Ecological site XA232X01Y209
Boreal Tussock Loamy Frozen Terraces

Last updated: 5/18/2020
Accessed: 04/19/2024

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): 232X–Yukon Flats Lowlands

The Yukon Flats Lowlands MLRA is an expansive basin characterized by numerous levels of flood plains and terraces that are separated by minimal breaks in elevation. This MLRA is in Interior Alaska and is adjacent to the middle reaches of the Yukon River. Numerous tributaries of the Yukon River are within the Yukon Flats Lowlands MLRA. The largest are Beaver Creek, Birch Creek, Black River, Chandalar River, Christian River, Dall River, Hadweenzic River, Hodzana River, Porcupine River, and Sheenjek River. The MLRA has two distinct LRU—lowlands and marginal uplands. The lowlands have minimal local relief and are approximately 9,000 square miles in size (Williams 1962). Landforms associated with the lowlands are flood plains and stream terraces. The marginal uplands consist of rolling and dissected plains that are a transitional area between the lowlands and adjacent mountain systems. The marginal uplands are approximately 4,700 square miles in size (Williams 1962).

This MLRA is bounded by the Yukon-Tanana Plateau to the south, Hodzana Highlands to the west, Porcupine Plateau to the east, and southern foothills of the Brooks Range to the north (Williams 1962). These surrounding hills and mountains partially isolate the Yukon Flats Lowlands MLRA from weather systems affecting other MLRAs of Interior Alaska. As a result, temperatures are generally warmer in summer and colder in winter than is characteristic in other areas at comparable latitude. There is a moisture and temperature gradient in which the lowlands region tends to be drier and colder and the surrounding marginal uplands region tends to be moister and warmer (PRISM Climate Group 2006).

The Yukon Flats Lowlands MLRA is mostly undeveloped lands that are sparsely populated and not accessible by a road system. A number of villages, including Beaver, Birch Creek, Chalkyitsik, Circle, Fort Yukon, Stevens Village, and Venetie, are adjacent to the Yukon River or one of its major tributaries. The largest village is Fort Yukon, which according to the 2010 U.S. Census has 583 residents that are dominantly Gwich'in Alaska Natives.

LRU notes

Alaska has no officially recognized LRU. However, there appear to be two distinct LRU in the Yukon Flats Lowlands MLRA. These LRU are thought to have differing climatic regimes, landforms, and soil types (STATSGO and Jorgensen and Meidinger 2015). The two LRU were previously discussed in the MLRA notes section above and are termed the lowlands LRU and the marginal uplands LRU.

This ecological site is associated with the lowlands LRU.

Classification relationships

Yukon Flats Lowlands MLRA.

Ecological site concept

This ecological site is associated with very poorly drained soils on the tread of terraces in the Yukon Flats Lowlands MLRA. Soils commonly have permafrost at moderate depth (20 to 40 inches) and lack gravelly horizons in the profile. Soils pond frequently for very long durations. The reference state supports two plant communities related to a fire regime.

The reference plant community is characterized as open low mixed shrub-sedge tussock bog (Viereck et al. 1992). Tussocks are common and abundant (formed by Bigelow's sedge [Carex bigelowii] and tussock cottongrass [Eriophorum vaginatum]). Other commonly observed species include shrub birch (Betula glandulosa), a mixture of willows (Salix spp.), leatherleaf (Chamaedaphne calyculata), bog blueberry (*Vaccinium uliginosum*), bog Labrador tea (*Ledum groenlandicum*), and shrubby cinquefoil (Dasiphora fruticosa).

Associated sites

XA232X01Y207	**Boreal Herbaceous Peat Flood Plain Depressions** This ecological site is associated with high pH floating mats in flood plain depressions in the Yukon Flats Lowlands MLRA. The reference state has soils that both pond and flood. The reference plant community is characterized as wet forb herbaceous (Viereck et al. 1992) and is composed of various obligate wetland species.
XA232X01Y222	**Boreal Graminoid Loamy Terrace Depressions** This ecological site is associated with closed depressions of stream terraces that support a reference state with multiple graminoid-dominant community phases. These depressions are considered closed because they are not associated with a flood regime and have limited, if any, groundwater flow or recharge. The presumed hydrological inputs for this ecological site are primarily thaw of the annual active soil layer and/or permafrost, snowmelt runoff, and precipitation. This hydrologic regime results in the development of sodic soil properties.
XA232X01Y223	**Boreal Scrub Loamy Frozen Terrace Depressions** This shrubby ecological site occurs in the transitional area between the forested tread of a stream terrace and the graminoid-dominant communities associated with closed, terrace depressions (ecological site R232XY222AK). This site typically occurs between the outer third and lip of these closed depressions. The reference plant community for ecological site is characterized as an open tall scrubland (Viereck et al. 1992) and those shrubs are primarily an assortment of willow (Salix spp.).
XA232X01Y229	**Boreal Scrub Loamy Terrace Swales** This ecological site is associated with swales on stream terraces in lowlands region of the Yukon Flats Lowlands MLRA. Associated soils are considered very poorly drained. The reference plant community is characterized as open tall scrub (Viereck et al. 1992) and the dominant shrubs are willow (Salix spp.) and shrub birch (Betula glandulosa).
XA232X01Y206	**Boreal Scrub Loamy Frozen Flood Plain Depressions** This ecological site is associated with depressions on flood plains in the Yukon Flats Lowlands MLRA. The reference state plant communities are associated with soils that both pond and flood. Ponding occurs frequently (greater than 50 times in 100 years) for long durations of time (between 7 and 30 days). Flooding occurs occasionally (5 to 50 times in 100 years) for brief durations of time (between 2 and 7 days). The reference plant community is characterized as mesic graminoid herbaceous (Viereck et al. 1992) and is primarily composed of bluejoint (Calamagrostis canadensis).
XA232X01Y280	**Boreal Scrub Loamy Flood Plain Wet** This ecological site occurs on the flood plain and adjacent terraces of minor, low-gradient tributaries in the lowlands region of the Yukon Flats Lowlands MLRA. The reference plant community is associated with soils that both pond and flood. The reference plant community phase is characterized as closed tall scrub (greater than 75 percent shrub cover; Viereck et al. 1992) primarily composed of a mixture of willow (Salix spp.).
XA232X01Y204	**Boreal Forest Loamy Flood Plain High** This ecological site occurs on the high flood plain of major tributaries in the Yukon Flats Lowlands MLRA. Flooding occurs occasionally (5 to 50 times in 100 years) for brief durations of time (between 2 and 7 days). The reference plant community is characterized as an open needleleaf forest (25 to 60 percent cover) primarily composed of mature white spruce (Picea glauca).

XA232X01Y201	**Boreal Woodland Peat Frozen Terraces** This ecological site occurs in organic rich bogs in the lowlands and marginal uplands regions of the Yukon Flats Lowlands MLRA. The cumulative thickness of organic material often exceeds 50 inches in the soil profile. Reference state soils are poorly drained and organic material is considered ultra to extremely acidic. The soils associated with the reference plant community generally has permafrost at moderate depth (20 to 40 inches). This ecological site has an alternative state related to thermokarst.
XA232X01Y218	**Boreal Woodland Loamy Frozen Terraces** This ecological site is associated with wet soils on the tread of stream terraces in Yukon Flats Lowlands MLRA. Soils generally have permafrost at moderate depth (20 to 40 inches) and pond occasionally for long durations of time. The reference plant community is characterized as a needleleaf woodland (10 to 25 percent cover; Viereck et al. 1992) composed of black spruce (Picea mariana) and white spruce (Picea glauca).
XA232X01Y219	**Boreal Forest Loamy Terraces Moist** This ecological site is associated with somewhat poorly to moderately well drained soils on the treads of stream terraces in the Yukon Flats Lowlands MLRA. Flooding frequency ranges from rare to none. The reference plant community is characterized as an open needleleaf forest (25 to 60 percent cover) primarily composed of mature white spruce (Picea glauca).
XA232X01Y221	**Boreal Forest Loamy Terraces** This ecological site is associated with moderately well to well drained soils on the tread of stream terraces in the Yukon Flats Lowlands MLRA. Flooding frequency ranges from rare to none. The reference plant community is characterized as an open needleleaf forest (25 to 60 percent cover) primarily composed of mature white spruce (Picea glauca).
XA232X01Y200	**Boreal Scrub Loamy Flood Plain Low** Ecological site R232XY200AK is associated with the low flood plain of major tributaries in the Yukon Flats Lowlands MLRA. Flooding occurs frequently (greater than 50 times in 100 years) for long durations of time (between 7 and 30 days). The reference plant community is characterized as closed tall scrub (greater than 75 percent shrub cover; Viereck et al. 1992) primarily composed of a mixture of willow (Salix spp.) and alder (Alder spp.).
XA232X01Y205	**Boreal Grass Loamy Flood Plain Depressions** This ecological site is associated with depressions on flood plains in the Yukon Flats Lowlands MLRA. The reference state plant communities are associated with soils that both pond and flood. Ponding occurs occasionally (5 to 50 times in 100 years) for brief durations of time (between 2 and 7 days). Flooding occurs occasionally for brief durations of time. The reference plant community is characterized as open tall scrub (Viereck et al. 1992) and is primarily composed of willow (Salix spp.).

Similar sites

XA232X02Y217	**Boreal Woodland Loamy Frozen Plain Wet** This ecological site occurs in the marginal uplands region of the Yukon Flats Lowlands MLRA where water accumulates on the slopes of these plains (e.g. lower third of slopes or in swales). Associated soils have very deep loess deposition and range from poorly to very poorly drained. The reference plant community is characterized as needleleaf woodland (10 to 25 percent cover; Viereck et al. 1992) primarily composed of black spruce (Picea mariana). Both ecological sites have abundant tussock cover.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Betula glandulosa* (2) *Chamaedaphne calyculata*
Herbaceous	(1) *Carex bigelowii* (2) *Eriophorum vaginatum*

Legacy ID

R232XY209AK

Physiographic features

This ecological site and its associated communities commonly occur on young and old terrace surfaces. The Yukon

Flats Lowlands MLRA is composed of broad and numerous terrace levels. Individual terrace levels commonly span several miles in all directions, but one level to the next can be separated by less than 25 feet in elevation. These terrace levels can be broadly segregated by age. Young terraces are generally proximal to active stream channels and have a recent or current association with a flood regime (rare flooding, 1 to 5 times in 100 years). While capped with organic material, soils on young terraces are primarily composed of alluvium (Gushdoiman, rarely flooded soils). Flight or satellite reconnaissance of young terraces results in observance of readily identifiable stream landforms, which in the Yukon Flats Lowlands MLRA commonly include meander scrolls, abandoned channels, and oxbow lakes. Old terraces are generally distal from active stream channels and are disconnected from a flood regime. Soils on old terraces are generally composed of eolian deposits and/or loess underlain by alluvium (Gushdoiman soils). The depositional surface material commonly is thick enough to mask stream landforms like abandoned linear channels. From the air, the depressions appear to be circular to amorphous in shape.

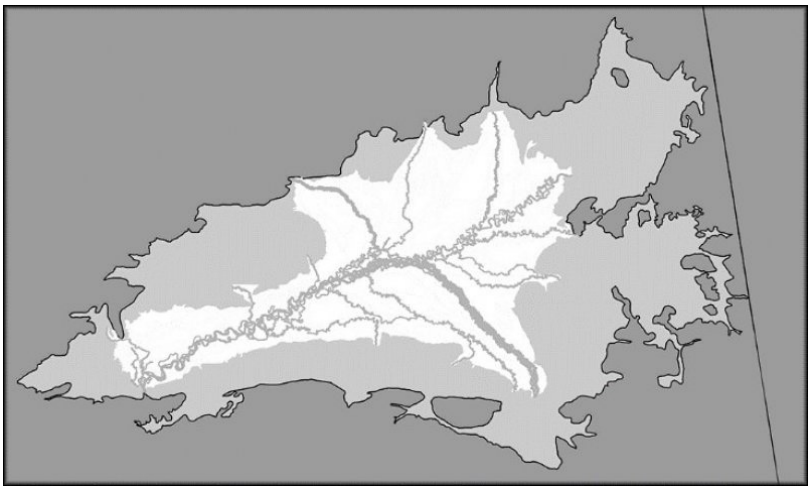


Figure 1. Lowlands region (white) and marginal uplands region (light gray) of the Yukon Flats Lowlands MLRA.

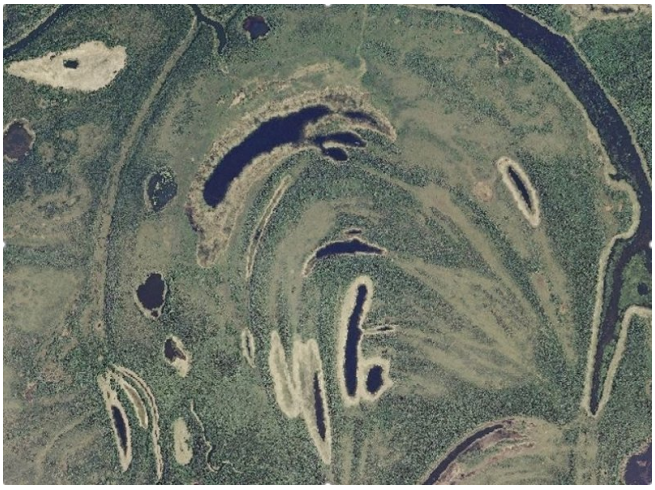


Figure 2. Aerial image of a meander scroll adjacent to the Yukon River, which is a landform associated with younger terrace surfaces.

Table 2. Representative physiographic features

Geomorphic position, terraces	(1) Tread
Landforms	(1) Alluvial plain > Stream terrace
Flooding duration	Brief (2 to 7 days)
Flooding frequency	None to rare
Ponding duration	Very long (more than 30 days)
Ponding frequency	Frequent
Elevation	300–725 ft
Slope	0–1%

Aspect	W, NW, N, NE, E, SE, S, SW

Climatic features

Short, warm summers and long, very cold winters characterize the subarctic continental climate of the area. The surrounding hills and mountains of this MLRA partially isolate it from weather systems affecting other interior lowlands. As a result, temperatures are generally warmer in summer and colder in winter than is characteristic in other areas of comparable latitude. The average annual temperature ranges from about 20 to 25 degrees F (-7 to -4 degrees C). The freeze-free period averages 70 to 120 days. The temperature usually remains above freezing from early June through late August. The average annual precipitation ranges from about 6 inches (150 millimeters) in the central basin to 15 inches (380 millimeters) along the boundary with the surrounding highlands. The maximum precipitation occurs in late summer, mainly as a result of thunderstorms. The average annual snowfall is about 45 to 55 inches (115 to 140 centimeters) (USDA, NRCS 2006).

All of the tabular data below was calculated from the PRISM dataset (1971-2000) and is specific to the Lowlands LRU in the Yukon Flats Lowlands MLRA.

Table 3. Representative climatic features

Frost-free period (characteristic range)	45-97 days
Freeze-free period (characteristic range)	70-120 days
Precipitation total (characteristic range)	8-13 in
Frost-free period (average)	75 days
Freeze-free period (average)	
Precipitation total (average)	10 in

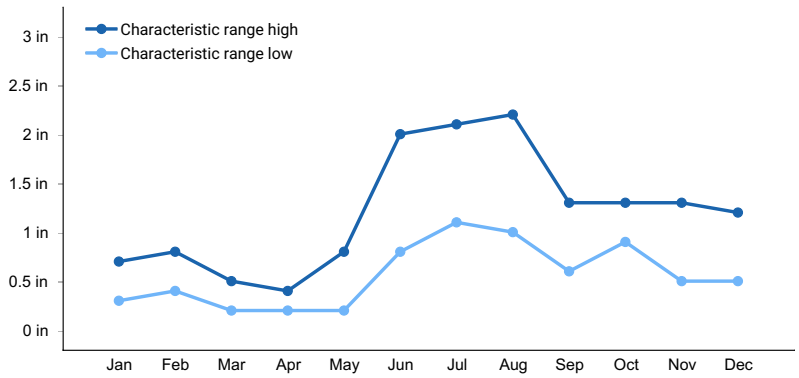


Figure 3. Monthly precipitation range

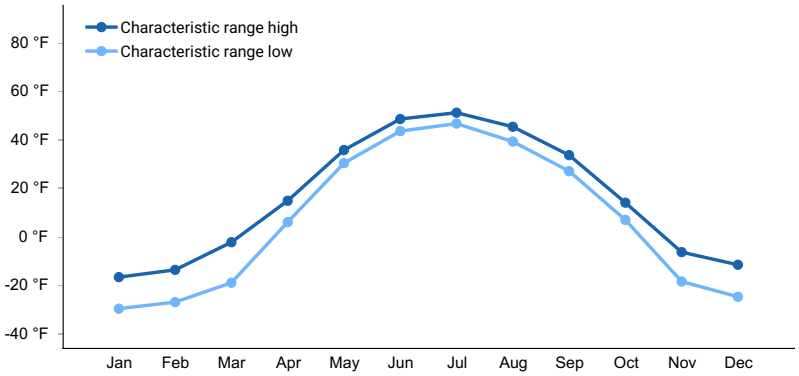


Figure 4. Monthly minimum temperature range

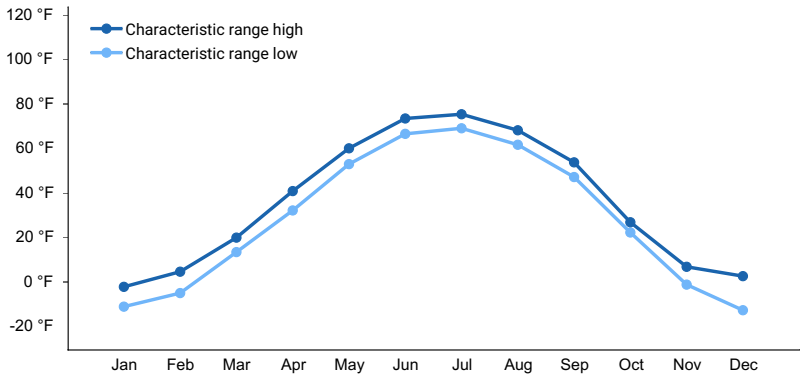


Figure 5. Monthly maximum temperature range

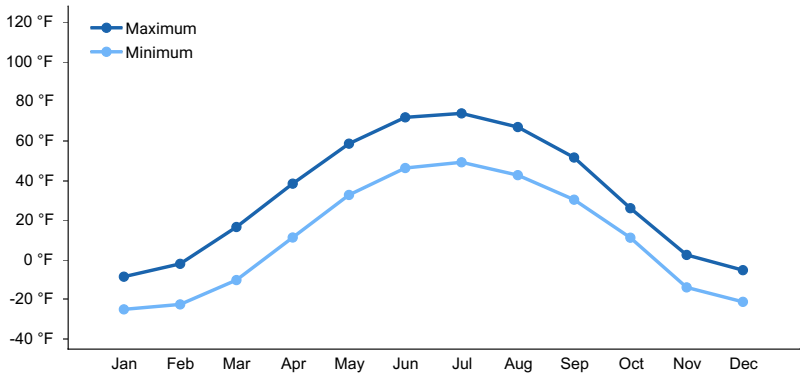


Figure 6. Monthly average minimum and maximum temperature

Influencing water features

Associated soils have a water table that remains at very shallow depth throughout the growing season (0 to 10 inches). During the growing season, ponding of water over the soil surface occurs frequently and for very long durations of time. The water table results in soils with very poorly drained conditions. Ponding duration and the typical depth to the water table was determined through field observations.

Due to the depth and persistence of this water table, wetland indicator plants are commonly observed in the reference state.

Soil features

Correlated soil components for the Yukon Flats Area, Alaska soil survey (AK685): Gushdoiman, rarely flooded; Gushdoiman.

Figure 7. Typical soil profile associated with Gushdoiman soil component.

Figure 8. Cryoturbation and permafrost are commonly observed in Gushdoiman soils.

Table 4. Representative soil features

Parent material	(1) Organic material (2) Alluvium
Family particle size	(1) Coarse-silty
Drainage class	Very poorly drained
Soil depth	80 in

Ecological dynamics

Fire

In the Yukon Flats Lowlands MLRA, fire is a common and natural event that has a significant control on the vegetation dynamics across the landscape. A typical fire event in areas associated with this ecological site will reset plant succession and alter dynamic soil properties (e.g., presence or depth of permafrost). For this ecological site to progress from the early fire stage to the reference plant community, data suggest that 20 years or more must elapse without another fire event.

When comparing the MLRAs of Interior Alaska, land in the Yukon Flats Lowlands MLRA burns most frequently (Begét et al. 2006). Within this MLRA, fire is considered a natural and common event that typically is unmanaged. Fire suppression generally occurs adjacent to villages or on allotments with known structures, both of which have a relatively limited acre footprint. From 2000 to 2015, 132 known fire events occurred on land in the Yukon Flats Lowlands MLRA and the burn perimeter of the fires totaled about 4.1 million acres (AICC 2016). Fire-related disturbances are highly patchy and can leave undisturbed areas within the burn perimeter. Ten of the fire events were attributed to human activities (affecting a total of 2,864 acres), but the majority were caused by lightning strikes (AICC 2016).

The fire regime within Interior Alaska follows two basic scenarios—low-severity burns and high-severity burns. It should be noted, however, that the fire regime in this area is generally thought to be much more complex (Johnstone et al. 2008). Burn severity refers to the proportion of the vegetative canopy and organic material consumed in a fire event (Chapin et al. 2006). Fires in cool and moist habitat tend to result in low-severity burns, while fires in warm and dry habitat tend to result in high-severity burns. From field observations and because the associated soils are cooler and very poorly drained, the typical fire scenario for this ecological site is considered to result in a low-severity burn.

While a low-severity fire can consume the bulk of above ground vegetation, minimal proportions of the organic mat are removed. Organic matter continues to insulate these cold soils and permafrost remains in the soil profile. While field observations support that each plant community is associated with permafrost, fire was thought to increase active layer depth causing the permafrost to occur deeper in the soil profile. When minimal proportions of the organic mat are consumed, many species regenerate asexually using below ground root tissues. Species known to regenerate after low-severity fire events include various graminoids (e.g. Carex spp. and Eriophorum spp.), forbs

(e.g. Equisetum sp.), and shrubs (e.g. *Ledum groenlandicum*, *Vaccinium uliginosum*, Salix sp.) (Johnstone et al. 2010).

Because the dominant vegetation (sedges, willows, and shrub birch) grows quickly and commonly regenerate after a fire event, minimal time is needed for postfire recovery back to the reference plant community (as compared to adjacent forested ecological sites). Full recovery of dynamic soil properties and vegetation are thought to take between 20 to 40 years, which is based on field data collected from a similar ecological site (XA232X01Y229). In comparison, it typically takes 100 to 150 years for a white spruce stand in Interior Alaska to mature (Chapin et al. 2006).

Flooding

This ecological site occurs on stream terraces that are associated with flooding. Historical flood markers in Fort Yukon and aerial observations conducted by U.S. Fish and Wildlife Service staff (personal communication) have shown that flooding occurs on terraces that support this ecological site. While flooding occurs, flood events are thought to occur rarely.
While conducting fieldwork, little if any evidence of flood-related disturbance was observed. Thus, no flood-related communities were developed for this ecological site. A flood event in areas associated with this ecological site likely has limited energy, depositing alluvium on the soil surface but causing minimal alterations to overall composition of the plant community.

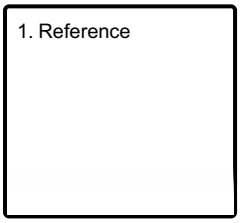
Other Observations

The majority of sample locations had no documented animal use (grazing or browsing). On occasion, willows were reported to be slightly browsed by moose (Alces alces). A browse rating of slight indicates the majority of willow in the sample plot was not browsed.

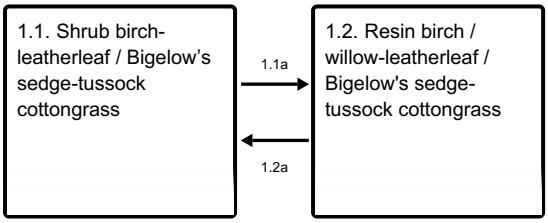
No alternative states for this ecological site were documented.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference

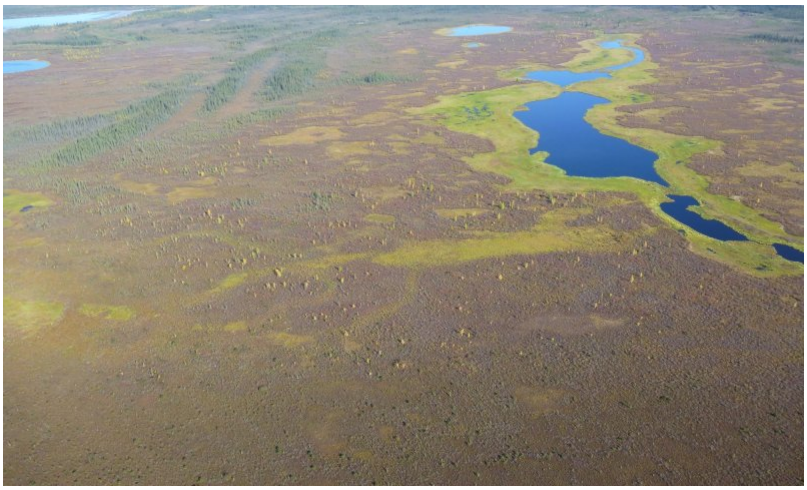


Figure 9. Aerial image of a terrace adjacent to Birch Creek. This ecological site is associated with wet frozen soils on stream terraces in the Yukon Flats Lowlands MLRA.

The reference state has two associated plant communities. Plant communities in the reference state appear to be largely controlled by the influences of ponding and fire. Fire may be an integral part of maintaining reference state vegetation. In the absence of fire, organic material accumulates and that increase facilitates tree, shrub, and moss invasion of tussocks (Viereck et al. 1992). The increase of non-graminoid cover is thought to lead to the senescence and death of tussocks (Viereck et al. 1992). Fire events remove non-graminoid cover, this disturbance provides nutrients for tussocks, and tussocks become more productive (Viereck et al. 1992). This report provides baseline vegetation inventory data for the ecological site. More data collection is needed to provide further information about existing plant communities and the disturbance regimes that would result in transitions from one community to another. The common and scientific plant names are from the USDA PLANTS database. All plant communities in this report are characterized using the Alaska Vegetation Classification (Viereck et al. 1992).

Community 1.1
Shrub birch-leatherleaf / Bigelow’s sedge-tussock cottongrass

Figure 10. Typical plant community associated with community 1.1.

Community Phase 1.1 Canopy Cover Table

Vegetation data is aggregated from all sample plots for this community phase. The data is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
T	white spruce	*Picea glauca*	PIGL	79	5 (0-20)
T	black spruce	*Picea mariana*	PIMA	64	3 (0-10)
S	willow	*Salix spp.*	SALIX	93	9 (0-30)
S	shrub birch	*Betula glandulosa*	BEGL	86	6 (0-20)
S	leatherleaf	*Chamaedaphne calyculata*	CHCA2	79	10 (0-30)
S	bog blueberry	*Vaccinium uliginosum*	VAUL	79	5 (0-15)
S	bog Labrador tea	*Ledum groenlandicum*	LEGR	79	4 (0-15)
S	shrubby cinquefoil	*Dasiphora fruticosa*	DAFR3	64	2 (0-10)
G	Bigelow's sedge	*Carex bigelowii*	CABI5	79	40 (0-75)
G	tussock cottongrass	*Eriophorum vaginatum*	ERVA4	79	10 (0-70)
F	horsetail	*Equisetum spp.*	EQUIS	57	1 (0-5)

This dataset includes data from 14 sample plots. The plots are distributed across the survey area and are independent of one another.

Values for tall, medium, regenerative, and stunted tree strata are used to calculate mean canopy cover and range values. Regenerative trees are not considered part of the overstory canopy.

Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens

Canopy cover data is rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover is rounded to the nearest integer. Data ranging from 10 to 100 percent cover is rounded to the nearest factor of 5.

Figure 11. Canopy cover table for community 1.1.

Reference plant community 1.1 is characterized as open low mixed shrub-sedge tussock bog. Tussocks are common and abundant (formed by Bigelow's sedge and tussock cottongrass). Stunted trees and seedlings of white spruce (*Picea glauca*) and black spruce (*Picea mariana*) are commonly observed but not abundant. Commonly observed species include shrub birch, willow (primarily S. arbusculoides, S. pulchra, and S. glauca), leatherleaf, bog blueberry, bog Labrador tea, and shrubby cinquefoil. The soil surface is primarily covered with herbaceous litter and areas between tussocks are often covered with water. In certain sample locations, moss is abundant (most commonly observed species were *Hylocomium splendens*, Sphagnum spp., and *Tomentypnum nitens*). The vegetative strata that characterize this community are low shrubs (between 8 and 36 inches in height) and medium graminoids (between 4 and 24 inches in height).

Forest overstory. Cover % values for tall, medium, regenerative, and stunted tree strata are used to calculate canopy cover range values. Regenerative trees are not considered part of the overstory canopy.

Dominant plant species

- white spruce (*Picea glauca*), tree
- black spruce (*Picea mariana*), tree
- littletree willow (*Salix arbusculoides*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- grayleaf willow (*Salix glauca*), shrub
- resin birch (*Betula glandulosa*), shrub
- leatherleaf (*Chamaedaphne calyculata*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- sphagnum (*Sphagnum*), other herbaceous
- tomentypnum moss (*Tomentypnum nitens*), other herbaceous

- horsetail (*Equisetum*), other herbaceous

Community 1.2
Resin birch / willow-leatherleaf / Bigelow's sedge-tussock cottongrass

Figure 12. Typical plant community associated with community 1.2.

Community Phase 1.2 Canopy Cover Table

Vegetation data is aggregated from all sample plots for this community phase. The data is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
T	resin birch	*Betula neoalaskana*	BENE4	62	3 (0-8)
S	willow	*Salix spp.*	SALIX	100	15 (0.1-45)
S	leatherleaf	*Chamaedaphne calyculata*	CHCA2	75	15 (0-40)
S	bog Labrador tea	*Ledum groenlandicum*	LEGR	75	6 (0-20)
S	Siberian alder	*Alnus viridis* ssp. *fruticosa*	ALVIF	50	2 (0-10)
S	shrub birch	*Betula glandulosa*	BEGL	50	3 (0-15)
S	bog blueberry	*Vaccinium uliginosum*	VAUL	50	3 (0-10)
G	Bigelow's sedge	*Carex bigelowii*	CABI5	88	40 (0-70)
G	bluejoint	*Calamagrostis canadensis*	CACA4	50	7 (0-40)
G	tussock cottongrass	*Eriophorum vaginatum*	ERVA4	25	5 (0-35)

This dataset includes data from 8 sample plots. The plots are distributed across the survey area and are independent of one another.

Values for tall, medium, regenerative, and stunted tree strata are used to calculate mean canopy cover and range values. Regenerative trees are not considered part of the overstory canopy.

Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens

Canopy cover data is rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover is rounded to the nearest integer. Data ranging from 10 to 100 percent cover is rounded to the nearest factor of 5.

Figure 13. Canopy cover table for community 1.2.

Community 1.2 is in the early stage of fire-induced secondary succession for this ecological site and is characterized as open low mixed shrub-sedge tussock bog (Viereck et al. 1992). Tussocks are common and abundant (formed by Bigelow's sedge and tussock cottongrass). After fire events, tussocks appear more productive. Seedling of resin birch (*Betula neoalaskana*) were commonly observed but not abundant. Commonly observed species include willow (primarily S. arbusculoides, S. pulchra, and S. glauca), leatherleaf, bog Labrador tea, Siberian alder (*Alnus viridis* ssp. fruticosa), shrub birch, bog blueberry, and bluejoint (*Calamagrostis canadensis*). The soil surface is primarily covered with herbaceous litter and areas between tussocks are often covered with water. In certain sample locations, moss is abundant (most commonly observed species were *Hylocomium splendens* and *Tomentypnum nitens*). The vegetative strata that characterize this community are medium shrubs

(between 3 and 10 feet in height), low shrubs (between 8 and 36 inches in height) and medium graminoids (between 4 and 24 inches in height).

Forest overstory. Cover % values for tall, medium, regenerative, and stunted tree strata are used to calculate canopy cover range values. Regenerative trees are not considered part of the overstory canopy.

Dominant plant species

- resin birch (*Betula neoalaskana*), tree
- littletree willow (*Salix arbusculoides*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- grayleaf willow (*Salix glauca*), shrub
- leatherleaf (*Chamaedaphne calyculata*), shrub
- Siberian alder (*Alnus viridis ssp. fruticosa*), shrub
- resin birch (*Betula glandulosa*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- tomentypnum moss (*Tomentypnum nitens*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

Shrub birch-leatherleaf / Bigelow's sedge-tussock cottongrass

Resin birch / willow-leatherleaf / Bigelow's sedge-tussock cottongrass

Fire.

Pathway 1.2a
Community 1.2 to 1.1

Resin birch / willow-leatherleaf / Bigelow's sedge-tussock cottongrass

Shrub birch-leatherleaf / Bigelow's sedge-tussock cottongrass

Time without fire.

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
white spruce	PIGL	*Picea glauca*	Native	–	0–20	–	–
black spruce	PIMA	*Picea mariana*	Native	–	0–20	–	–

Table 6. Community 1.2 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (Ft)	Canopy Cover (%)	Diameter (In)	Basal Area (Square Ft/Acre)
Tree							
resin birch	BENE4	*Betula neoalaskana*	Native	–	0–8	–	–

Inventory data references

NASIS User Site ID / Modal Datasets
11BB06101 plant community 1.1
11BB07001 plant community 1.1
11SN03102 plant community 1.1
12BB00203 plant community 1.1
12NR00102 plant community 1.1
12NR04503 plant community 1.1
12NR04601 plant community 1.1
12SS03002 plant community 1.1
14AK2903033 plant community 1.1
14DM00502 plant community 1.1
14NR01201 plant community 1.1
2015AK290497 plant community 1.1
2015AK290618 plant community 1.1
S2015AK290013 plant community 1.1
11BB07004 plant community 1.2
11SN03104 plant community 1.2
12BB00101 plant community 1.2
12SS03202 plant community 1.2
14AK2903027 plant community 1.2
14DM00302 plant community 1.2
2015AK290400 plant community 1.2
2015AK290656 plant community 1.2

Other references

Alaska Interagency Coordination Center (AICC). 2016. http://fire.ak.blm.gov/

Begét, J.E., D. Stone, and D.L. Verbyla. 2006. Regional overview of Interior Alaska. In Alaska's Changing Boreal Forest. F.S. Chapin III, M.W. Oswood, K. Van Cleve, L.A. Viereck, and D.L. Verbyla, editors. New York, Oxford University Press. Pages 12-20.

Bernhardt E.L., T.N. Hollingsworth, and F.S. Chapin III. 2011. Fire severity mediates climate-driven shifts in understory composition of black spruce stands of interior Alaska. Journal of Vegetation Science, 22: 32-44.

Chapin, F.S., III, L.A. Viereck, P.C. Adams, K. Van Cleve, C.L. Fastie, R.A. Ott, D. Mann, and J.F. Johnstone. 2006. Successional processes in the Alaskan boreal forest. In Alaska's Changing Boreal Forest. F.S. Chapin III, M.W. Oswood, K. Van Cleve, L.A. Viereck, and D.L. Verbyla, editors. New York, Oxford University Press. Pages 100-120.

Hinzman, L.D., L.A. Viereck, P.C. Adams, V.E. Romanovsky, and K. Yoshikawa. 2006. Climate and permafrost dynamics of the Alaskan boreal forest. In Alaska's Changing Boreal Forest. F.S. Chapin III, M.W. Oswood, K. Van Cleve, L.A. Viereck, and D.L. Verbyla, editors. New York, Oxford University Press. Pages 39-61.

Johnstone, J.F., T.N. Hollingsworth, and F.S. Chapin III. 2008. A key for predicting postfire successional trajectories in black spruce stands of Interior Alaska. U.S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station General Technical Report PNW-GTR-767.

Johnstone J.F., T.N. Hollingsworth, F.S. Chapin III, M.C. Macks. 2010. Changes in fire regime break the legacy lock on successional trajectories in Alaskan boreal forest. Global Change Biology, 16: 1281-1295.

PRISM Climate Group. 2006. Climate data of United States, 1971-2000. Oregon State University, Corvallis.

Schoeneberger, P.J., and D.A. Wysocki. 2012. Geomorphic description system. Version 4.2. U.S. Department of Agriculture, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, Nebraska.

Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and W.D. Broderson, editors. 2012. Field book for describing and sampling soils. Version 3.0. U.S. Department of Agriculture, Natural Resources Conservation Service.

Soil Survey Division Staff. 2017. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296.

Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wezlick. 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.

Williams, J.R. 1962. Geologic reconnaissance of the Yukon Flats District, Alaska. U.S. Department of the Interior, Geologic Survey Bulletin 1111-H.
Geologic Survey Bulletin 1111-H.

Contributors

Blaine T. Spellman

Approval

Michael Margo, 5/18/2020

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	05/11/2020
Approved by	Michael Margo
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:**