

# Ecological site R233XY152AK

## High-elevation Scrub Gravelly Flood Plains

Last updated: 6/10/2025

Accessed: 03/16/2026

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### 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): 233X–Upper Kobuk and Koyukuk Hills and Valleys

The Upper Kobuk and Koyukuk Hills and Valleys MLRA (herein called area) occurs in Interior Alaska. This area makes up 8,405 square miles. The largest tributaries are the Kobuk and the Koyukuk Rivers. Major tributaries of the Kobuk are the Reed, Beaver, Mauneluk, and Pau Rivers. Major tributaries of the Koyukuk River are the Alatna, John, and Kanuti Rivers. This area is primarily undeveloped wildland and sparsely populated. The communities within or near this area are Bettles, Kobuk, and Shungnak.

The terrain of this area consists of broad, nearly level river valleys and basins and rolling uplands separated by isolated hills and low rounded mountains. In the river valleys, nearly level flood plains and stream terraces gradually transition to gently sloping to moderately steep slopes leading to the hills and mountains. Basins are on the Pau River Flats between the eastern Zane and Lockwood Hills, on the Kanuti Flats between the Kanuti and Koyukuk Rivers, and along the middle reaches of the Hogatza River. Basins and stream terraces are dotted with hundreds of lakes and interconnecting wetlands. Elevation ranges from about 150 feet in the western part of the area, at the confluence of the Kobuk and Mauneluk Rivers, to 4,765 feet at the summit of Fritts Mountain, in the Angaycuham Mountains.

### Geology and Soils

The northern part of the area was covered repeatedly by Pleistocene glaciers originating in the Brooks Range to the north. Slightly modified to highly modified moraines and drift cover many of the rolling uplands. Glacial ice flowed over most of the hills and low mountains, removing existing deposits and leaving a thin layer of glacial deposits. Today,

the lower mountain slopes, hills, and valley bottoms are covered with a variety of material, including glacial drift, colluvium, slope alluvium, fluvial deposits, and silty loess. In the southern part of the area, basins and valleys are filled with Quaternary glaciofluvial and fluvial deposits. Hills and upland slopes are covered with bedrock colluvium and slope alluvium, which are mantled with loess in places. The bedrock geology underlying much of the area consists dominantly of Permian through Lower Cretaceous stratified sedimentary and volcanic rocks.

This area is in the zone of discontinuous permafrost. Permafrost is close to the surface in lands with finer textured sediments throughout the area. Isolated masses of ground ice occur on terraces and the lower side slopes of hills. Permafrost does not occur on flood plains, on steep south-facing slopes, or other lands with very gravelly soils. Periglacial features, such as thermokarst pits, peat plateaus, and earth hummocks, are on the lower hill and mountain slopes and in upland valleys.

The dominant soil orders in this area are Gelisols, Inceptisols, and Entisols. The Gelisols are shallow or moderately deep to permafrost, occur on finer textured sediments, and are poorly drained or very poorly drained. Common Gelisol suborders are Histels, Orthels, and Turbels. The Histels have thick accumulations of surface organic material and occur in depressions, lake margins, and peat plateau. The Orthels and Turbels have comparably thinner surface organic material and occur on stream terraces and hill and upland slopes. The Inceptisols and Entisols are typically associated with gravelly soils that do not have permafrost within their profile, are deep, and are somewhat poorly drained to well drained. The common Inceptisol suborders are Cryepts and Gelepts both of which occur on upland and mountain slopes. Cryepts occur under forested soils at lower elevations and Gelepts on alpine tundra at higher elevations. Common Entisol suborders are Cryofluvents and Cryorthents both of which occur on alluvium on flood plains. Miscellaneous (non-soil) areas make up about 8 percent of this MLRA. The most common are rock outcrop, rubble land, and water.

Wildfires disturb the insulating organic material at the soil surface and can change the presence and/or depth of permafrost in the soil profile. These fire related changes to permafrost can also change the depth and presence of perched water tables. Gelisols that burn in this area can change soil taxonomic classification. For instance, depending on fire-severity, Histels may change to Orthels and Orthels may change to Inceptisols. Depending on the frequency and intensity of fires, landform position, and soil texture, the soils may or may not revert back to their original taxonomic classification.

## Climate

Short, warm summers and long, cold winters characterize the continental subarctic climate of the area. The average annual precipitation ranges from 15 to 19 inches on valley bottoms and basins and from 19 to 26 inches at the higher elevations in the hills and mountains (PRISM 2018). Most of the precipitation falls as rain between May and September. The average annual snowfall ranges from 65 to 80 inches. The average

annual temperature is 22 to 24 degrees Fahrenheit (PRISM 2018). The temperature normally remains above freezing from mid-June through August in river valleys and basins with a freeze-free period ranging from 109 to 125 days. The freeze-free period is significantly shorter on higher elevation mountain slopes.

## Vegetation

Most of this area is forested below an elevation of 1600 feet. Dominant tree species on slopes are white spruce and black spruce. Black spruce stands dominate on north-facing slopes, stream terraces, and other sites with poor drainage and permafrost. White spruce stands dominate on steep, south-facing slopes with dry soils. At lower elevations, lightning-caused wildfires are common, often burning many thousands of acres during a single fire event. Following wildfires, forbs, grasses, willow, ericaceous shrubs, paper birch, and quacking aspen communities are common until they are eventually replaced by stands of spruce. Tall willow and alder scrub is extensive on low flood plains. White spruce and balsam poplar are common on high flood plains.

With increasing elevation, the forests and woodlands give way to subalpine communities dominated by krummholz spruce, shrub birch, willow, and ericaceous shrubs. At even higher elevations, alpine communities prevail which are characterized by diverse forbs, dwarf ericaceous shrubs, and eightpetal mountain-avens. Many of these high elevation communities have a considerable amount of lichen cover and bare ground.

## LRU notes

In this area, we refer to three life zones that are defined by the physiological limits of plant communities along an elevational gradient: boreal, subalpine, and alpine. The boreal life zone is the elevational band where forest communities dominate. Not all areas in the boreal life zone are forest communities, however, particularly in places with too wet or dry soil to support tree growth (e.g., bogs or river bluffs). Above the boreal band of elevation, subalpine and alpine vegetation dominate. The subalpine zone is a narrow transitional band between the boreal and the alpine life zones, and is characterized by sparse, stunted trees that can be considered tree line. In the subalpine, certain types of birch and willow shrub species grow at greater than or equal to one meter in height (commonly *Betula glandulosa* and *Salix pulchra*). In the alpine, trees no longer occur, and all shrubs are dwarf or lay prostrate on the ground. In this area, the boreal life zone occurs below 1600 feet elevation on average. The transition between boreal and subalpine vegetation can occur within a range of approximately 350 feet of elevation, and is highly dependent on slope, aspect, and shading from adjacent mountains.

Within each life zone, there are plant assemblages that are associated with cold slopes and warm slopes. Cold slopes and warm slopes are created by the combination of the steepness of the slope, the aspect, and shading from surrounding ridges and mountains. Warm slope positions occur on southeast to west facing slopes that are moderate to very steep (greater than 10 percent slope) and are not shaded by the surrounding landscape.

Cold slopes occur on northwest to east facing slopes, occur in shaded slope positions, or occur in low-lying areas that are cold air sinks. Examples of shaded positions include head slopes, low relief backslopes of hills, and the base of hills and mountains shaded by adjacent mountain peaks. Warm boreal slope soils have a cryic soil temperature regime and lack permafrost. In this area, white spruce forests are an indicator of warm boreal slopes. Cold boreal slope soils have a gelic soil temperature regime and commonly have permafrost. In this area, black spruce forests and woodlands are an indicator of cold boreal slopes. The boreal life zone can occur at higher elevations on warm slopes, and lower elevations on cold slopes.

## Classification relationships

Landfire BPS - 16371 – Western North American Boreal Alpine Floodplain – Lower Elevations

## Ecological site concept

- Occurs in the alpine on flood plains in the mountains.
- Soils formed in alluvium.
- Flooding occurs occasionally. Ponding does not occur.
- These moist soils are considered somewhat poorly drained.
- Soils are very deep. Permafrost does not occur in the soil profile.
- The reference plant community is closed tall scrub (Viereck et al. 1992) with feltleaf willow and tealeaf willow the dominant overstory shrub. Two plant communities occur within the reference state related to flooding.

## Associated sites

R233XY101AK	<b>Alpine Dwarf Scrub Gravelly Slopes</b> Occurs upslope in the alpine.
R233XY115AK	<b>Alpine Sedge Silty Frozen Slopes</b> Occurs upslope in the alpine.
R233XY134AK	<b>Alpine Dwarf Scrub Gravelly Frozen Slopes</b> Occurs upslope in the alpine.
R233XY148AK	<b>Subalpine Scrub Gravelly Moist Slopes</b> Occurs upslope in the subalpine.
R233XY164AK	<b>Subalpine Scrub Gravelly Slopes</b> Occurs upslope in the subalpine.

## Similar sites

R231XY152AK	<b>High-elevation scrub gravelly drainageways</b> Occurs in an adjacent area (MLRA 231X) on similar soils and is provisionally thought to have similar vegetation and disturbance dynamics.
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R233XY130AK	<p><b>Boreal Scrubland Gravelly Floodplain</b></p> <p>Ecological site 130 occurs in the boreal life zone on flood plains. Both ecological sites 130 and 152 have willow dominant overstories but have different types of understory vegetation.</p>
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**Table 1. Dominant plant species**

Tree	Not specified
Shrub	(1) <i>Salix alaxensis</i> (2) <i>Salix pulchra</i>
Herbaceous	(1) <i>Mertensia paniculata</i> (2) <i>Aconitum delphiniifolium</i>

### Physiographic features

- Occurs on low flood plains in the mountains.
- Associated with the subalpine and alpine life zones. Representative elevation occurs between 1600 and 2400 feet.
- Slopes are nearly level and occur on all slope aspects.
- Flooding occurs occasional, while ponding does not occur.
- These are moist soils with a seasonal water table occurring between 10 and 30 inches.
- Associated with negligible to very low amounts of runoff to adjacent, downslope ecological sites.

**Table 2. Representative physiographic features**

Landforms	(1) Mountains > Flood plain
Runoff class	Negligible to very low
Flooding frequency	None to occasional
Ponding frequency	None
Elevation	488–732 m
Slope	0–2%
Water table depth	25–76 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	152–823 m
Slope	Not specified
Water table depth	Not specified

## Climatic features

This High-elevation Scrub Gravelly Flood Plains ecological site is associated with a harsh climate especially when compared to ecological sites at lower elevations in the boreal life zone. In MLRA 233X, snow first blankets and persists the longest in the alpine and subalpine life zones. During the growing season (May through September), it is consistently 2 to 3 degrees Fahrenheit colder in the alpine and subalpine (PRISM 2018). These small differences in temperature are exacerbated due to constant and strong winds. Winds are much more intense in these high elevation areas because of limited trees providing windbreaks. When compared to the boreal life zone, this site has a much shorter growing season, and the growing season is significantly colder for associated vegetation.

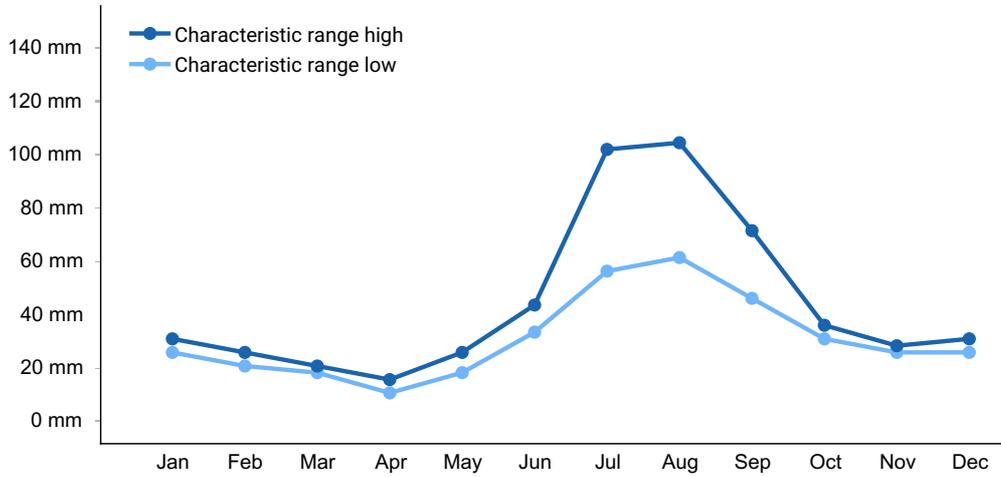
Short, warm summers and long, cold winters characterize the subarctic continental climate associated with this boreal forest gravelly slopes ecological site. The mean annual temperature for MLRA 233X ranges from 22 to 24 degrees Fahrenheit (PRISM 2008). The warmest months span May through August with mean normal maximum monthly temperatures ranging from 51 to 64 degrees Fahrenheit. The coldest months span December through March with mean normal minimum temperatures ranging from -2 to 3 degrees Fahrenheit. The freeze-free period for this high-elevation ecological site ranges from 65 to 88 days, and the temperature generally remains above freezing from late May through early-September.

The area receives minimal annual precipitation with July through September being the wettest. Average annual precipitation across MLRA 233X ranges between 17 to 21 inches (PRISM 2008). Approximately half of the annual precipitation occurs during the months of July through September with seasonal thunderstorms. The average annual snowfall ranges from 65 to 80 inches (USDA 2022). The ground is consistently covered with snow from November through March.

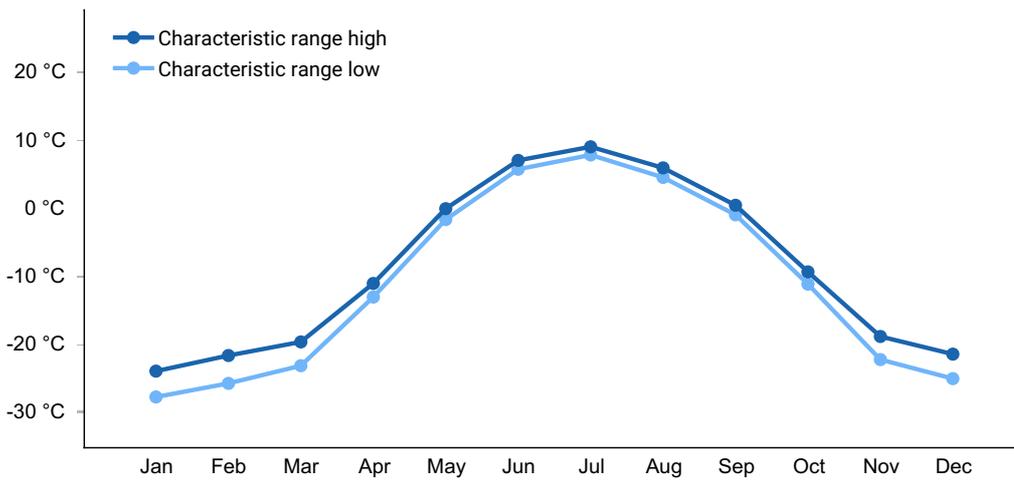
**Table 4. Representative climatic features**

Frost-free period (characteristic range)	48-69 days
Freeze-free period (characteristic range)	69-85 days
Precipitation total (characteristic range)	432-533 mm
Frost-free period (actual range)	17-73 days
Freeze-free period (actual range)	65-88 days
Precipitation total (actual range)	356-610 mm

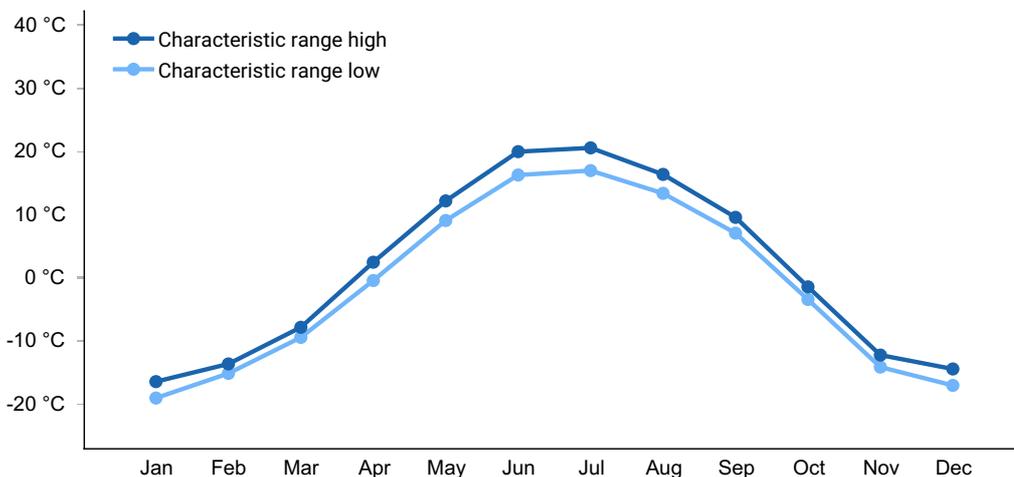
Frost-free period (average)	60 days
Freeze-free period (average)	76 days
Precipitation total (average)	457 mm



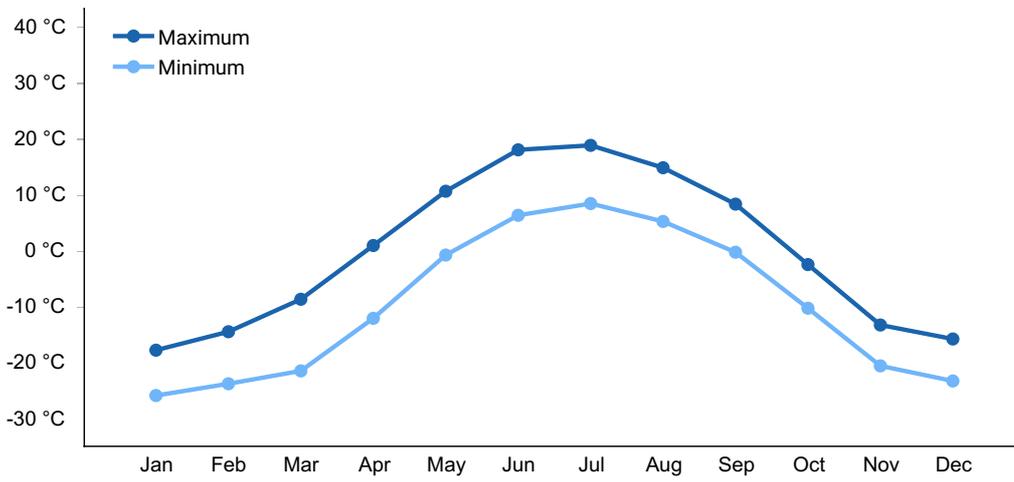
**Figure 1. Monthly precipitation range**



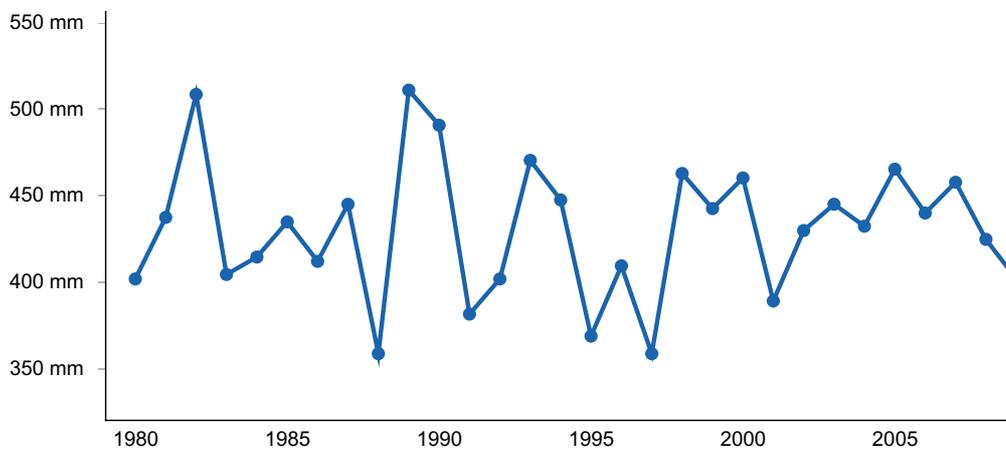
**Figure 2. Monthly minimum temperature range**



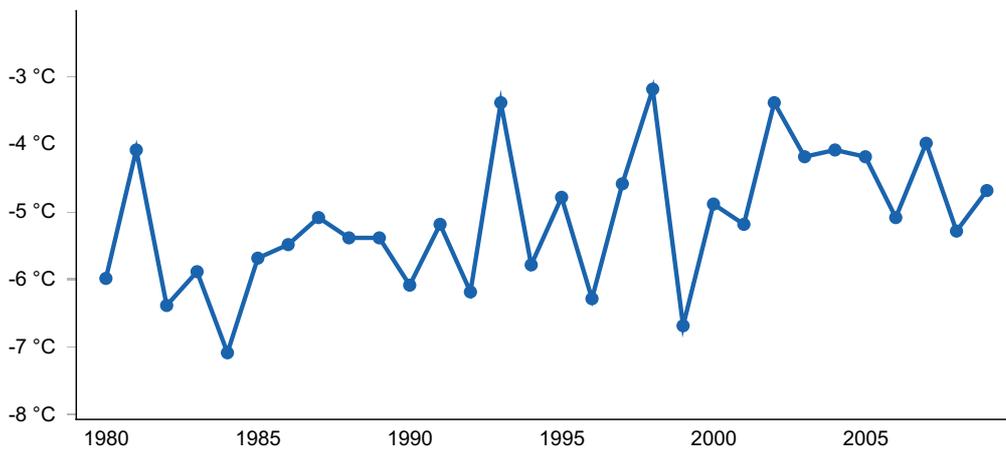
**Figure 3. Monthly maximum temperature range**



**Figure 4. Monthly average minimum and maximum temperature**



**Figure 5. Annual precipitation pattern**



**Figure 6. Annual average temperature pattern**

## Climate stations used

- (1) BETTLES AP [USW00026533], Bettles Field, AK

## Influencing water features

In the associated flood plains, overbank flow from the channel and subsurface hydraulic connections between the stream and adjacent wetlands are the main sources of water (Smith et al. 1995).

Depth to the water table may decrease following summer storm events or spring snowmelt and increase during extended dry periods.

## Wetland description

This ecological site is classified as a riverine wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

## Soil features

- Soils formed in alluvium.
- Rock fragments on the soil surface range between 3 and 50 percent cover.
- Soils are not capped with organic material.
- The surface mineral horizon is stratified silts and fine sands. The thickness of these finer sediment horizons is highly variable and occur over bands of sandy and gravelly alluvium.
- These gravelly soils have subsurface rock fragments ranging between 35 and 75 percent of the soil profile by volume.
- While soils are very deep, strong contrasting textural stratification occurs at very shallow depths (3 to 5 inches). This restriction can affect the movement and retention of water and/or nutrients. Soils do not have permafrost.
- The pH of the soil profile ranges from slightly acidic to moderately alkaline.
- These moist soils are considered somewhat poorly drained.
- Soils are classified as Entisols in the great group Gelorthents.

**Table 5. Representative soil features**

Parent material	(1) Alluvium
Surface texture	(1) Fine sand (2) Silt
Family particle size	(1) Sandy-skeletal
Drainage class	Somewhat poorly drained
Permeability class	Rapid
Depth to restrictive layer	8–13 cm
Soil depth	152 cm
Surface fragment cover ≤3"	2–25%
Surface fragment cover >3"	1–25%

Available water capacity (0-101.6cm)	3.56–5.84 cm
Calcium carbonate equivalent (25.4-101.6cm)	1–5%
Clay content (0-50.8cm)	4–6%
Electrical conductivity (25.4-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (25.4-101.6cm)	0
Soil reaction (1:1 water) (25.4-101.6cm)	6.2–8.4
Subsurface fragment volume ≤3" (0-152.4cm)	25–50%
Subsurface fragment volume >3" (0-152.4cm)	10–25%

**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"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	0.76–5.84 cm
Calcium carbonate equivalent (25.4-101.6cm)	Not specified
Clay content (0-50.8cm)	Not specified
Electrical conductivity (25.4-101.6cm)	Not specified
Sodium adsorption ratio (25.4-101.6cm)	0–3
Soil reaction (1:1 water) (25.4-101.6cm)	Not specified
Subsurface fragment volume ≤3" (0-152.4cm)	Not specified

Subsurface fragment volume >3" (0-152.4cm)	Not specified
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## Ecological dynamics

### Climate

Located in the alpine and subalpine life zones, this High-elevation Scrub Gravelly Flood Plains ecological site is exposed to a variety of harsh environmental conditions. Compared to the boreal life zone, snowpack tends to be deeper and persist for longer durations of time. As a result, alpine and subalpine vegetation has a comparatively shorter season to grow and reproduce. When this site is snow-free, cold soil temperatures and high winds also inhibit plant growth and performance with krummholz white spruce being common. This harsh climate maintains vegetation within this site and prevents the establishment and/or growth of dominant boreal species like white spruce and black spruce.

Separate alpine and subalpine flood plain ecological site concepts were not developed for this MLRA because the size, structure, and composition of vegetation appeared to remain constant across both life zones. Future targeted data collection may result in splitting this site between alpine and subalpine life zones.

### Flooding

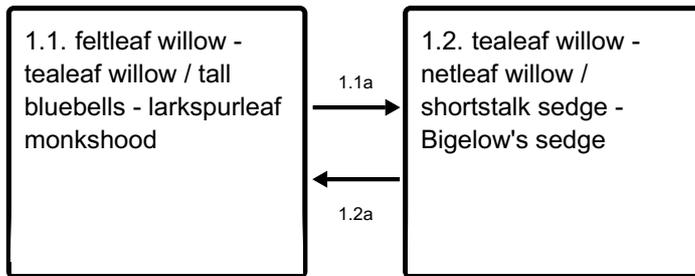
Data indicates that certain plant communities within the reference state flood more frequently and/or severely than other communities. As flooding frequency and duration decreases, willow height and cover increases. Given this observation, a more frequently and severely flooded plant community was incorporated into the reference state (community 1.2). These plant communities represent the successional transition from river wash to the reference plant community (community 1.1).

## State and transition model

### Ecosystem states

1. Reference State
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## State 1 submodel, plant communities



1.1a - More frequent and longer duration flooding

1.2a - Less frequent and shorter duration flooding

## State 1 Reference State

Two plant communities occur within the reference state and the vegetation differs in large part due to flooding. For this site, plant community 1.1 has the least frequent and shortest duration flood events. This community is characterized as open tall scrub (Viereck et al. 1992) with the dominant overstory vegetation being being feltleaf willow and tealeaf willow. The vegetation modeled for this site has limited data and is considered provisional.

### Dominant plant species

- feltleaf willow (*Salix alaxensis*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- tall bluebells (*Mertensia paniculata*), other herbaceous
- larkspurleaf monkshood (*Aconitum delphiniifolium*), other herbaceous

### Community 1.1

#### feltleaf willow - tealeaf willow / tall bluebells - larkspurleaf monkshood

The reference plant community is characterized as open tall scrub (Viereck et al. 1992) with dominant overstory vegetation being feltleaf willow and tealeaf willow. White spruce are occasionally present but with limited cover. Other common species include scrub birch (*Betula glandulosa*), shrubby cinquefoil, bluejoint, shortstalk sedge, tall bluebells, larkspurleaf monkshood, Tilesius' wormwood, fireweed, ledge stonecrop, arctic dock, Schreber's big red stem moss, and splendid feathermoss. The soil surface is primarily covered with herbaceous litter, surface rock fragments, and moss. This site typically has a distinct channel with flowing water (as much as 15 percent of the plot). The vegetative strata that characterize this community are tall shrubs (greater than 10 feet), medium shrubs (between 3 and 10 feet), and medium forbs (between 4 and 24 inches).

### Dominant plant species

- feltleaf willow (*Salix alaxensis*), shrub
- tealeaf willow (*Salix pulchra*), shrub

- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- resin birch (*Betula glandulosa*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- shortstalk sedge (*Carex podocarpa*), grass
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- tall bluebells (*Mertensia paniculata*), other herbaceous
- larkspurleaf monkshood (*Aconitum delphiniifolium*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- Tilesius' wormwood (*Artemisia tilesii*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- ledge stonecrop (*Rhodiola integrifolia*), other herbaceous
- arctic dock (*Rumex arcticus*), other herbaceous

## Community 1.2

### tealeaf willow - netleaf willow / shortstalk sedge - Bigelow's sedge

The reference plant community is characterized as open low scrub (Viereck et al. 1992). Common species include feltleaf willow, tealeaf willow, scrub birch (*Betula glandulosa*), shrubby cinquefoil, bog blueberry, netleaf willow, eightpetal mountain-avens, shortstalk sedge, Bigelow's sedge, Altai fescue, various bluegrass, and Schreber's big red stem moss. The vegetative strata that characterize this community are low shrub (between 8 and 36 inches), dwarf shrubs (less than 8 inches), and medium graminoids (between 4 and 24 inches). This site typically has a distinct channel with flowing water (as much as 30 percent of the plot). Areas of bare soil with surface rock fragments are extensive (up to 90 percent of the plot). When not bare, the soil surface is primarily covered with herbaceous litter and moss.

### Dominant plant species

- tealeaf willow (*Salix pulchra*), shrub
- feltleaf willow (*Salix alaxensis*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- netleaf willow (*Salix reticulata*), shrub
- resin birch (*Betula glandulosa*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- eightpetal mountain-avens (*Dryas octopetala* ssp. *octopetala*), shrub
- Alaskan mountain-avens (*Dryas octopetala* ssp. *alaskensis*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- shortstalk sedge (*Carex podocarpa*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- Altai fescue (*Festuca altaica*), grass
- bluegrass (*Poa*), grass
- water sedge (*Carex aquatilis*), grass
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous

- Alaska springbeauty (*Claytonia sarmentosa*), other herbaceous
- western arctic shootingstar (*Dodecatheon frigidum*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- boreal sagebrush (*Artemisia arctica*), other herbaceous
- Richardson's brookfoam (*Boykinia richardsonii*), other herbaceous
- dwarf fireweed (*Chamerion latifolium*), other herbaceous
- tall bluebells (*Mertensia paniculata*), other herbaceous
- alpine mountainsorrel (*Oxyria digyna*), other herbaceous
- meadow bistort (*Polygonum bistorta*), other herbaceous
- ledge stonecrop (*Rhodiola integrifolia*), other herbaceous

## **Pathway 1.1a**

### **Community 1.1 to 1.2**

More frequent and longer duration high-water and/or flooding events that scour the soils in the drainageway.

## **Pathway 1.2a**

### **Community 1.2 to 1.1**

Less frequent and shorter duration high-water and/or or flooding events that scour the soils in the drainageway.

## **Additional community tables**

### **Animal community**

not available

### **Hydrological functions**

not available

### **Recreational uses**

not available

### **Wood products**

not available

### **Other products**

not available

## Other information

not available

## Inventory data references

The vegetation modeled for this site has limited data and is considered provisional. The associated model was largely developed from NRCS staff with working knowledge of the area and literature review.

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## Contributors

Blaine Spellman

## 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)	
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Contact for lead author	
Date	03/16/2026
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:**

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

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

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

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

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

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

**and thickness):**

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

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):**
- 

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:**

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**17. Perennial plant reproductive capability:**

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