USDA Natural Resources
Conservation Service

Ecological site F224XY302AK
Alluvial Uplands Provisional Ecological Site Group

Last updated: 6/13/2025
Accessed: 12/05/2025

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 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. 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
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
- 16012 Western North American Boreal Treeline White Spruce-Hardwood Woodland - Boreal Transition

- 16150 Western North American Boreal Lowland Large River Floodplain Forest and Shrubland
(Landfire, 2024)

Ecological site concept

- Occurs on glacial/fluvial outwash plains and terraces, stream terraces, alluvial fans, moraines, and till plains.
- Mineral, non-organic soils
- Alluvium influenced soils
- Forested sites on lower elevation slopes
- Vegetation is not influenced by ground water, and this ecological site is not hydrologically driven. Neighboring (upslope) sites may contribute runoff during major events, but no major flooding impacts.

Associated sites

F224XY301AK	**Bedrock Hills Provisional Ecological Site Group** Bedrock hills are steeper bedrock sites that commonly occur upslope of alluvial fans or directly adjacent to terraces and fans. The dominant species shift from an aspen and spruce birch mix to a spruce-dominated community on the steeper slopes.

Similar sites

F224XY303AK	**Silty Ash Slopes Provisional Ecological Site Group** The Silty slopes ecological site describes slightly steeper slopes that commonly occur above alluvial fans or directly adjacent to terraces and fans. Dominant species shift from an aspen/spruce mix to a birch/spruce driven community.

Table 1. Dominant plant species

Tree	(1) *Betula papyrifera* (2) *Picea glauca*
Shrub	(1) *Ledum groenlandicum* (2) *Vaccinium vitis-idaea*
Herbaceous	(1) *Hylocomium splendens* (2) *Calamagrostis canadensis*

Physiographic features

- This ecological site occurs on terraces, alluvial fans and glacial/fluvial outwash, moraines, and till plains.
- Occurs on the lower lying hills and fans ranging from 50 to 1000 feet elevation.
- Slopes are typically nearly level (zero to two percent) but can range up to 12 percent.

Table 2. Representative physiographic features

Landforms	(1) Stream terrace (2) Alluvial fan (3) Till plain > Moraine (4) Hills > Moraine (5) Outwash plain > Terrace
Runoff class	Medium
Flooding frequency	None
Ponding frequency	None
Elevation	15–305 m
Slope	0–2%
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	None to occasional
Ponding frequency	Not specified
Elevation	15–549 m
Slope	0–12%

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

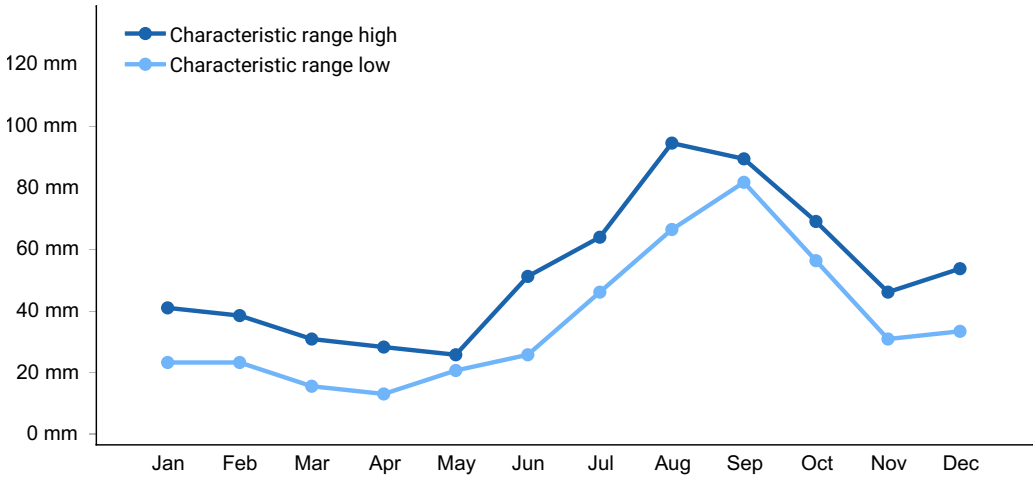


Figure 1. Monthly precipitation range

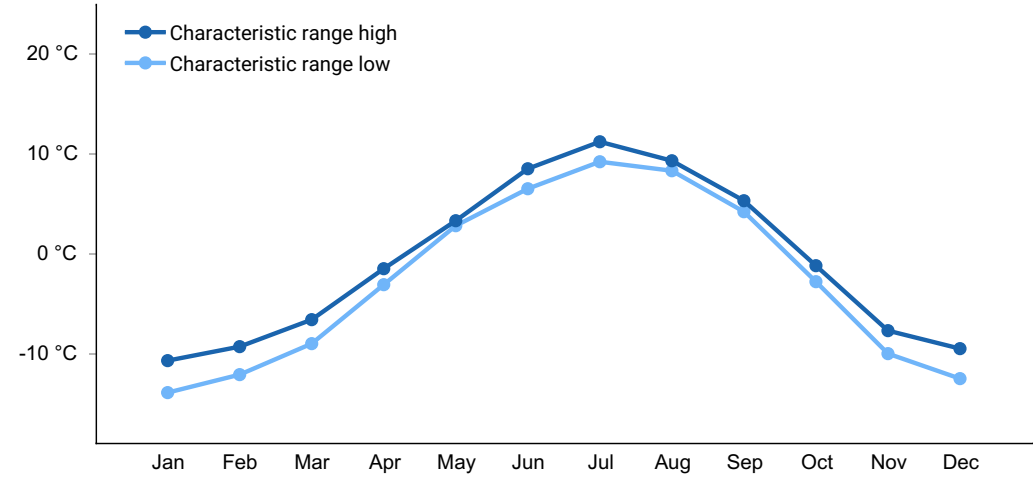


Figure 2. Monthly minimum temperature range

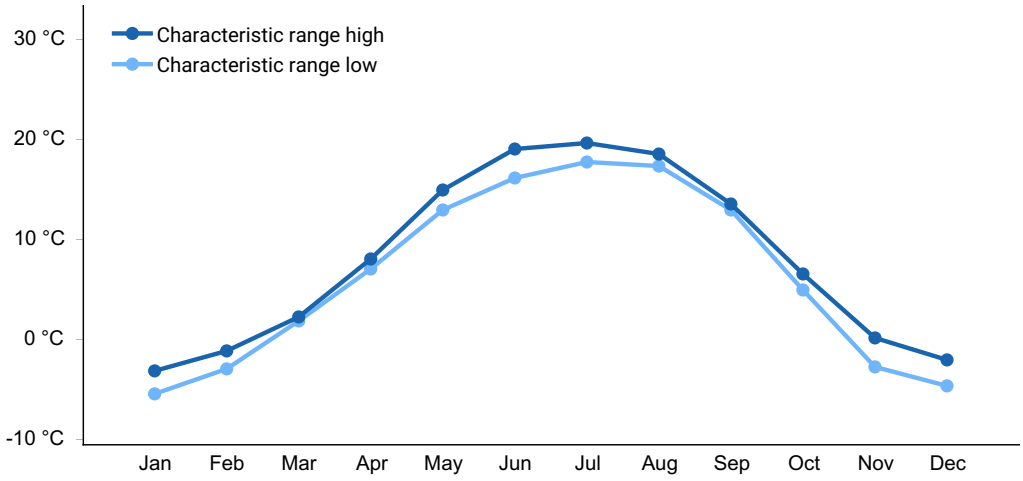


Figure 3. Monthly maximum temperature range

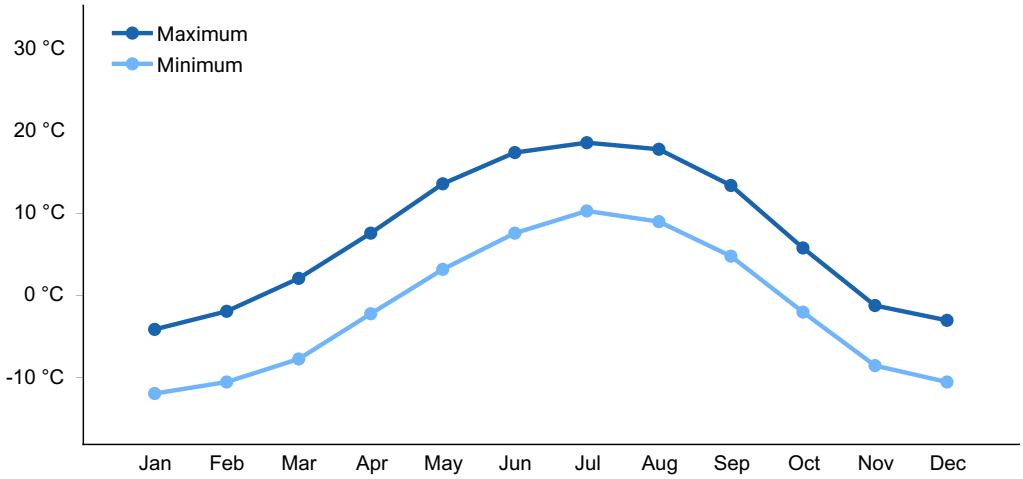


Figure 4. Monthly average minimum and maximum temperature

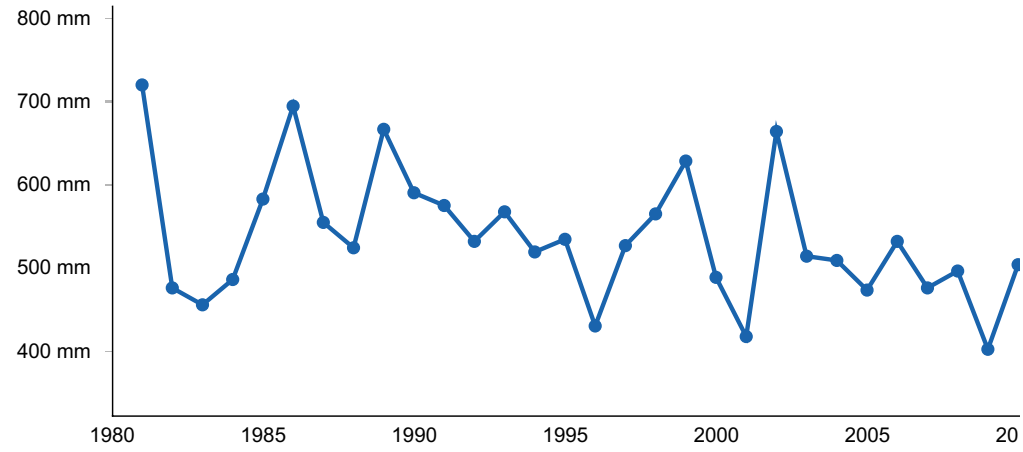


Figure 5. Annual precipitation pattern

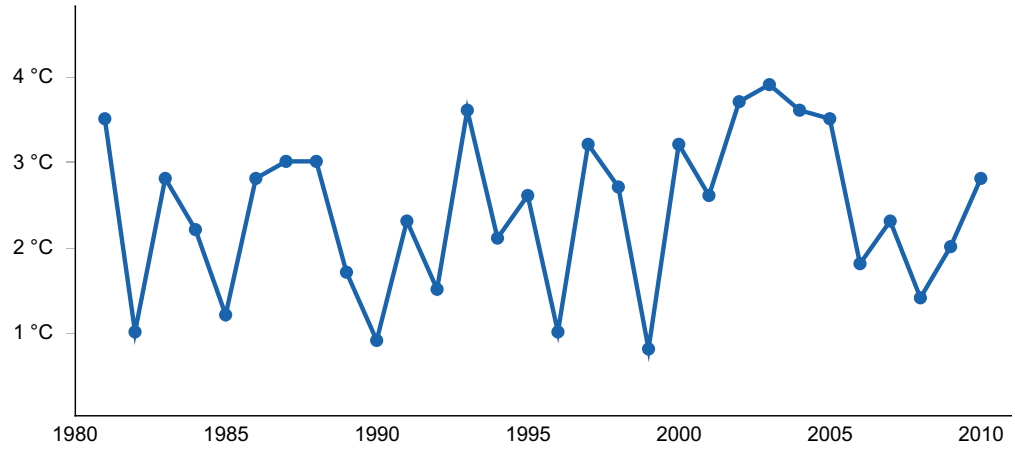


Figure 6. Annual average temperature pattern

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 a water table or streams.

Wetland description

This ecological site is not a wetland.

Soil features

- Soils contain gravels and/or cobbles throughout the profile but commonly do not have rock fragments on the surface.
- The top organic horizon is thin (one to five inches) when present
- Textures include silt loam, fine sandy loam, loamy fine sands, loamy very fine sands, and sand.
- Soils are very deep.
- Soils are extremely to slightly acidic in the top ten inches.
- The soil profile has shallow abrupt textural changes that restrict roots between depths of 10 and 20 inches.

Table 5. Representative soil features

Parent material	(1) Loess (2) Alluvium (3) Glaciofluvial deposits (4) Colluvium
Surface texture	(1) Silt loam (2) Cobbly fine sandy loam (3) Very gravelly sand (4) Very gravelly loamy fine sand (5) Gravelly loamy very fine sand
Drainage class	Well drained
Permeability class	Slow to moderately slow
Depth to restrictive layer	25–51 cm
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (25.4-101.6cm)	6.1–17.53 cm
Soil reaction (1:1 water) (0-25.4cm)	4.4–6.1
Subsurface fragment volume <=3" (0-152.4cm)	5–30%
Subsurface fragment volume >3" (0-152.4cm)	5–15%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (25.4-101.6cm)	5.08–20.32 cm
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	0–31%

Subsurface fragment volume >3" (0-152.4cm)	0–22%

Ecological dynamics

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 reference plant community. Hardwood density will start to decrease around 130 to 400 years before the community is dominated by a closed forest of mature conifers.

Although lightning strikes and natural fires are rare, wildfires play an infrequent but important role in the disturbance regime. Estimates of mean fire return intervals can range from 800 years (Bert 2004) to 600 years (FRCC workshop, 2004).

One of the most potent natural disturbances of southcentral Alaska are 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.

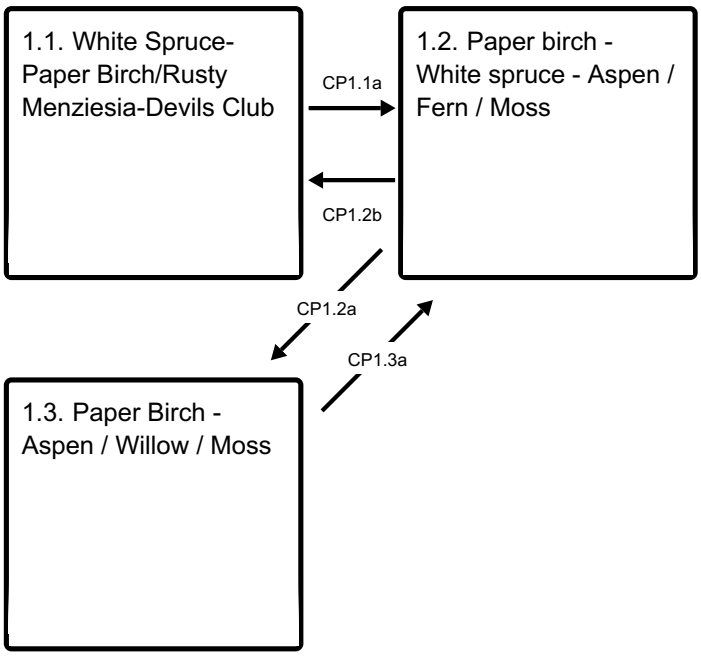
Bluejoint can produce a network of rhizomatous roots that can prevent spruce seedlings from establishing in just a few years after a fire, especially on deep, loamy soils. Other natural occurrences include wind, avalanche and landslides. Grazing will also affect this ecological site.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities



CP1.1a - Light and short duration ground fire

CP1.2b - Time without fire

CP1.2a - Frequent fire

CP1.3a - Recovery time

State 1
Reference State

The reference state supports a variety of forest types including mixed paper birch-white spruce open forest, mixed paper birch-quaking aspen forest, and mixed black spruce-paper birch forest. Forests dominated by black spruce (*Picea mariana*) probably developed after forest fires and may persist indefinitely. Understory characteristics vary considerably, reflecting a range of successional stages, microsites, and disturbance history. Mature paper birch-white spruce forest with dense tall and low shrub understory is the latest successional stage and the presumed potential vegetation. The most abundant shrubs include Sitka alder (*Alnus viridis* ssp. sinuata), devil's club (*Oplopanax horridus*), rusty menziesia (*Menziesia ferruginea*), highbush cranberry (*Viburnum edule*), ovalleaf blueberry (*Vaccinium ovalifolium*), and occasionally willow (Salix spp.). Scattered herbs, patches of moss, and leafy litter characterize the forest floor.

Dominant plant species

- white spruce (*Picea glauca*), tree
- black spruce (*Picea mariana*), tree
- paper birch (*Betula papyrifera*), tree
- quaking aspen (*Populus tremuloides*), tree
- Sitka alder (*Alnus viridis ssp. sinuata*), shrub
- devilsclub (*Oplopanax horridus*), shrub

- rusty menziesia (*Menziesia ferruginea*), shrub
- squashberry (*Viburnum edule*), shrub
- oval-leaf blueberry (*Vaccinium ovalifolium*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- common ladyfern (*Athyrium filix-femina*), other herbaceous
- western oakfern (*Gymnocarpium dryopteris*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous

Community 1.1
White Spruce-Paper Birch/Rusty Menziesia-Devils Club

The characteristic plant community for this ecological site is the reference plant community. The open forest of white spruce and paper birch is the latest successional stage and the presumed potential vegetation. The open forest overstory community consists of birch (*Betula papyrifera*) and white spruce (*Picea glauca*) with tree cover less than 50 percent. Low bush cranberry (*Vaccinium vitis-idaea*), labrador tea (Ledum spp.) and bunchberry (*Cornus canadensis*) dominate the shrub understory.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- white spruce (*Picea glauca*), tree
- devilsclub (*Oplopanax horridus*), shrub
- rusty menziesia (*Menziesia ferruginea*), shrub
- bunchberry dogwood (*Cornus canadensis*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- Labrador tea (*Ledum*), shrub

Community 1.2
Paper birch - White spruce - Aspen / Fern / Moss

Plant community 1.2 consists of open mixed forest, primarily paper birch (*Betula papyrifera*) with white spruce (*Picea glauca*) and aspen (*Populus tremuloides*). Tree density less than 60 percent. This mid development site has an understory of various combinations of low shrubs, herbs and mosses.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- white spruce (*Picea glauca*), tree
- quaking aspen (*Populus tremuloides*), tree
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- spinulose woodfern (*Dryopteris carthusiana*), other herbaceous

Community 1.3

Paper Birch - Aspen / Willow / Moss

Plant community 1.3 consists of open hardwood, primarily paper birch (*Betula papyrifera*) and aspen (*Populus tremuloides*) with tree density less than 60 percent. This mid development site has an understory of willow (Salix spp.) and various herbs and mosses.

Dominant plant species

- paper birch (*Betula papyrifera*), tree
- quaking aspen (*Populus tremuloides*), tree
- willow (*Salix*), shrub
- alder (*Alnus*), shrub
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- groundcedar (*Lycopodium complanatum*), other herbaceous

Pathway CP1.1a
Community 1.1 to 1.2

After a light and short duration ground fire, the understory plant community can be changed.

Pathway CP1.2b
Community 1.2 to 1.1

Given time without fire, white spruce and shrub cover will recover.

Pathway CP1.2a
Community 1.2 to 1.3

After frequent fire plant community 1.2 can be regressed further to a community dominated by aspen and birch with many shoots and suckers.

Pathway CP1.3a
Community 1.3 to 1.2

With time following fire, this community has the potential to recover to Community 1.2.

Additional community tables

Animal community

This ecological site composition supports occasional stands with abundant herbaceous understory suited for livestock grazing. This ecological site provides favorable habitat for moose, spruce grouse, and other wildlife.

Wood products

This ecological site is well 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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Contributors

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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	12/05/2025
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):**

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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:**
