USDA Natural Resources
Conservation Service

Ecological site F224XY301AK
Bedrock Hills Provisional Ecological Site Group

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

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. The largest lakes are Tustumena, Skilak, and Beluga Lake.

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 the area. Glacial deposits and active fluvial deposits are common.

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. Arctic winter weather patterns are present in northern areas. 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
135 Coastal Trough Humid Tayga 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
- 16061 Western North American Boreal Dry Aspen-Steppe Bluff-Lower Elevations
- 16050 Western North American Boreal Mesic Birch-Aspen Forest

(Landfire, 2024)

Ecological site concept

- Mineral, non-organic soils
- Soils formed in till, colluvium or glacial drift
- Includes moderately to very steep slopes of mountains, hills and sea cliffs
- Ecological site does not flood or pond.
- Fire is the major disturbance. The forest is susceptible to spruce bark beetle infestations, which causes spruce mortality and can exacerbate fire dynamics.

Associated sites

R224XY304AK	**Skeletal Slopes Provisional Ecological Site Group** Skeletal slopes will occur below or intermixed with the Bedrock hills. Bedrock Hills are forested sites fringing on the meadows.

Similar sites

F224XY302AK	**Alluvial Uplands Provisional Ecological Site Group** The Alluvial uplands have similar birch, aspen, and spruce cover, but the understory plant cover and diversity are different. The production of alluvial uplands holds greater potential with deeper soils. Bedrock hills are limited with shallower restricted soils depth.

Table 1. Dominant plant species

Tree	(1) *Betula papyrifera* (2) *Picea glauca*
Shrub	(1) *Vaccinium uliginosum*
Herbaceous	(1) *Calamagrostis canadensis* (2) *Cornus canadensis*

Physiographic features

This ecological site occurs on hills and ridges in the Matanuska River canyon and upper Matanuska Valley, and on isolated bedrock hills and low mountains, such as the Butte, in the lower Matanuska Valley. Elevation ranges from 50 to 2000 feet above sea level. Slopes are typically steep to very steep (20 to 60 percent) but may extend from 5 to over 100 percent.

Table 2. Representative physiographic features

Landforms	(1) Mountain (2) Escarpment (3) Sea cliff (4) Hills > Hill (5) Mountains > Ridge
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	15–610 m
Slope	20–60%
Water table depth	152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	0–1,372 m
Slope	5–100%
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

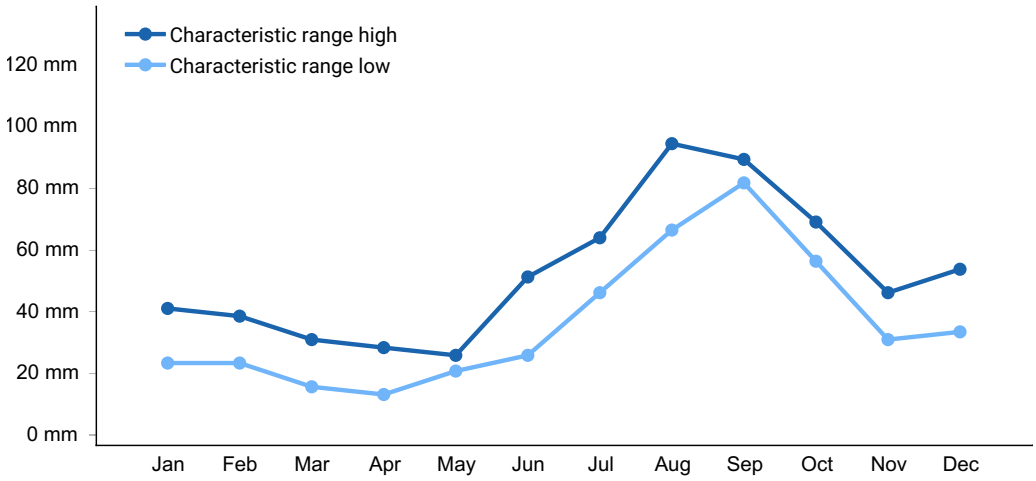


Figure 1. Monthly precipitation range

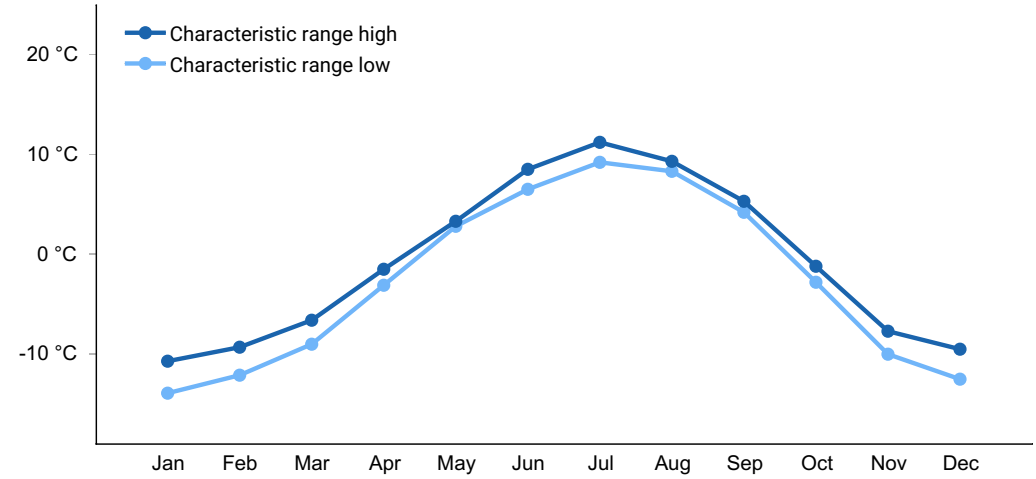


Figure 2. Monthly minimum temperature range

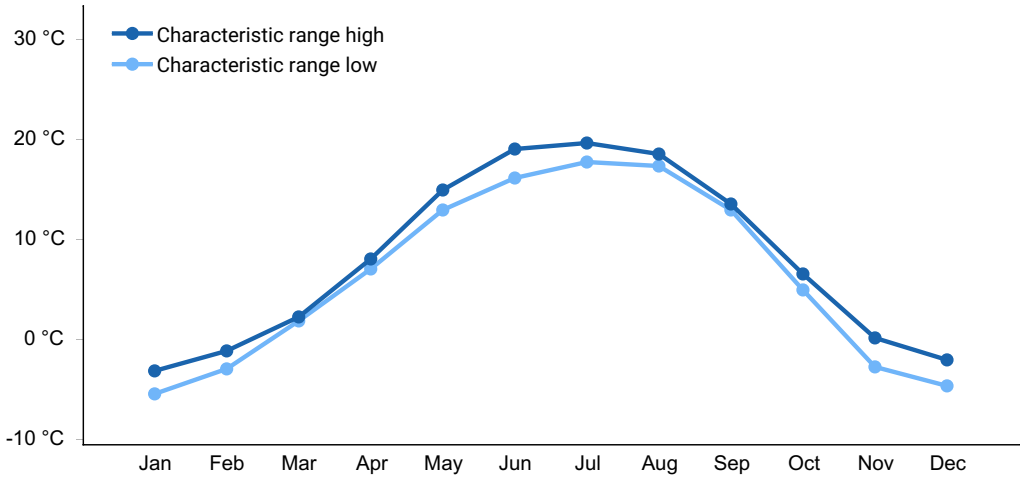


Figure 3. Monthly maximum temperature range

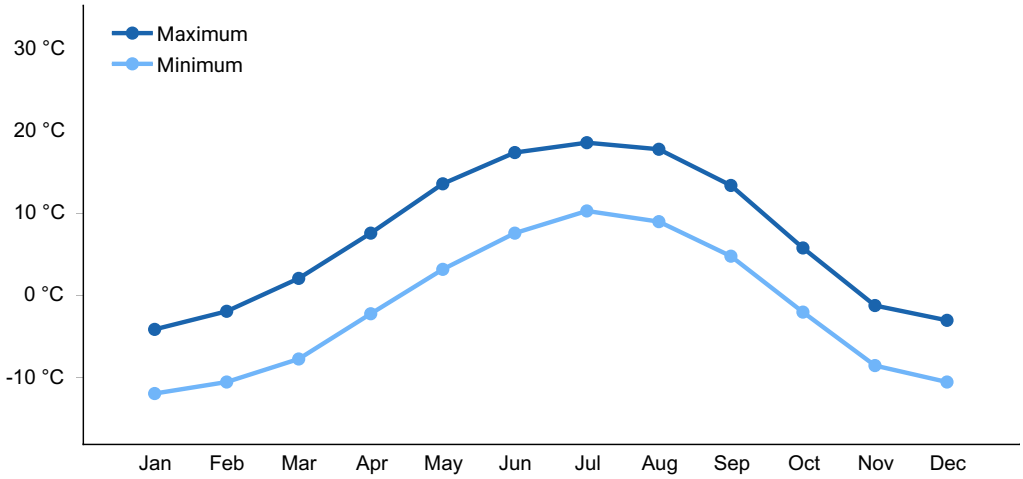


Figure 4. Monthly average minimum and maximum temperature

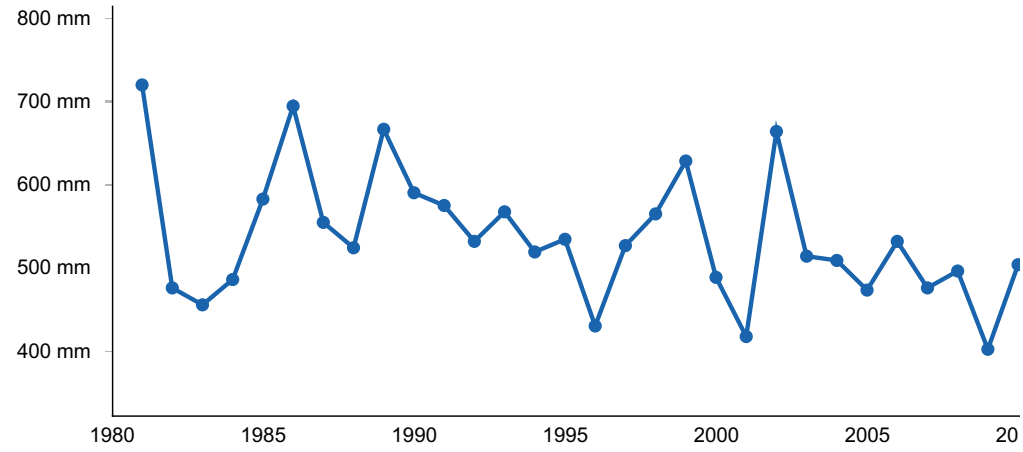


Figure 5. Annual precipitation pattern

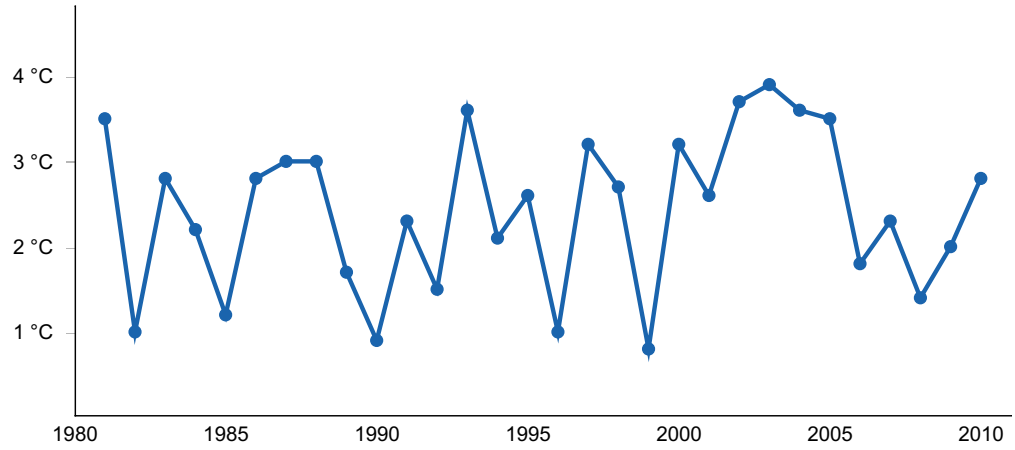


Figure 6. Annual average temperature pattern

Climate stations used

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

Influencing water features

This ecological site is not influenced by water table or streams.

Wetland description

This ecological site is not a wetland.

Soil features

- Soils formed in till, loess, or glaciofluvial deposits
- Soils are moderately deep to very deep. Lithic bedrock is the most common restrictive layer.
- Drainage is classified as well drained.
- Soils are very strongly to slightly acidic.

Table 5. Representative soil features

Parent material	(1) Loess–granite (2) Till (3) Glaciofluvial deposits

Surface texture	(1) Silt (2) Gravelly silt (3) Gravelly loamy very fine sand (4) Cobbly silt loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow
Depth to restrictive layer	36–51 cm
Soil depth	48–152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	2.79–10.92 cm
Soil reaction (1:1 water) (0-25.4cm)	4.9–6.3
Subsurface fragment volume <=3" (0-152.4cm)	0–20%
Subsurface fragment volume >3" (0-152.4cm)	1–9%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	36–104 cm
Soil depth	Not specified
Surface fragment cover <=3"	0–9%
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	1.02–27.69 cm
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	0–54%
Subsurface fragment volume >3" (0-152.4cm)	0–22%

Ecological dynamics

This ecological site concept is captured from the historic range site. The site occurred

across an elevational/precipitation grandiant, with Rusty Menziesia occurring on the wetter sites. Open spruce-paper birch forests occur on several upland sites in southcentral Alaska. Successional relations of these communities are poorly understood. Typically, white spruce (or black spruce) replaces hardwood species in the climax plant community.

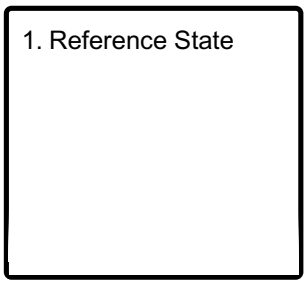
Wildfires play an infrequent but important role in the disturbance regime. It has been the historically dominant disturbance of this ecological site. Quaking aspen is a seral plant community after fire.

One of the most potent natural disturbances of south-central Alaska is the spruce bark beetle (Dendroctonus rufipennis) infestations. Vast acres of dead and dying timber have affected changes in hydrology, changes in woody debris inputs to streams, and long-term shifts in wildlife habitat. When the canopy of these forests is thinned by spruce bark beetle-mortality, bluejoint grass (*Calamagrostis canadensis*) and tall fireweed (Epilobium angustifolium) tend to invade sites. Bluejoint can produce a network of rhizomatous roots that can prevent spruce seedlings from establishing in just a few years after a fire, especially on deep, loamy soils.

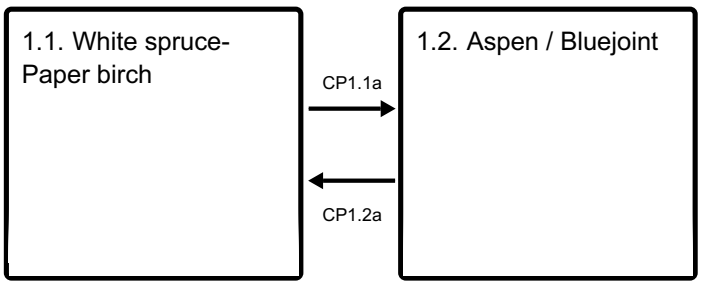
Other natural occurrences include wind, avalanche and landslides. Grazing will also affect this ecological site.

State and transition model

Ecosystem states



State 1 submodel, plant communities



CP1.1a - Beetle kill and/or Fire

CP1.2a - Time

State 1
Reference State

The reference state for this ecological site is a mixed forest. No other states are identified at this time; as more data is collected, this is suspected to change. This state is dominated by a forest of paper birch (*Betula papyrifera*), white spruce (*Picea glauca*), and sometimes cottonwood (*Populus balsamifera* ssp. trichocarpa). Drought or dry conditions can trigger the spruce bark beetle infestation. The spruce bark beetle will nest and kill mature white spruce. In some cases, the beetle will also invade younger spruce. When this happens, the overstory opens, causing an increase in understory vegetation such as bluejoint grass (*Calamagrostis canadensis*), especially if the grass is already a dominant species in the plant community. Dead and dying spruce trees make this community highly susceptible to lightning-caused fire. This promotes aspen (*Populus tremuloides*) growth. Spruce will colonize and overtop aspen over time.

Dominant plant species

- white spruce (*Picea glauca*), tree
- paper birch (*Betula papyrifera*), tree
- black cottonwood (*Populus balsamifera ssp. trichocarpa*), tree

Community 1.1
White spruce-Paper birch

Open white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*) forest is the latest successional stage and the presumed potential climax plant community. Tree canopy cover is 60 percent or less. Cottonwood (*Populus balsamifera* ssp. trichocarpa) can also be common. Highbush cranberry (*Viburnum edule*), willows (Salix spp.), rose (*Rosa acicularis*), and ericaceous shrubs dominate the shrub layer. Oak fem (*Gymnocarpium dryopteris*), bluejoint grass (*Calamagrostis canadensis*), and feathermosses are common in the understory.

Forest understory. Low ericaceous shrubs, alder and a diverse community of forbs dominate.

Dominant plant species

- white spruce (*Picea glauca*), tree
- paper birch (*Betula papyrifera*), tree
- black cottonwood (*Populus balsamifera ssp. trichocarpa*), tree
- squashberry (*Viburnum edule*), shrub
- prickly rose (*Rosa acicularis*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous

Table 7. Ground cover

Tree foliar cover	40-60%
Shrub/vine/liana foliar cover	1-10%

Grass/grasslike foliar cover	1-20%
Forb foliar cover	1-85%
Non-vascular plants	1-50%
Biological crusts	0-1%
Litter	40-90%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-1%
Bedrock	0%
Water	0%
Bare ground	0-1%

Table 8. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	1-20%	–
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	10-10%	–	–
>4 <= 12	40-60%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

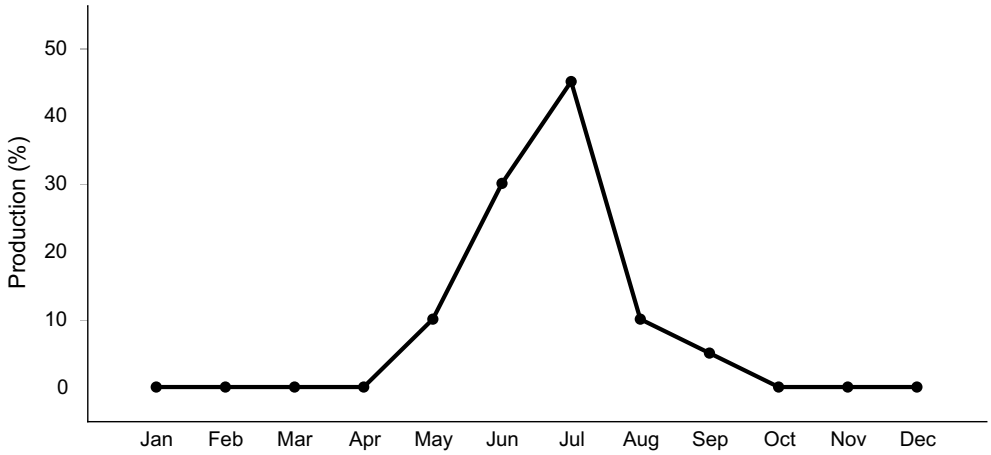


Figure 7. Plant community growth curve (percent production by month). AK0022, Southern. 60-200 days.

Community 1.2
Aspen / Bluejoint

Aspen suckers and birch shoots dominate the post-fire community. Open stands of hardwood with an understory of various combinations of low shrubs, herbs and mosses dominate. Bluejoint grass (*Calamagrostis canadensis*) can spread rapidly from rhizomes and capture a large percentage of the site if it is already common in the pre-bum condition.

Forest overstory. Aspen dominated.

Forest understory. Highbush cranberry, fireweed, and lowbush cranberry. If bluejoint is in the pre-burn condition, bluejoint can spread.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- bluejoint (*Calamagrostis canadensis*), grass

Table 9. Ground cover

Tree foliar cover	1-25%
Shrub/vine/liana foliar cover	1-45%
Grass/grasslike foliar cover	0%
Forb foliar cover	1-45%
Non-vascular plants	16-50%
Biological crusts	0%
Litter	1-90%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-1%
Bedrock	0%
Water	0%
Bare ground	1%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	1-20%	–
>0.3 <= 0.6	–	0-1%	–	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	0-10%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	10-20%	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway CP1.1a
Community 1.1 to 1.2

Fire is the major disturbance on this ecological site. Fire frequency and severity are directly affected by spruce bark beetles. Spruce bark beetle infestations kill spruce trees, leaving dead dry snags, opening the canopy and leading to sunnier, drier understories. These conditions are more susceptible to burn. Even without burning, an increase in understory light allows bluejoint grass (*Calamagrostis canadensis*) to spread rapidly from rhizomes and capture a large percentage of the understory, changing community dynamics. A post-fire community is dominated by birch (*Betula papyrifera*) and aspen (*Populus tremuloides*) from shoots and suckers. Plant community 1.2 consists of open hardwood, primarily aspen (*Populus tremuloides*) with tree density less than 60 percent. This early to mid-development site has an understory of various combinations of low shrubs, herbs and mosses.

Pathway CP1.2a
Community 1.2 to 1.1

Over time, the 1.1 plant community will come back without manipulation.

Additional community tables

Table 11. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
white spruce	PIGL	*Picea glauca*	Native	3–18.3	10–20	12.7–20.6	–

Table 12. 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	–	1–20
Forb/Herb					
larkspurleaf monkshood	ACDE2	*Aconitum delphiniifolium*	Native	–	1
Shrub/Subshrub					
Sitka alder	ALVIS	*Alnus viridis ssp. sinuata*	Native	–	10
Nonvascular					
spiny false fiddleleaf	HYSP	*Hydrolea spinosa*	Native	–	10–50

Table 13. Community 1.2 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
quaking aspen	POTR5	*Populus tremuloides*	Native	–	1–25	5.1–15.2	–
paper birch	BEPA	*Betula papyrifera*	Native	–	1–5	–	–

Table 14. Community 1.2 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Shrub/Subshrub					
bunchberry dogwood	COCA13	*Cornus canadensis*	Native	–	30
black crowberry	EMNI	*Empetrum nigrum*	Native	–	20
bog Labrador tea	LEGR	*Ledum groenlandicum*	Native	–	15

Animal community

The Bedrock Hills ecological site is suited for livestock grazing and provides suitable habitat for moose and spruce and ruffed grouse.

Wood products

The Bedrock Hills ecological site is suited for forestry.

Inventory data references

No field plots were available for 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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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	04/13/2026
Approved by	Blaine Spellman
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):**

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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):**

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:**