susitna, Matanuska, Kenai, and Deep Creek that all drain into Cook Inlet. Large lakes include Tustumena and Skilak.

Climate is highly variable ranging from temperate maritime to continental subarctic. Winter arctic weather systems are common in the northern portion of the MLRA. The average annual precipitation ranges from 15 to 60 inches (380 to 1,525 millimeters). The average annual snowfall is about 60 to 120 inches (150 to 305 centimeters). The average annual temperature is about 27 to 36 degrees F (-3 to 2 degrees C). The freeze-free period averages 65 to 160 days, decreasing with elevation.

Vegetation ranges from spruce/birch forests in the lowlands to subalpine scrubland at high elevations. Saltwater meadows along the coast and wetlands and extensive marsh occur throughout the lowlands across the valley. In most years precipitation is adequate for crops, with limited irrigation. Major rivers are affected by high sediment-laden glacial meltwater and ice dam damage and flooding is a risk during spring thaw. Water is hard or very hard, with high potential levels of iron, but is otherwise of excellent quality. Alpine vegetation is associated with the adjacent Cook Inlet Mountains MLRA (223X).

The dominant soil orders in this MLRA are Spodosols, Histosols, Entisols, and Inceptisols. Water, riverwash, beaches, and other miscellaneous (non-soil) areas are 15 percent of this MLRA. Glacial and volcanic ash wind-blown deposits influence much of area, while fluvial deposits are common in riparian areas.

The MLRA is visited by a great number of migrating birds and supports large populations of waterfowl. Most of the rivers and streams are important spawning grounds for salmon (Chinook, coho, and red salmon). Peonies, hay, potatoes, and hardy vegetables are important agriculture with a few dairy and beef cattle farms present. Commercial logging and subsistence firewood gathering are locally important, as is subsistence gathering. Other major industries in the area include commercial fishing, fish processing, and oil and gas extraction. Tourism and wildland recreation are becoming increasingly important.

The major resource concerns are water erosion and water quality. Aquifers are highly susceptible to contamination from runoff. The intrusion of seawater can be a problem along Cook Inlet. Rapid development and off-road recreation are creating significant damage to the wildlands.

LRU notes

This MLRA is a transitional zone between temperate maritime and continental subarctic climatic zones to the south and areas of arctic winter weather patterns to the north. With this transition, there are major variations in climatic influences and vegetative responses. With further soil survey and vegetative surveys, this MLRA will be evaluated for potential Land Resource Unit (LRU) development.

Classification relationships

Coastal Trough Province of the Pacific Mountain System

USFS Description of Ecoregions of the United States
100 Polar Domain
130 Subarctic Division
M135 Alaska Range Humid Tayga--Meadow Province

United States National Vegetation Classification
C01. Forest & Woodland Class
S15. Temperate & Boreal Forest & Woodland Subclass
F001. Boreal Forest & Woodland Formation
D014. North American Boreal Forest and Woodland Division
M156. White Spruce - Black Spruce Boreal Montane Woodland Group

LandFire BpS Model/Description Version: Nov. 2024
- 16110 Western North American Boreal Mesic Bluejoint-Forb Meadow
(Landfire, 2024)

Ecological site concept

- Non-organic soils
- Soils formed in volcanic ash and/or silty loess of gravelly alluvium, colluvium or glacial deposits.
- Soils are deep to very deep. Limiting layer is present in many horizons due to a strongly contrasting textural stratification with the silty loam surface soils with an abrupt transition to very gravel and cobbly horizons.
- Slopes are generally gently rolling to moderately steep, ranging from 2 to 45 percent. But there are instances of steeper slopes.
- Includes hills, mountain slopes (lower third), moraines, outwash plains, and till plains.
- Grass and herbaceous dominated communities.
- No flooding or ponding, and no connection to the ground water.

Associated sites

F224XY303AK	**Silty Ash Slopes Provisional Ecological Site Group** Silty Ash slopes are common, with forest cover and lack the significant gravel stratified layers lower in the soil profile.

Similar sites

F224XY204AK	**Mixed Forest/Meadow Flood Plains Provisional Ecological Site Group** Floodplains will have similar herbaceous understory vegetative cover, with an extra layer of willows and other shrubs indicative of higher water influence.

Table 1. Dominant plant species

Tree	Not specified
Shrub	Not specified
Herbaceous	(1) *Calamagrostis canadensis* (2) *Chamerion angustifolium*

Physiographic features

This ecological site is common to hills and mountain slopes on outwash plains, till plains, and moraines. Elevations range from 10 to 1,200 feet, though correlated soils extend to 4,000 feet likely representing the subalpine. It is primarily on southern aspects but can be found on all aspects. Slopes range from 2 to 45 percent with potential as high as 85 percent.

Table 2. Representative physiographic features

Landforms	(1) Hills (2) Mountains (3) Outwash plain (4) Till plain (5) Moraine
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	30–366 m
Slope	2–45%
Water table depth	152 cm
Aspect	SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	9–1,219 m
Slope	0–85%
Water table depth	Not specified

Climatic features

Climate is highly variable, generally ranging from temperate maritime to continental subarctic. Most weather systems originate in the North Pacific and the Gulf of Alaska. In winter, particularly in the northern part of the area, arctic weather systems are more common. In the Matanuska Valley, seasonal winds pick up fine-earth material from unvegetated flood plains and create extensive dust clouds that can reach an altitude of 5,000 feet (1,525 meters) or more. The average annual precipitation ranges from 15 to 60 inches (380 to 1,525 millimeters). It generally is higher on the southern Kenai Peninsula, in the northern Susitna Valley, and at the higher elevations along the mountains. The average annual snowfall is about 60 to 120 inches (150 to 305 centimeters). The average annual temperature is about 27 to 36 degrees F (-3 to 2 degrees C). The freeze-free period averages 65 to 160 days, decreasing in length with elevation (USDA-NRCS 2022).

For detailed information visit the Natural Resources Conservation Service National Water and Climate Center at http://www.wcc.nrcs.usda.gov/. Point Mackenzie, Anchorage INTL AP, Talkeetna AP, Homer AP, and Kenai Muni AP are the representative climate stations. The following graphs and charts are a collective sample representing the averaged normals and 30-year annual rainfall data for the selected weather stations from 1981 to

2010.

Table 4. Representative climatic features

Frost-free period (characteristic range)	84-115 days
Freeze-free period (characteristic range)	118-142 days
Precipitation total (characteristic range)	457-635 mm
Frost-free period (actual range)	81-117 days
Freeze-free period (actual range)	112-144 days
Precipitation total (actual range)	432-686 mm
Frost-free period (average)	100 days
Freeze-free period (average)	130 days
Precipitation total (average)	533 mm

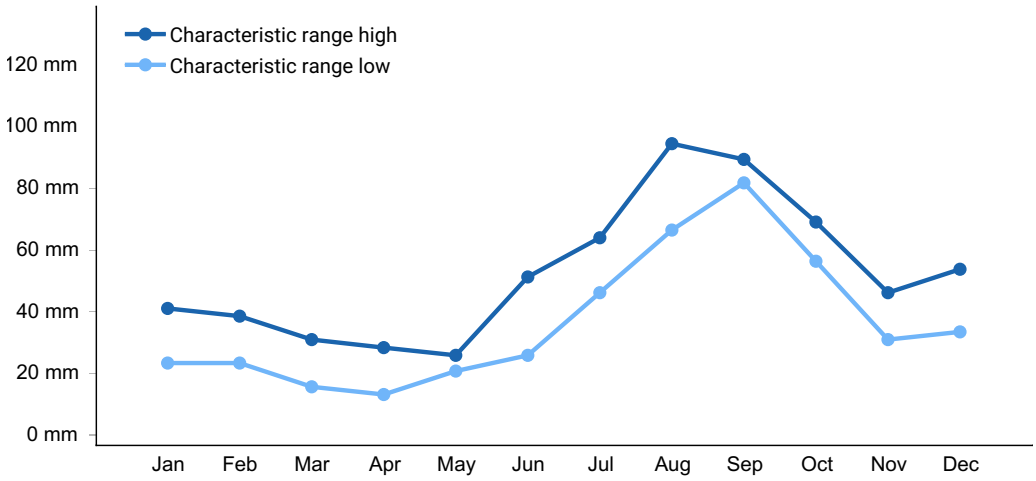


Figure 1. Monthly precipitation range

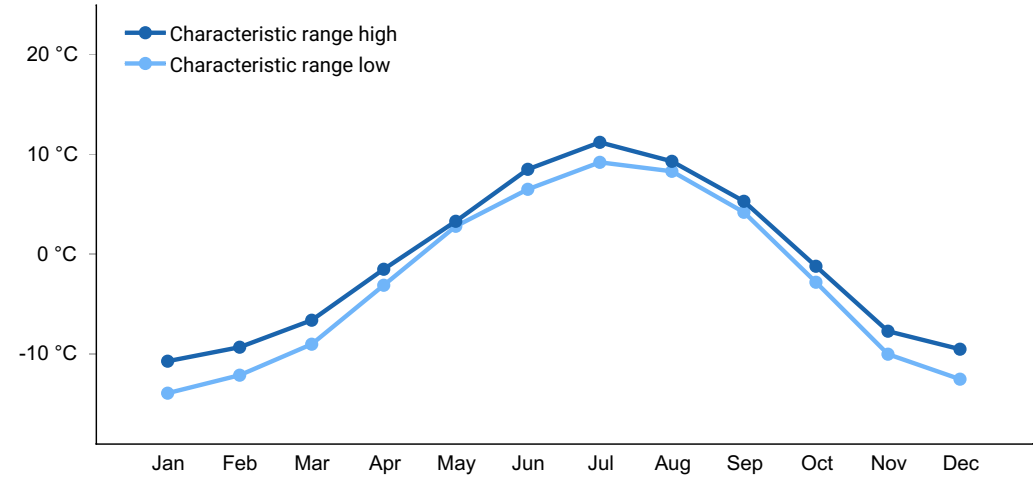


Figure 2. Monthly minimum temperature range

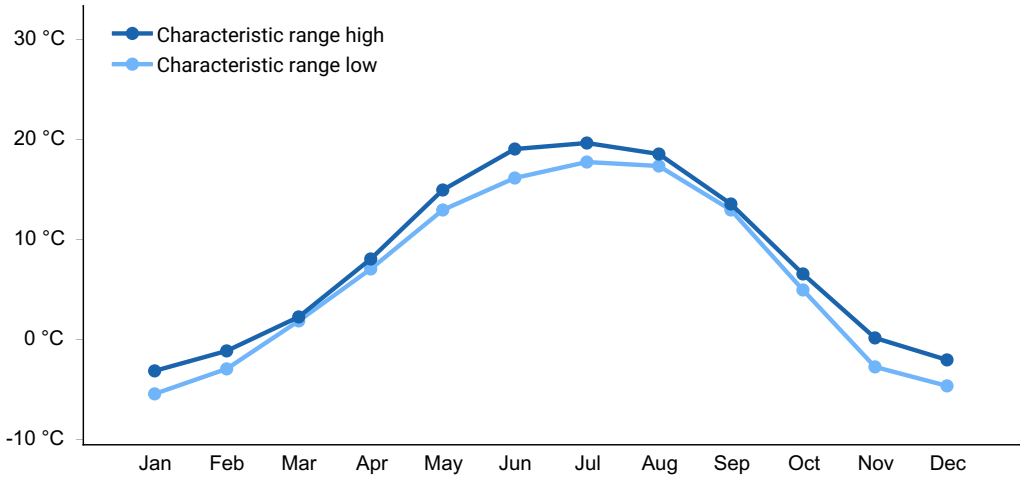


Figure 3. Monthly maximum temperature range

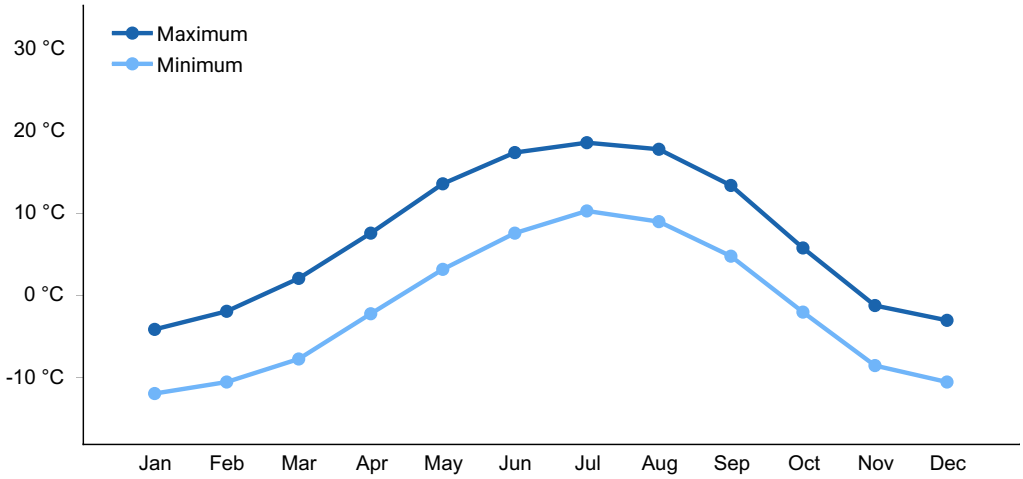


Figure 4. Monthly average minimum and maximum temperature

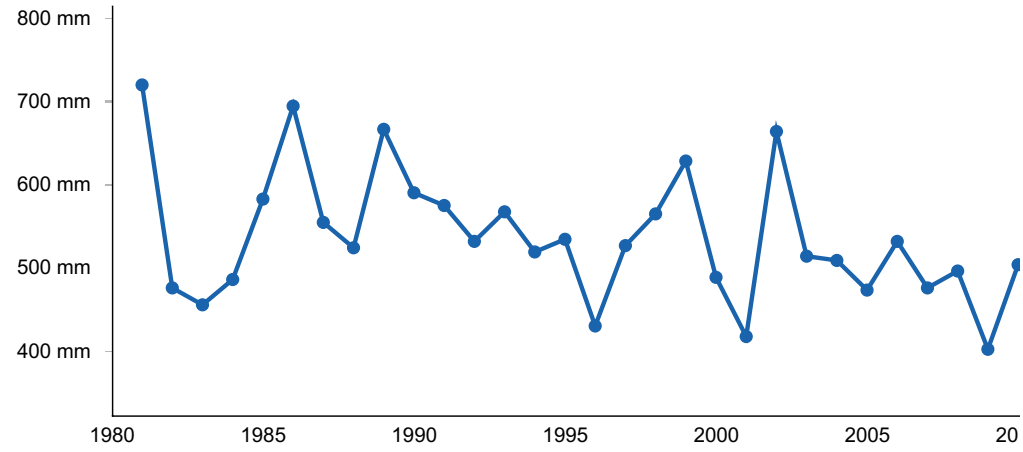


Figure 5. Annual precipitation pattern

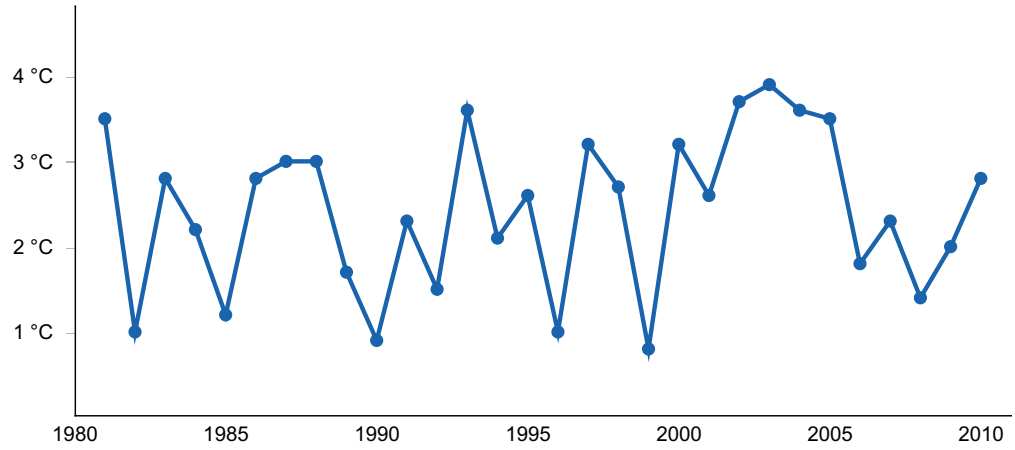


Figure 6. Annual average temperature pattern

Climate stations used

- (1) TALKEETNA AP [USW00026528], Talkeetna, AK
- (2) POINT MACKENZIE [USC00507444], Wasilla, AK
- (3) ANCHORAGE INTL AP [USW00026451], Anchorage, AK
- (4) KENAI MUNI AP [USW00026523], Kenai, AK
- (5) HOMER AP [USW00025507], Homer, AK

Influencing water features

This ecological site is an upland, well drained site. Water from rainfall or snowmelt rarely runs off but will instead infiltrate and percolate through the soil.

Wetland description

No wetlands are included within this ecological site concept.

Soil features

Glacial outwash, till and loess soils are deep and formed from silty volcanic ash, loess, and glaciofluvial deposits. Surface textures are silt loam. They are classified well drained. Permeability is moderate, available water capacity is moderate to high, and runoff is slow. Soil reaction is slightly acid or neutral. Wind erosion hazard is high.

Table 5. Representative soil features

Parent material	(1) Loess (2) Ash flow (3) Till (4) Alluvium (5) Glaciofluvial deposits

Surface texture	(1) Silt (2) Very gravelly loamy sand (3) Gravelly very fine sandy loam (4) Very cobbly loamy sand
Family particle size	(1) Medial-skeletal (2) Medial over loamy-skeletal (3) Medial over sandy or sandy-skeletal
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	25–102 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	9.4–20.83 cm
Soil reaction (1:1 water) (0-25.4cm)	5.1–6.1
Subsurface fragment volume <=3" (0-152.4cm)	0–32%
Subsurface fragment volume >3" (0-152.4cm)	0–67%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	18–152 cm
Soil depth	Not specified
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0–29%
Available water capacity (0-101.6cm)	5.08–34.04 cm
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

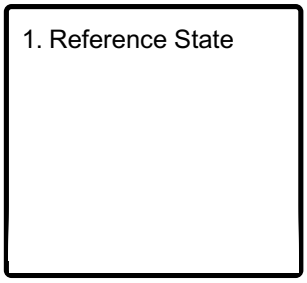
Ecological dynamics

The climax plant community is dominated by grass and forbs, specifically bluejoint (*Calamagrostis canadensis*) and fireweed (*Chamerion angustifolium*). Average annual biomass produced is 7,000 pounds per acre.

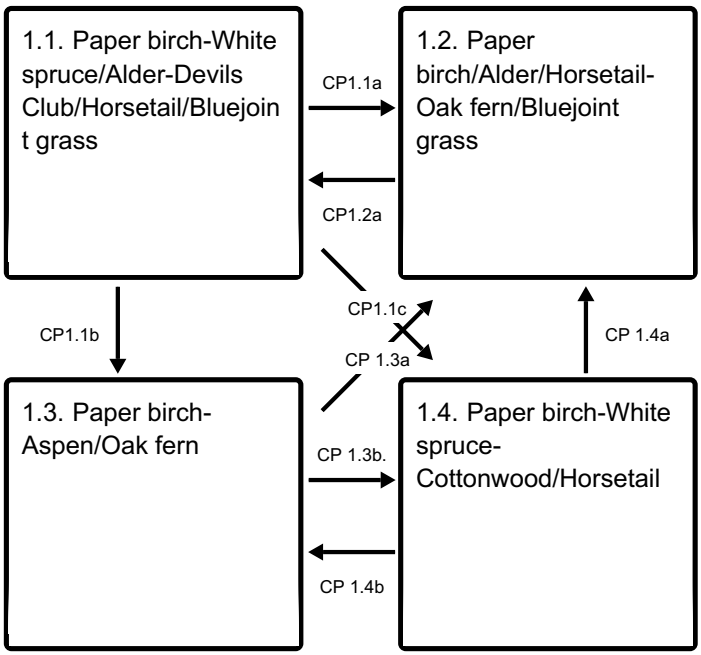
With continuous horse grazing, this ecological site will go to one dominated by fireweed, and when grazed by cattle, will become a community dominated by bluegrass (Poa sp.). In areas where the soil is exposed, shrubs and spruce trees will come in and may slowly expand into the grass community, as younger trees are established in the drip line of the larger trees where grass cannot grow.

State and transition model

Ecosystem states



State 1 submodel, plant communities



CP1.1a - frequent fire, beetle kill

CP1.1b - Hot fire, beetle kill, man-made disturbance

CP1.1c - moderate disturbance (controlled fire, restricted firewood, other)

CP1.2a - time, no disturbance

CP 1.3a - Time, No disturbance

CP 1.3b. - Time, No disturbance

CP 1.4a - fire disturbance and/or associated with bark beetle kill
CP 1.4b - fire disturbance and/or associated with bark beetle kill

State 1
Reference State

The Reference State describes areas with no human disturbance and generally experiences a normal, self-replacing fire regime. This open forest or woodland is dominated by spruce and paper birch. The hardwood cover is thought to mature and begin to decline after 130 to 400 years of age, hypothetically allowing spruce to become dominant and close the canopy. However, there are no known documented community shifts of this nature. The natural disturbances include wind, avalanche, landslides, and infrequent fire. Grazing will also have an impact on the Reference communities of this State. However, no documentation is collected for these communities at this time.

Dominant plant species

- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.1
Paper birch-White spruce/Alder-Devils Club/Horsetail/Bluejoint grass

The characteristic plant community for this site is the reference plant community. For this site, the open forest of white spruce - paper birch is the latest successional stage and the presumed potential vegetation. The open forest overstory community consists of paper birch (*Betula papyrifera*) and white spruce (*Picea glauca*) with tree density less than 50 percent. High bush cranberry (Vibernum edule), bluejoint grass (*Calamagrostis canadensis*), and oak fern (*Gymnocarpium dryopteris*) dominate the understory.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- white spruce (*Picea glauca*), tree
- alder (*Alnus*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- horsetail (*Equisetum*), other herbaceous

Community 1.2
Paper birch/Alder/Horsetail-Oak fern/Bluejoint grass

As communities recover from a natural disturbance or are re-establishing after a stand replacing fire, or other catastrophic event, this community is the mid-seral stage of recovery.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- alder (*Alnus*), shrub
- devilsclub (*Oplopanax horridus*), shrub
- squashberry (*Viburnum edule*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- horsetail (*Equisetum*), other herbaceous
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous

Community 1.3
Paper birch-Aspen/Oak fern

In the recovery process following disturbance, this community is an early- to mid-seral community. Position on the landform, plant materials in the near proximity to the site in recovery will influence the community. Aspen and oak ferns will be the early seral community where competition is low and spruce are suppressed in the community. Spruce suppression occurs with beetle infestations, type of disturbance, hydrology of the specific site of recovery.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- quaking aspen (*Populus tremuloides*), tree
- black cottonwood (*Populus balsamifera ssp. trichocarpa*), tree
- bog Labrador tea (*Ledum groenlandicum*), shrub
- Bebb willow (*Salix bebbiana*), shrub
- Moss (*Moss*), other herbaceous
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous

Community 1.4
Paper birch-White spruce-Cottonwood/Horsetail

In the recovery process following disturbance, this community is an early- to mid-seral community. Position on the landform, plant materials in the near proximity to the site in recovery will influence the community. Aspen and oak ferns will be the early seral community where competition is low and spruce are suppressed in the community. Spruce suppression occurs with beetle infestations, type of disturbance, hydrology of the specific site of recovery.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- white spruce (*Picea glauca*), tree

- black cottonwood (*Populus balsamifera ssp. trichocarpa*), tree
- alder (*Alnus*), shrub
- horsetail (*Equisetum*), other herbaceous
- Moss (*Moss*), other herbaceous
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous

Pathway CP1.1a
Community 1.1 to 1.2

After frequent ground fire and bark beetle infestation, white spruce is decreased. With more open overstory, the understory plant community can be more diverse.

Pathway CP1.1b
Community 1.1 to 1.3

After a hot fire which can be associated with bark beetle, and man-made disturbance such as firewood cutting, plant community 1.3 comes in.

Pathway CP1.1c
Community 1.1 to 1.4

In some cases where the fire is not intense, firewood cutting is restricted, or other moderate disturbance, the white spruce can remain in the overstory, but cottonwood is present.

Pathway CP1.2a
Community 1.2 to 1.1

With time and no disturbance white spruce will come into the site.

Pathway CP 1.3a
Community 1.3 to 1.2

With time and no disturbance, the aspen will begin to die out going into the 1.4 or 1.2 community.

Pathway CP 1.3b.
Community 1.3 to 1.4

With time and no disturbance, the aspen will begin to die out going into the 1.4 or 1.2 community.

Pathway CP 1.4a

Community 1.4 to 1.2

Withe fire disturbance and/or associated with bark beetle kill, 1.4 can regress to the 1.3 plant community.

Pathway CP 1.4b
Community 1.4 to 1.3

With fire disturbance and/or associated with bark beetle kill, 1.4 can regress to the 1.3 plant community

Additional community tables

Table 7. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Grass/grass-like (Graminoids)					
bluejoint	CACA4	*Calamagrostis canadensis*	Native	–	20–30
Forb/Herb					
horsetail	EQUIS	*Equisetum*	Native	–	5–10
Fern/fern ally					
western oakfern	GYDR	*Gymnocarpium dryopteris*	Native	–	5–10
shieldfern	LASTR	*Lastreopsis*	Native	–	0–5
Shrub/Subshrub					
Sitka alder	ALVIS	*Alnus viridis ssp. sinuata*	Native	–	5–15
devilsclub	OPHO	*Oplopanax horridus*	Native	–	5–15
squashberry	VIED	*Viburnum edule*	Native	–	0–10
prickly rose	ROAC	*Rosa acicularis*	Native	–	0–5
American red raspberry	RUID	*Rubus idaeus*	Native	–	0–5

Animal community

This ecological site is used by wildlife of all kinds, including migratory songbirds, but is especially important for large mammals including bears and moose. Moose use the tall

vegetation to conceal themselves when bedding down. Bears also make use of the tall vegetation for cover when traveling. Forage value is high in the early spring when the grass starts growing and is low in the summer and fall when other plants are more nutritious and available.

Hydrological functions

Due to the large amount of litter from the previous year's growth, any snowmelt or rainfall will infiltrate into the soil instead of running off over the soil surface. Flow patterns on the surface are typically nonexistent.

Recreational uses

This is a popular site for recreation, due to the lack of trees and the natural beauty of this site, particularly in the late summer when the fireweed is in full bloom. Both walking trails and 4-wheeler recreation trails are popular in these areas. Also winter ski trails are often located on this site due to the lack of trees.

Wood products

Typically, no wood products are produced from this ecological site.

Inventory data references

No field plots were available to describe this ecological site. A review of the scientific literature and professional experience were used to approximate the plant communities for this provisional ecological site. Information for the state-and-transition model was obtained from the same sources. All community phases are considered provisional based on these plots and the sources identified in ecological site description.

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Contributors

Marji Patz
Jamin Johanson
Blaine Spellman
Phil Barber
Tyler Annetts

Acknowledgments

The original site concepts for the Loamy slopes was created and published by Karin Sonnen, the State Grazing/Rangeland Management Specialist for Alaska in May of 2010.

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	04/11/2026
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:**

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2. **Presence of water flow patterns:**

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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:**
