USDA Natural Resources
Conservation Service

Ecological site R231XY198AK
Boreal Scrubland Loamy Flood Plain

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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): 231X–Interior Alaska Highlands

The Interior Alaska Uplands (MLRA 231X) is in the Interior Region of Alaska and includes the extensive hills, mountains, and valleys between the Tanana River to the south and the Brooks Range to the north. These hills and mountains surround the Yukon Flats Lowlands (MLRA 232X). MLRA 231X makes up about 69,175 square miles. The hills and mountains of the area tend to be moderately steep to steep resulting in high-relief slopes. The mountains are generally rounded at lower elevations and sharp-ridged at higher elevations. Elevation ranges from about 400 feet in the west, along the boundary with the Interior Alaska Lowlands (MLRA 229X), to 6,583 feet at the summit of Mt. Harper, in the southeast. Major tributaries include large sections of the Yukon, Koyukuk, Kanuti, Charley, Coleen, and Chatanika Rivers. This area is traversed by several major roads, including the Taylor Highway in the east and the Steese, Elliott, and Dalton Highways north of Fairbanks. The area is mostly undeveloped wild land that is sparsely populated. The largest community along the road system is Fairbanks with smaller communities like Alatna, Allakaket, Chicken, Eagle, Eagle Village, Hughes, and Rampart occurring along the previously mentioned rivers and highways.

The vast majority of this MLRA was unglaciated during the Pleistocene epoch with the exceptions being the highest mountains and where glaciers extended into the area from the Brooks Range. For the most part, glacial moraines and drift are limited to the upper elevations of the highest mountains. Most of the landscape is mantled with bedrock colluvium originating from the underlying bedrock. Valley bottoms are filled with Holocene fluvial deposits and colluvium from the adjacent mountain slopes. Silty loess, which originated from unvegetated flood plains in and adjacent to this area, covers much of the surface. On hill and mountain slopes proximal to major river valleys (e.g., Tanana and Yukon Rivers), the loess is many feet thick. As elevation and distance from major river valleys increases, loess thickness decreases significantly. Bedrock is commonly exposed on the highest ridges.

This area is in the zone of discontinuous permafrost. Permafrost commonly is close to the surface in areas of the finer textured sediments throughout the MLRA. Isolated masses of ground ice occur in thick deposits of loess on terraces and the lower side slopes of hills. Solifluction lobes, frost boils, and circles and stripes are periglacial features common on mountain slopes in this area. Pingos, thermokarst pits and mounds, ice-wedge polygons, and earth hummocks are periglacial features common on terraces, lower slopes of hills and mountains, and in upland valleys in the area.

The dominant soil orders in this area are Gelisols, Inceptisols, Spodosols, and Entisols. The soils in the area have a subgelic or cryic soil temperature regime, an aquic or udic soil moisture regime, and mixed mineralogy. Gelisols are common on north facing slopes, south facing footslopes, valley bottoms, and stream terraces. Gelisols are typically shallow or moderately deep to permafrost (10 to 40 inches) and are poorly or very poorly drained. Wildfires can disturb the insulating organic material at the surface, lowering the permafrost layer, eliminating perched water tables from Gelisols, and thus changing the soil classification. Inceptisols and Spodosols commonly form on south facing hill and mountain slopes. Entisols are common on flood plains and high elevation mountain slopes. Miscellaneous (non-soil) areas make up about 2 percent of this MLRA. The most common miscellaneous areas are rock outcrop and rubble land. In many valleys placer mine tailings are common.

Short, warm summers and long, cold winters characterize the subarctic continental climate of the area. The mean annual temperature of the area ranges from 22 to 27 degrees F. The mean annual temperature of the southern half of the area is approximately 3 degrees warmer compared to the northern half (PRISM 2018). The warmest months span June through August with mean monthly temperatures ranging from 50 to 56 degrees F. The coldest months span November through February with mean monthly temperatures ranging from -5 to 3 degrees F. When compared to the high-elevation alpine and subalpine life zones, the lower elevation boreal life zone tends to be 2-3 degrees F colder during the coldest months and 1-2 degrees F warmer during the warmest months (PRISM 2018). The freeze-free period at the lower elevations averages about 60 to 100 days, and the temperature usually remains above freezing from June through mid-September.

Precipitation is limited across this area, with the average annual precipitation ranging from 12 to 19 inches. The southern half of the areas receives approximately 2.5 inches more annual precipitation then the northern half (PRISM 2018). The lower elevation boreal life zone receives approximately 2.5 inches less annual precipitation than the high-elevation alpine and subalpine life zones (PRISM 2018). Approximately 3/5th of the annual precipitation occurs during the months of June through September with thunderstorms being common. The average annual snowfall ranges from about 45 to 100 inches. The ground is consistently covered with snow from November through March.

Most of this area is forested below an elevation of about 2500 feet. Dominant tree species on slopes are white spruce and black spruce. Black spruce stands are most common on north-facing slopes, stream terraces, and other sites with poor drainage and permafrost. White spruce stands are most common on warm slopes with dry soils. At lower elevations, lightning-caused wildfires are common, often burning many thousands of acres during a single fire. 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

This area supports three life zones 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 typically a narrow transitional band between the boreal and the alpine life zones, and is characterized by sparse, stunted trees. In the subalpine, certain types of birch and willow shrub species grow at ≥ 1 m 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 2500 feet elevation on average. The transition between boreal and alpine vegetation can occur within a range of elevations, and is highly dependent on slope, aspect, and shading from adjacent mountains.

Within each life zone, there are plant assemblages that are typically associated with cold slopes and warms 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 typically occur on southeast to west facing slopes that are moderate to very steep (>10% slope) and are not shaded by the surrounding landscape. Cold slopes typically 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 typically 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 – 7416150 – Western North American Boreal Lowland Large River Floodplain Forest and Shrubland (Landfire 2009)

Ecological site concept

This site occurs on the low flood plains of large rivers (e.g. Yukon River) that flood frequently and have loamy soils. In this area, the flood plain of large rivers have been divided into low, middle, and high flood plain positions. When compared to middle and high flood plains, low flood plain positions have comparably more frequent and longer duration flood events. On the low flood plain, flooding occurs frequently (greater than 50 times in 100 years) for brief to long durations of time (7 to 30 days). These differences in the flood regime result in the low flood plain supporting shrub dominant communities, the middle flood plain supporting balsam poplar forests, and the high flood plain supporting white spruce forests. For this site, soils are well drained and lack permafrost. The typical soil profile has a thick layer of loamy alluvium.

Field work indicates that certain sampled communities within the reference state flood more frequently and/or severely then other communities. As flooding frequency and duration increases, willow and alder shrub cover and shrub height decrease significantly. Given this observation, more frequently and severely flooded plant communities are incorporated into the reference state.

For this site, the reference plant community 1.1 has the least frequent and shortest duration flood events. This community is characterized as closed tall scrub (Viereck et al. 1992) with the dominant tall scrub being feltleaf willow and thinleaf alder. Other commonly observed species include redosier dogwood, sandbar willow, false mountain willow, grayleaf willow, prickly rose, field horsetail, Tilesius' wormwood, arctic aster, northern bedstraw, silverweed cinquefoil, alpine sweetvetch, and tall bluebells.

Associated sites

R231XY138AK	**Boreal Sedge Loamy Flood Plain Depressions** Occurs on depressional features of the same large river flood plain with sedge dominant communities.
F231XY169AK	**Boreal Woodland Peat Frozen Flats** Occurs on adjacent stream terraces that no longer flood. Soils have permafrost and support black spruce woodlands.
F231XY171AK	**Boreal Woodland Loamy Frozen Terraces** Occurs on adjacent stream terraces that no longer flood. Soils have permafrost and support black spruce woodlands.
F231XY189AK	**Boreal Forest Loamy Flood Plain** Occurs on the middle flood plain of the same large rivers that support balsam poplar forests.
F231XY196AK	**Boreal Forest Loamy Frozen Flood Plain** Occurs on the high flood plain of the same large rivers that support white spruce forests.

Similar sites

XA232X01Y200	**Boreal Scrub Loamy Flood Plain Low** Occurs on the low floodplain of large rivers in the Yukon Flats Lowlands area. Tall willow and alder scrubland are the dominant reference vegetation.
R231XY130AK	**Boreal Scrubland Gravelly Floodplain** Occurs on the low flood plains of small montane streams in the area. These are very similar sites that have different flood regimes and soils.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Salix alaxensis* (2) *Alnus incana ssp. tenuifolia*

Herbaceous	(1) *Equisetum arvense*

Physiographic features

This boreal site occurs on low flood plain of large rivers in the area. These flood plains typically have negligible slope and occur on all aspects. The boreal site occurs below 900 feet elevation. This site does not pond. The site floods frequently for brief to very long durations of time. During high-water and flooding, the water table is commonly at the soil surface.

Table 2. Representative physiographic features

Landforms	(1) Alluvial plain > Flood plain
Runoff class	Negligible
Flooding duration	Brief (2 to 7 days) to long (7 to 30 days)
Flooding frequency	Frequent
Ponding frequency	None
Elevation	198–274 m
Slope	0–3%
Water table depth	0 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to low
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–10%
Water table depth	Not specified

Climatic features

Short, warm summers and long, cold winters characterize the subarctic continental climate associated with this boreal site. The mean annual temperature of the site ranges from 22 to 27 degrees F. The warmest months span June through August with mean normal maximum monthly temperatures ranging from 60 to 66 degrees F. The coldest months span November through February with mean normal minimum temperatures ranging from -3 to -12 degrees F. The freeze-free period for the site ranges from 80 to 120 days, and the temperature usually remains above freezing from late May through mid-September.

The area receives minimal annual precipitation with the summer months being the wettest. Average annual precipitation across the area typically ranges between 12 to 18 inches. Approximately 3/5th of the annual precipitation occurs during the months of June through September with thunderstorms common. The average annual snowfall ranges from about 45 to 100 inches. The ground is consistently covered with snow from November through March.

Table 4. Representative climatic features

Frost-free period (characteristic range)	16-78 days
Freeze-free period (characteristic range)	76-114 days
Precipitation total (characteristic range)	305-457 mm

Frost-free period (actual range)	4-87 days
Freeze-free period (actual range)	48-120 days
Precipitation total (actual range)	229-508 mm
Frost-free period (average)	53 days
Freeze-free period (average)	90 days
Precipitation total (average)	381 mm

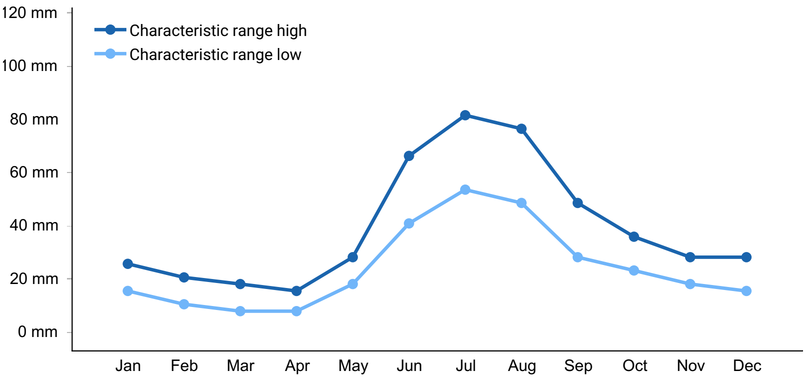


Figure 1. Monthly precipitation range

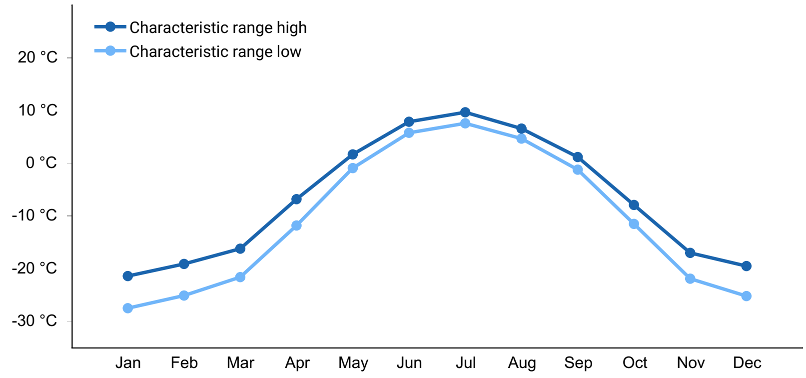


Figure 2. Monthly minimum temperature range

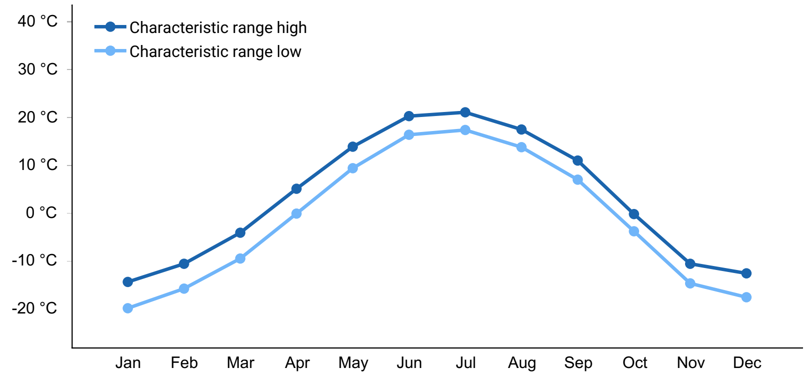


Figure 3. Monthly maximum temperature range

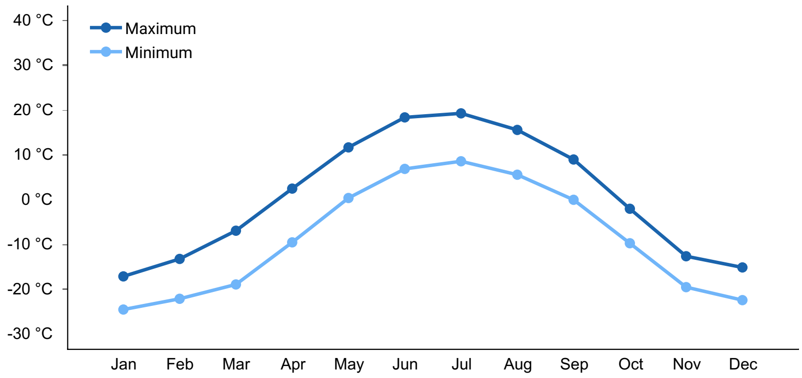


Figure 4. Monthly average minimum and maximum temperature

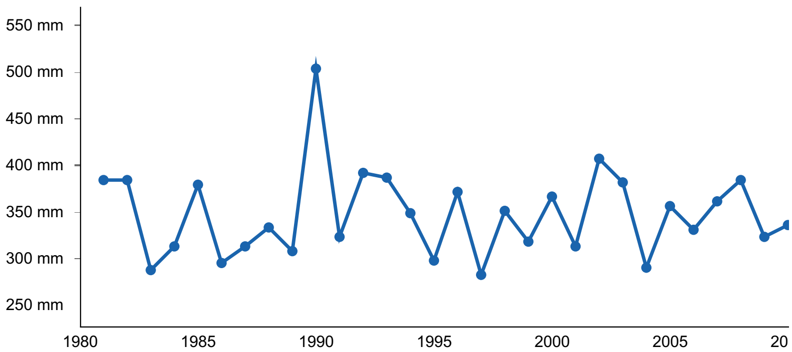


Figure 5. Annual precipitation pattern

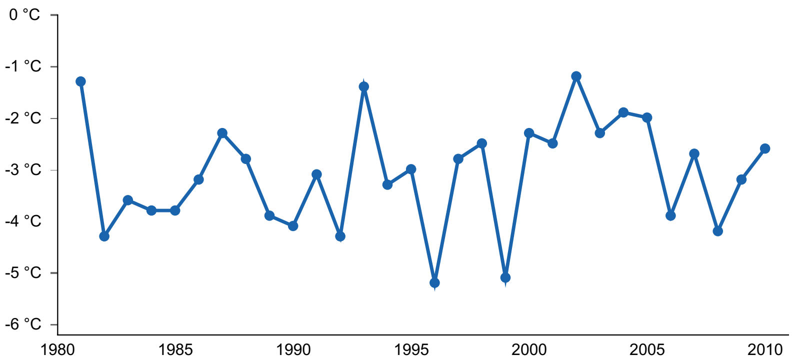


Figure 6. Annual average temperature pattern

Climate stations used

- (1) COLLEGE 5 NW [USC00502112], Fairbanks, AK
- (2) COLLEGE OBSY [USC00502107], Fairbanks, AK
- (3) KEYSTONE RIDGE [USC00504621], Fairbanks, AK
- (4) EAGLE AP [USW00026422], Tok, AK
- (5) CHICKEN [USC00501684], Tok, AK
- (6) MILE 42 STEESE [USC00505880], Fairbanks, AK
- (7) BETTLES AP [USW00026533], Bettles Field, AK
- (8) CIRCLE HOT SPRINGS [USC00501987], Central, AK
- (9) FT KNOX MINE [USC00503160], Fairbanks, AK
- (10) GILMORE CREEK [USC00503275], Fairbanks, AK
- (11) FOX 2SE [USC00503181], Fairbanks, AK
- (12) ESTER DOME [USC00502868], Fairbanks, AK
- (13) ESTER 5NE [USC00502871], Fairbanks, AK

Influencing water features

This site is classified as a RIVERINE wetland under the Hydrogeomorphic (HGM) classification system (Smith et al.

1995; USDA-NRCS 2008). Channel overbank flow and subsurface hydraulic connections are the main sources of water for this ecological site (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

n/a

Soil features

Soils formed in loamy alluvium and are very deep. Surface rock fragments are often not present but the most severely flooded areas can have 50 percent or more cover. Due to frequent flooding, the mineral soil surface lacks an organic cap. These mineral soils are stratified loamy sands and sandy loams formed from alluvium. Rock fragments range between 5 and 20 percent of the soil profile by volume. The pH of the soil profile ranges from neutral to moderately alkaline. After high-water and flooding, the soils drain. The soils are dry for long portions of the growing season and are considered well drained.

Figure 7. A typical soil profile associated with this site.

Table 5. Representative soil features

Parent material	(1) Alluvium
Surface texture	(1) Loamy sand (2) Sandy loam
Family particle size	(1) Coarse-loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	9.91–33.02 cm
Calcium carbonate equivalent (25.4-101.6cm)	0–7%
Clay content (0-50.8cm)	2–5%
Electrical conductivity (25.4-101.6cm)	0–10 mmhos/cm

Sodium adsorption ratio (25.4-101.6cm)	0
Soil reaction (1:1 water) (25.4-101.6cm)	6.9–8.3
Subsurface fragment volume <=3" (0-152.4cm)	5–20%
Subsurface fragment volume >3" (0-152.4cm)	0–3%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Soil depth	Not specified
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–25%
Available water capacity (0-101.6cm)	Not specified
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)	Not specified
Soil reaction (1:1 water) (25.4-101.6cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	3–21%
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

Flooding

All large river flood plain in this area have low, middle, and/or high flood plain sites. These flood plain sites represent major breaks in the flood regime and dominant vegetative type on associated tributaries. The low flood plain ecological site is thought to flood frequently (>50 times in 100 years) for long durations of time (7 to 30 days) and supports a willow and alder dominant reference plant community phase. The middle flood plain ecological site is thought to flood occasionally (5 to 50 times in 100 years) for long durations of time and supports a balsam poplar dominant reference plant community phase. The high flood plain ecological site is thought to flood occasionally to rarely for brief durations of time (2 to 7 days) and supports a white spruce dominant reference plant community phase.

The shift of vegetative type from willow to white spruce dominance represents riparian primary succession along major tributaries in the area. On other Interior Alaska flood plains, this successional process is thought to take between 200 and 300 years (Chapin et al. 2006). The flood regime, growth traits of vegetation, biotic competition, and a slew of other factors contribute to the dynamic nature of boreal flood plain succession. For more detailed information on boreal flood plain succession and successional drivers, refer to Walker et al. (1986) and Chapin et al. (2006).

Field work indicates that certain sampled communities within the reference state flood more frequently and/or severely then other communities. As flooding frequency and duration decreases, willow and alder height and cover increases. Given this observation, more frequently and severely flooded plant communities were incorporated into the reference state (community 1.2, 1.3, and 1.4). These plant communities represent the successional transition from river wash to the reference plant community (community 1.1).

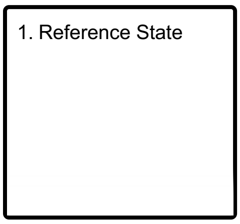
Community 1.3 and 1.4 are both considered pioneering stages of flood plain succession. Community 1.3 is associated with wetter soil conditions and community 1.4 with drier soil conditions. Regardless of these differences, both communities are believed to eventually transition to community 1.2 and 1.1.

Ice jam flooding and ice bulldozing are associated disturbances. Breakup is the seasonal transition between a river being frozen and flowing. Ice jam flooding occurs during breakup when large ice chunks can block the flow of surging water in a river channel and cause overland flooding. Ice bulldozing occurs during this time where large ice chunks and debris are pushed into the flood plain and can completely shear off the above ground vegetation. During field work, ice bulldozing was documented to have sheared off the tall willow and alder scrub canopy, but these species quickly regenerate from below ground root reserves within one or two years. Based on this observation, a unique plant community was not incorporated into the state-and-transition model for this site.

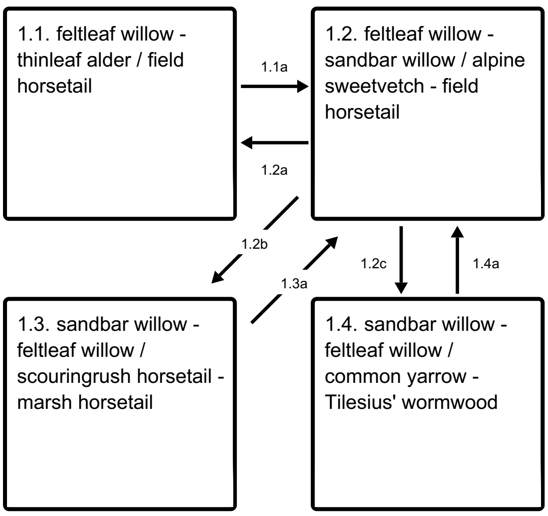
These large-order streams have terrace sites (see F231XY169AK and F231XY171AK). When compared to flood plains, stream terraces occur on higher landform positions that are often further away from the active stream channel. These stream terraces no longer flood. Stream terraces have thick peat layers, contact permafrost at shallow to moderate depths, commonly pond, and have wetter soils. Stream terraces support stands of black spruce (*Picea mariana*).

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1a - More frequent and longer duration flooding

1.2a - Less frequent and shorter duration flooding

1.2b - More frequent and longer duration flooding

1.2c - More frequent and longer duration flooding

1.3a - Less frequent and shorter duration flooding

1.4a - Less frequent and shorter duration flooding

State 1
Reference State

Figure 8. A tall closed willow community of the Yukon River flood plain.

The reference state has four associated community phases. Plant communities in the reference state are largely controlled by the influences of flooding. As flooding becomes less frequent and lasts for shorter durations of time, balsam poplar and white spruce gain dominance and the ecological site shifts to the middle or high flood plain.

Dominant plant species

- feltleaf willow (*Salix alaxensis*), shrub
- thinleaf alder (*Alnus incana ssp. tenuifolia*), shrub
- sandbar willow (*Salix interior*), shrub
- field horsetail (*Equisetum arvense*), other herbaceous
- alpine sweetvetch (*Hedysarum alpinum*), other herbaceous
- common yarrow (*Achillea millefolium*), other herbaceous
- Tilesius' wormwood (*Artemisia tilesii*), other herbaceous
- dwarf scouringrush (*Equisetum scirpoides*), other herbaceous

Community 1.1
feltleaf willow - thinleaf alder / field horsetail

Figure 9. A typical plant community associated with community 1.1.

The reference plant community is characterized as closed tall scrub (Viereck et al. 1992), which is primarily composed of feltleaf willow and thinleaf alder. Balsam poplar seedling and saplings are common but are not a dominant overstory species. Other commonly observed species include redosier dogwood, sandbar willow, false mountain willow, grayleaf willow, prickly rose, field horsetail, Tilesius' wormwood, arctic aster, northern bedstraw, silverweed cinquefoil, alpine sweetvetch, and tall bluebells. The vegetative strata that characterize this community phase are tall shrubs (greater than 10 feet), medium shrubs (between 3 and 10 feet), and medium forbs (between 4 and 24 inches). The soil surface is primarily covered with herbaceous litter and woody debris, but large patches of exposed bare soil can occur (as much as 50 percent of plot).

Forest understory. Cover from seedlings and saplings (tree regeneration) were not included in the overstory canopy cover values but are included in the cover percent values for individual tree species.

Dominant plant species

- feltleaf willow (*Salix alaxensis*), shrub
- thinleaf alder (*Alnus incana ssp. tenuifolia*), shrub
- redosier dogwood (*Cornus sericea*), shrub
- sandbar willow (*Salix interior*), shrub
- false mountain willow (*Salix pseudomonticola*), shrub
- grayleaf willow (*Salix glauca*), shrub
- prickly rose (*Rosa acicularis*), shrub
- field horsetail (*Equisetum arvense*), other herbaceous
- Tilesius' wormwood (*Artemisia tilesii*), other herbaceous
- arctic aster (*Eurybia sibirica*), other herbaceous
- northern bedstraw (*Galium boreale*), other herbaceous
- silverweed cinquefoil (*Argentina anserina*), other herbaceous
- alpine sweetvetch (*Hedysarum alpinum*), other herbaceous
- tall bluebells (*Mertensia paniculata*), other herbaceous

Community 1.2
feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

Figure 10. A typical plant community associated with community 1.2.

Figure 11. Ice bulldozing destroys above ground biomass but shrubs regenerate from below ground root reserves.

Community 1.2 is characterized as open tall scrub (Viereck et al. 1992) primarily composed of willow. Commonly observed species include feltleaf willow, sandbar willow, thinleaf alder, bluejoint, alpine sweetvetch, field horsetail, marsh horsetail, arctic aster, and silverweed cinquefoil. The vegetative strata that characterize this community are medium shrubs (between 3 and 10 feet), tall forbs (greater than 24 inches), and medium forbs (between 4 and 24 inches). The soil surface is primarily covered with herbaceous litter and woody debris, but large patches of exposed bare soil can occur (as much as 95 percent of plot).

Dominant plant species

- feltleaf willow (*Salix alaxensis*), shrub
- sandbar willow (*Salix interior*), shrub
- thinleaf alder (*Alnus incana ssp. tenuifolia*), shrub
- Pacific willow (*Salix lucida ssp. lasiandra*), shrub
- false mountain willow (*Salix pseudomonticola*), shrub
- firmleaf willow (*Salix pseudomyrsinites*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- fescue (*Festuca*), grass
- sedge (*Carex*), grass
- alpine sweetvetch (*Hedysarum alpinum*), other herbaceous
- field horsetail (*Equisetum arvense*), other herbaceous
- meadow horsetail (*Equisetum pratense*), other herbaceous
- Bodin's milkvetch (*Astragalus bodinii*), other herbaceous
- silverweed cinquefoil (*Argentina anserina*), other herbaceous
- Yukon Indian paintbrush (*Castilleja yukonis*), other herbaceous
- arctic aster (*Eurybia sibirica*), other herbaceous
- Tilesius' wormwood (*Artemisia tilesii*), other herbaceous
- marsh grass of Parnassus (*Parnassia palustris*), other herbaceous
- Siberian yarrow (*Achillea sibirica*), other herbaceous

Community 1.3
sandbar willow - feltleaf willow / scouringrush horsetail - marsh horsetail

Figure 12. A typical plant community associated with community 1.3.

Community phase 1.3 is characterized as open low scrub (Viereck et al. 1992). Commonly observed species include feltleaf willow, sandbar willow, bluejoint, water sedge, scouringrush horsetail, marsh horsetail, and silverweed cinquefoil. The vegetative strata that characterize this community phase are low shrubs (between 8 and 36 inches), medium forbs (between 4 and 24 inches), and medium graminoids (between 4 and 24 inches). Large patches of exposed bare soil commonly occurs (as much as 100 percent of plot).

Community 1.4
sandbar willow - feltleaf willow / common yarrow - Tilesius' wormwood

Figure 13. A typical plant community associated with community 1.4.

Community phase 1.4 is sparsely vegetated and is often characterized as mesic forb herbaceous or open low scrub (Viereck et al. 1992). Balsam poplar seedling and saplings are common but are not a dominant overstory species. Other commonly observed species include sandbar willow, feltleaf willow, common yarrow, Tilesius' wormwood, arctic aster, and alpine sweetvetch. The vegetative strata that characterize this community are low shrubs (between 8 and 36 inches) and medium forbs (between 4 and 24 inches). Large patches of exposed bare soil and rock fragments commonly occurs (as much as 100 percent of plot).

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- sandbar willow (*Salix interior*), shrub
- feltleaf willow (*Salix alaxensis*), shrub
- tufted hairgrass (*Deschampsia cespitosa*), grass
- wildrye (*Elymus*), grass
- glaucous bluegrass (*Poa glauca*), grass
- common yarrow (*Achillea millefolium*), other herbaceous
- Tilesius' wormwood (*Artemisia tilesii*), other herbaceous
- scouringrush horsetail (*Equisetum hyemale*), other herbaceous
- wild chives (*Allium schoenoprasum var. sibiricum*), other herbaceous
- silverweed cinquefoil (*Argentina anserina*), other herbaceous
- arctic aster (*Eurybia sibirica*), other herbaceous
- alpine sweetvetch (*Hedysarum alpinum*), other herbaceous
- Rocky Mountain goldenrod (*Solidago multiradiata*), other herbaceous
- Lake Huron tansy (*Tanacetum bipinnatum ssp. huronense*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

feltleaf willow - thinleaf alder / field horsetail

feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

More frequent and longer duration flooding or ice bulldozing. The reference state for this ecological site floods frequently for long periods of time (> 50 times in 100 years). Areas that are thought to flood less frequently are represented by community 1.1 and areas that are thought to flood more frequently are represented by community 1.2, 1.3, and 1.4. When compared to community 1.1, the more frequently flooded plant community (community 1.2) has less willow and alder shrub cover.

Pathway 1.2a
Community 1.2 to 1.1


feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

feltleaf willow - thinleaf alder / field horsetail

Less frequent and shorter duration flooding. Areas that are thought to flood less frequently are represented by community 1.1 and areas that are thought to flood more frequently are represented by community 1.2. When compared to community 1.1, the more frequently flooded plant community has less willow and alder cover.

Pathway 1.2b
Community 1.2 to 1.3


feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

sandbar willow - feltleaf willow / scouringrush horsetail - marsh horsetail

More frequent and longer duration flooding. Areas that are thought to flood less frequently are represented by community 1.2 and areas that are thought to flood more frequently are represented by community 1.3. When compared to community 1.3, the more frequently flooded plant communities have less willow and alder cover.

Pathway 1.2c
Community 1.2 to 1.4


feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

sandbar willow - feltleaf willow / common yarrow - Tilesius' wormwood

More frequent and longer duration flooding. Areas that are thought to flood less frequently are represented by community 1.2 and areas that are thought to flood more frequently are represented by community 1.4. When compared to community 1.2, the more frequently flooded plant communities have less willow and alder cover.

Pathway 1.3a
Community 1.3 to 1.2


sandbar willow - feltleaf willow / scouringrush horsetail - marsh horsetail

feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

Less frequent and shorter duration flooding. Areas that are thought to flood less frequently are represented by community 1.2 and areas that are thought to flood more frequently are represented by community 1.3. When compared to community 1.2, the more frequently flooded plant community has less willow and alder cover.

Pathway 1.4a
Community 1.4 to 1.2

sandbar willow - feltleaf willow / common yarrow - Tilesius' wormwood

feltleaf willow - sandbar willow / alpine sweetvetch - field horsetail

Less frequent and shorter duration flooding. Areas that are thought to flood less frequently are represented by community 1.2 and areas that are thought to flood more frequently are represented by community 1.4. When compared to community 1.2, the more frequently flooded plant community has less willow and alder cover.

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)
Tree							
quaking aspen	POTR5	*Populus tremuloides*	Native	0.9–4.6	0–15	–	–

Table 8. Community 1.1 forest understory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)
Forb/Herb					
field horsetail	EQAR	*Equisetum arvense*	Native	0.1–0.6	0–60
marsh horsetail	EQPA	*Equisetum palustre*	Native	0.1–0.6	0–30
silverweed cinquefoil	ARAN7	*Argentina anserina*	Native	0.1–0.6	0–5
Tilesius' wormwood	ARTI	*Artemisia tilesii*	Native	0.1–0.6	0–5
arctic aster	EUSI13	*Eurybia sibirica*	Native	0.1–0.6	1–4
northern bedstraw	GABO2	*Galium boreale*	Native	0.1–0.6	0–4
tall bluebells	MEPA	*Mertensia paniculata*	Native	0.1–0.6	0–4
alpine sweetvetch	HEAL	*Hedysarum alpinum*	Native	0.1–0.6	0–3
marsh grass of Parnassus	PAPA8	*Parnassia palustris*	Native	0–0.1	0–2
Lake Huron tansy	TABIH	*Tanacetum bipinnatum ssp. huronense*	Native	0.1–0.6	0–2
Shrub/Subshrub					
feltleaf willow	SAAL	*Salix alaxensis*	Native	3–4.6	30–80
redosier dogwood	COSES	*Cornus sericea ssp. sericea*	Native	0.9–3	5–60
thinleaf alder	ALINT	*Alnus incana ssp. tenuifolia*	Native	3–4.6	18–45
grayleaf willow	SAGL	*Salix glauca*	Native	3–4.6	0–20
prickly rose	ROAC	*Rosa acicularis*	Native	0.9–1.8	0–20
Bebb willow	SABE2	*Salix bebbiana*	Native	3–4.6	0–15
sandbar willow	SAIN3	*Salix interior*	Native	3–4.6	5–15
false mountain willow	SAPS	*Salix pseudomonticola*	Native	3–4.6	0–15

Animal community

n/a

Hydrological functions

n/a

Recreational uses

n/a

Wood products

n/a

Other products

n/a

Other information

n/a

Inventory data references

Tier 2 sampling plots used to develop the reference state. Plot numbers as recorded in NASIS with associated community phase.

Community 1.1
08CS02302, 08CS02305, 08CS02401, 08TC01605

Community 1.2
08CS02301, 08CS03802, 08TC01604, 10NP02001

Community 1.3
09NP02002, 10NP00405, 10NP02002, 10NP03401

Community 1.4
10NP00401, 10NP02004

Ice bulldozing:
09NP02001, 10NP00402

References

Chapin, F.S., L.A. Viereck, P.C. Adams, K.V. Cleve, C.L. Fastie, R.A. Ott, D. Mann, and J.F. Johnstone. 2006. Successional processes in the Alaskan boreal forest. Page 100 in Alaska's changing boreal forest. Oxford University Press.

Schoeneberger, P.J. and D.A. Wysocki. 2012. Geomorphic Description System. Natural Resources Conservation Service, 4.2 edition. National Soil Survey Center, Lincoln, NE.

Smith, R.D., A.P. Ammann, C.C. Bartoldus, and M.M. Brinson. 1995. An approach for assessing wetland functions using hydrogeomorphic classification, reference wetlands, and functional indices.

United States Department of Agriculture, . 2022. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin.

Viereck, L.A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska vegetation classification. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station General Technical Report PNW-GTR-286..

Walker, L.R., J.C. Zasada, and F.S. Chapin III. 1986. The role of life history processes in primary succession on an Alaskan floodplain. Ecology 67:1243–1253.

Other references

LANDFIRE. 2009. Western North American Boreal Lowland Large River Floodplain Forest and Shrubland . In: LANDFIRE National Vegetation Dynamics Models. USDA Forest Service and US Department of Interior. Washington, DC.

PRISM Climate Group. 2018. Alaska – average monthly and annual precipitation and minimum, maximum, and mean temperature for the period 1981-2010. Oregon State University, Corvallis, Oregon. https://prism.oregonstate.edu/projects/alaska.php. (Accessed 4 September 2019).

United States Department of Agriculture-Natural Resources Conservation Service. 2016. U.S. General Soil Map (STATSGO2). Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov. Accessed (Accessed 3 March 2021).

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Approval

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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	02/08/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

3. **Number and height of erosional pedestals or terracettes:**

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

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

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

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

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

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

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

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):**

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant:

    Sub-dominant:

    Other:

    Additional:

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):**

14. **Average percent litter cover (%) and depth (in):**

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):**

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:**

17. **Perennial plant reproductive capability:**