USDA Natural Resources Conservation Service

Ecological site XA232X01Y218
Boreal Woodland Loamy Frozen Terraces

Last updated: 5/18/2020
Accessed: 05/14/2024

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 regions—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 wet soils on the tread of terraces in the lowlands region of the Yukon Flats Lowlands MLRA. Soils generally have permafrost at moderate depth (20 to 40 inches) and lack gravelly horizons in the profile. Soils pond occasionally for long durations of time. The reference state supports multiple plant communities related to a fire regime.

Reference plant community 1.1 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). Commonly observed understory species include grayleaf willow (Salix glauca), red fruit bearberry (Arctostaphylos rubra), lingonberry (Vaccinium vitis-idaea), black crowberry (Empetrum nigrum), bog Labrador tea (*Ledum groenlandicum*), dwarf scouringrush (Equisetum scirpoides), and stairstep moss (Hylocomium splendens).

Associated sites

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).
XA232X01Y224	**Boreal Woodland Sandy Terrace Rises** This ecological site is associated with vegetated dunes on treads of stream terraces in the lowlands region of the Yukon Flats Lowlands MLRA. The reference plant community is characterized as a needleleaf woodland (10 to 25 percent cover; Viereck et al. 1992) composed primarily of mature white spruce (Picea glauca).
XA232X01Y250	**Boreal Woodland Gravelly Terraces Dry** This ecological site is associated with somewhat excessively drained soils on the tread of gravelly stream terraces in Yukon Flats Lowlands MLRA. Gravelly horizons occur at very shallow depth (0 to 10 inches). The reference plant community is characterized as a needleleaf woodland (10 to 25 percent cover; Viereck et al. 1992) composed primarily of mature white spruce (Picea glauca).
XA232X01Y200	**Boreal Scrub Loamy Flood Plain Low** This ecological site 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.).
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.

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).
XA232X01Y202	**Boreal Forest Loamy Flood Plain Middle** This ecological site occurs on the middle flood plain of major tributaries in the Yukon Flats Lowlands MLRA. Flooding occurs occasionally (5 to 50 times in 100 years) for long durations of time (between 7 and 30 days). The reference plant community is characterized as a closed deciduous forest (60-100 percent cover; Viereck et al. 1992) primarily composed of mature balsam poplar (Populus balsamifera).
XA232X01Y209	**Boreal Tussock Loamy Frozen Terraces** This ecological site occurs on stream terraces in the lowlands region of the Yukon Flats Lowlands MLRA. Soils commonly have permafrost at moderate depth (20 to 40 inches) and pond frequently for very long durations. The reference plant community is characterized as open low mixed shrub-sedge tussock bog (Viereck et al. 1992).
XA232X01Y212	**Boreal Sedge Peat Terrace Depressions** This ecological site is associated with drainageways on stream terraces in the lowlands region of the Yukon Flats Lowlands MLRA. Associated drainageways are very poorly drained, which means the water table remains above the soil surface for the entire growing season. The reference plant community phase is characterized as subarctic lowland sedge wet meadow (Viereck et al. 1992) and is composed primarily of water sedge (Carex aquatilis).
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).

Similar sites

XA232X01Y262	**Boreal Woodland Gravelly Terraces** XA232X01Y262 occurs on gravelly stream terraces and has gravelly horizons from very shallow to shallow depths (0 to 20 inches). The gravelly soils tend to hinder permafrost aggregation within the soil profile. Soils associated with XA232X01Y262 tend to have higher pH (neutral to moderately alkaline) and have more diverse assemblages of vascular and nonvascular species.
XA232X01Y201	**Boreal Woodland Peat Frozen Terraces** XA232X01Y201 is associated with acidic bogs. Associated soils are organic-rich where the cumulative thickness of organic material often exceeds 50 inches. While plant community assemblages are similar, Sphagnum moss and reindeer lichen are much more abundant in plant communities associated with XA232X01Y201.

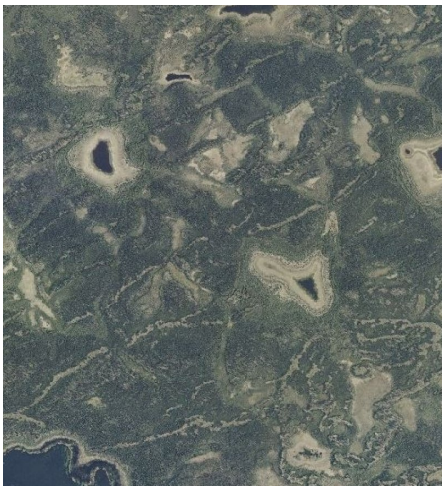


Figure 1. Aerial image of longitudinal dunes adjacent to the Upper Mouth of Birch Creek. The dunes are the linear features. Interdunes are associated with XA232X01Y218.

Table 1. Dominant plant species

Tree	(1) *Picea mariana* (2) *Picea glauca*
Shrub	(1) *Vaccinium vitis-idaea* (2) *Ledum groenlandicum*
Herbaceous	(1) *Hylocomium splendens*

Legacy ID

F232XY218AK

Physiographic features

This ecological site and its associated plant communities commonly occur on young and old terrace surfaces. The lowlands region in 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 (Twin 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 (see photo below). 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 (Chissovun and Tulebagh 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.

During the soil survey, each soil type originally had a correspondingly unique ecological site. After more fieldwork and data analysis, it was determined that these different soil types appear to support plant communities that respond similarly to fire and have similar kinds and amounts of vegetation in the reference state. As a result, the soil components were all correlated into one ecological site.

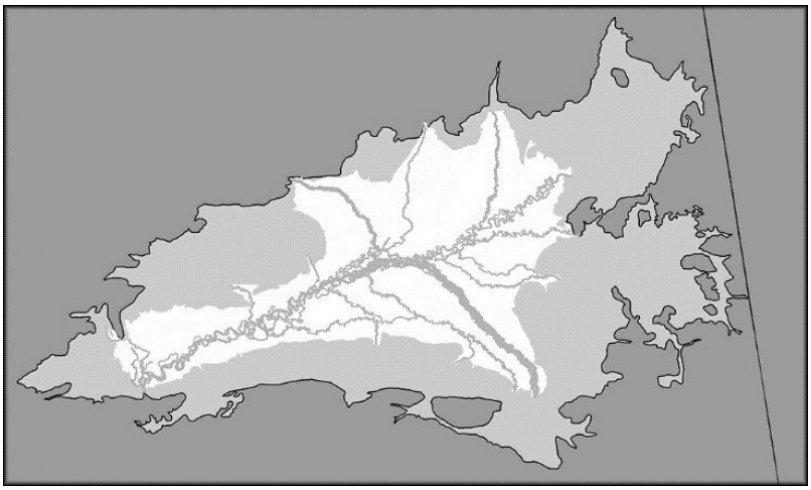


Figure 2. Lowlands region (white) and marginal uplands region (light gray) of the Yukon Flats Lowlands MLRA.

Figure 3. Aerial image of a meander scroll adjacent to the Yukon River, which is a landform associated with younger terrace surfaces. Poorly drained soils on this meander scroll support community phases associated with ecological site F232XY218AK.

Table 2. Representative physiographic features

Geomorphic position, terraces	(1) Tread
Landforms	(1) Alluvial plain > Stream terrace (2) Alluvial plain > Stream terrace > Interdune
Flooding frequency	None to rare
Ponding duration	Long (7 to 30 days)
Ponding frequency	None to occasional
Elevation	91–305 m
Slope	0–3%
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)	203-330 mm
Frost-free period (average)	75 days
Freeze-free period (average)	
Precipitation total (average)	254 mm

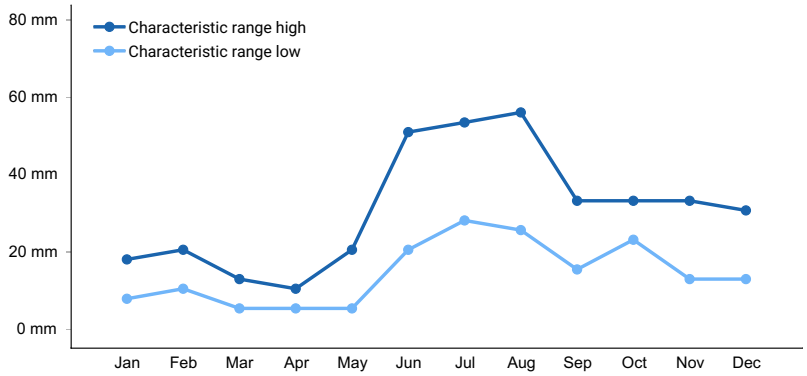


Figure 4. Monthly precipitation range

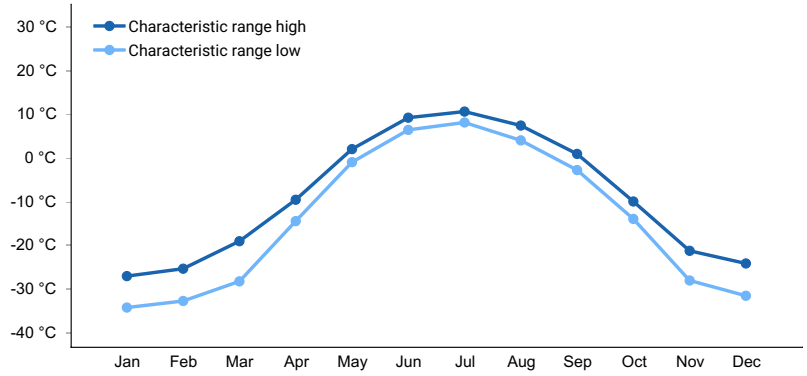


Figure 5. Monthly minimum temperature range

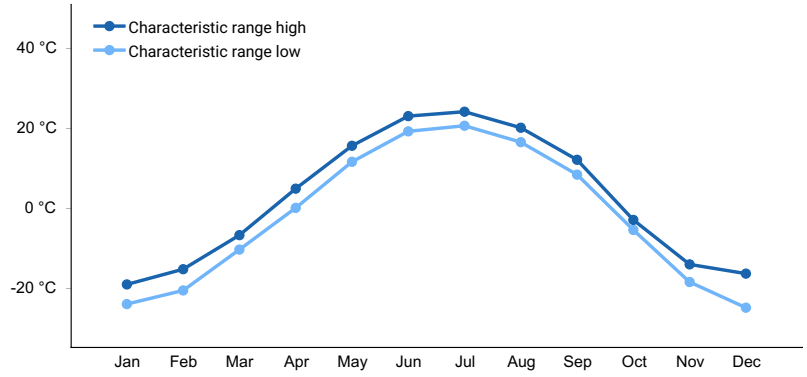


Figure 6. Monthly maximum temperature range

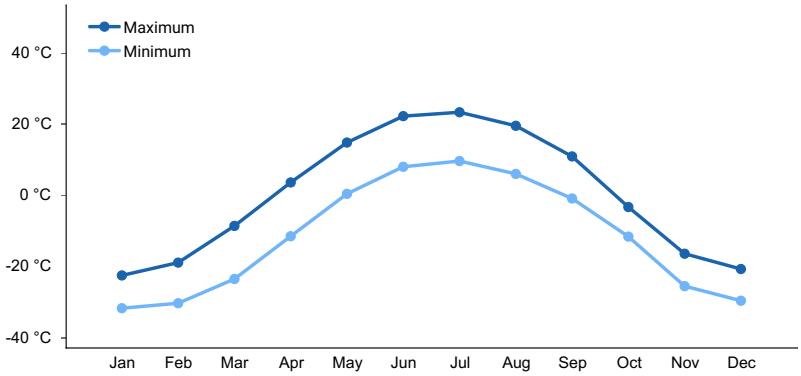


Figure 7. Monthly average minimum and maximum temperature

Influencing water features

During the early growing season, a perched water table is over the seasonal frost in the soil profile resulting in wet soils at very shallow depth (less than 10 inches). During this time frame, ponding occurs occasionally (5 to 50 times in 100 years) for long durations of time (between 7 and 30 days). As the seasonal frost melts, the water drains from these soils. During long portions of the growing season, a water table is commonly at shallow depths (10 to 20 inches) in the soil profile. The typical depth to the water table was determined through field observation and by the presence of redoximorphic features that are common throughout the soil profile.

White spruce are more productive when growing in well-drained soils in this MLRA. The water table associated with this ecological site decreases white spruce productivity and increases the presence of wetland indicator species.

Soil features

Correlated soil components for the Yukon Flats Area, Alaska soil survey (AK685): Chissovun; Twin; Tulebagh.

Figure 8. Typical soil profile associated with Twin soil component.

Figure 9. Chissovun, Twin, and Tulebagh soil components have permafrost at depth.

Table 4. Representative soil features

Parent material	(1) Organic material (2) Alluvium (3) Eolian deposits
Family particle size	(1) Coarse-silty (2) Coarse-loamy
Drainage class	Poorly drained

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 thickness of permafrost). For this ecological site to progress from the early fire stage to the reference plant community, data suggest that 70 years or more must elapse without another fire event.

When comparing all MLRAs of Interior Alaska, land in the Yukon Flats Lowlands MLRA burns most frequently (Begét et al. 2006). Within the Yukon Flats Lowlands MLRA, fire is considered to be a natural and common event that typically goes 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 perimeters of the fires totaled about 4.1 million acres (AICC 2016). Fire-related disturbances are highly patchy and can leave large undisturbed areas within the burn perimeters. Ten fires were attributed to human activities (affecting a total of 2,864 acres), but the majority of the fires 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 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 community phase is associated with permafrost, fire was thought to increase active layer depth causing the permafrost to occur deeper in the soil profile.

In areas prone to low-severity fire events, the pre-fire vegetative community generally reestablishes quickly and there is minimal long-term alteration to community composition (Johnstone et al. 2010; Bernhardt et al. 2011). 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). Black spruce is the Interior Alaska tree species best adapted to a low-severity fire regime. Black spruce have semi-serotenous cones and a low-severity fire often results in a flush of black spruce seedlings at the burned location.

Field data suggest that each of the woodland communities burn and that fire events will cause a transition to the early stage of fire succession. This stage (community 1.3) is a mix of species that either regenerate in place (e.g., subterranean root crowns for willow and rhizomes for graminoids) and/or from wind-dispersed seeds or spores (e.g., resin birch [*Betula neoalaskana*] and Polytrichum moss [Polytrichum spp.]). The early stage of fire succession is primarily composed of tree seedlings, ericaceous shrubs, willow, and graminoids. In the absence of fire, tree seedlings continue to colonize and grow in recently burned areas until they become dominant in the overstory. The later stages of succession have an overstory that is a mix of immature broadleaf and needleleaf trees (community 1.2) or is primarily a mixed age needleleaf stand (community 1.1).

Given the high frequency of fire and its associated footprint, much of the land in the Yukon Flats Lowlands MLRA has burned too recently to support reference plant community 1.1. GIS data and flight reconnaissance have shown that large swaths of mature spruce stands are uncommon throughout the MLRA. Mixed and broadleaf forests have the highest spatial representation in the Yukon Flats Lowlands MLRA.

Flooding

This ecological site is associated with younger terraces that rarely flood (Twin soils) and older terraces that no longer flood (Chissovun and Tulebagh soils). 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 the younger terraces that support this ecological site.

While conducting fieldwork, little if any evidence of flood-related disturbance was observed. Thus, no flood-related plant 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

Soils associated with this ecological site tend to be more acidic when compared to soils associated with ecological site F232XY262AK. This ecological site typically has soil pH ranging from moderately acidic to neutral at shallow to moderate depths. Areas with higher soil pH have plant communities that are similar to plant communities associated with ecological site F232XY262AK.

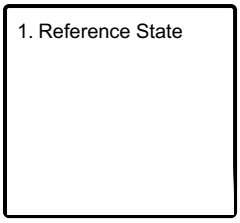
While field work indicates low-severity fires are most common, high-severity fires can and likely do occur in areas associated with this ecological site. A high-severity fire would likely cause permafrost to drop out of the soil profile and result in unique and currently unknown plant community phases within the reference state. Due to a lack of data, high-severity fire events are considered atypical in areas that support this ecological site.

Animal use (browsing and grazing) of this ecological site primarily consists of moose browse on willow and tree regeneration. Severity of moose browse is considered slight for all plant communities. A browse severity rating of slight on willow and tree regeneration is defined as a majority of individuals having no signs of browsing.

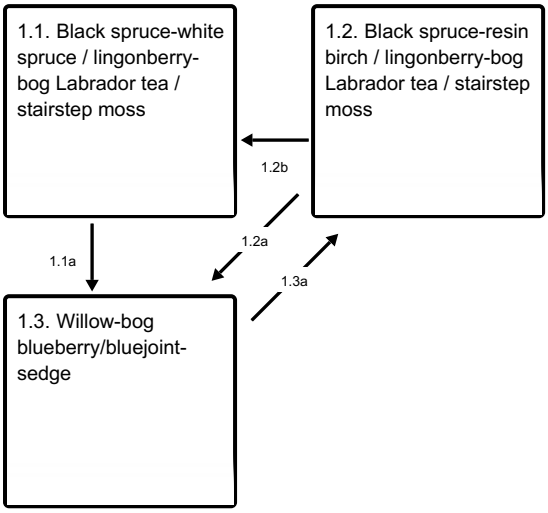
No alternative states for this ecological site were documented.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

Figure 10. Aerial image of a stream terrace in the Yukon Flats Lowlands MLRA. This ecological site occurs on stream terraces in this MLRA.

The reference state has three associated community phases. The phases are grouped by the structure and dominance of the vegetation (e.g., coniferous trees, deciduous trees, shrubs, and forbs) and their ecological function and stability. Plant communities in the reference state appear to be largely controlled by the influences of fire. 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 communities in this report are characterized using the Alaska Vegetation Classification (Viereck et al. 1992).

Community 1.1
Black spruce-white spruce / lingonberry-bog Labrador tea / stairstep moss

Figure 11. 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	74	10 (0-50)
T	black spruce	*Picea mariana*	PIMA	63	15 (0-45)
S	lingonberry	*Vaccinium vitis-idaea*	VAVI	100	20 (0.1-70)
S	grayleaf willow	*Salix glauca*	SAGL	95	7 (0-40)
S	red fruit bearberry	*Arctostaphylos rubra*	ARRU	89	5 (0-15)
S	prickly rose	*Rosa acicularis*	ROAC	84	1 (0-7)
S	black crowberry	*Empetrum nigrum*	EMNI	74	6 (0-20)
S	bog blueberry	*Vaccinium uliginosum*	VAUL	74	5 (0-20)
S	bog Labrador tea	*Ledum groenlandicum*	LEGR	63	7 (0-35)
S	littletree willow	*Salix arbusculoides*	SAAR3	58	1 (0-5)
S	shrubby cinquefoil	*Dasiphora fruticosa*	DAFR3	47	1 (0-5)
S	shrub birch	*Betula glandulosa*	BEGL	32	2 (0-35)
G	sedge	*Carex spp.*	CAREX	58	3 (0-10)
G	bluejoint	*Calamagrostis canadensis*	CACA4	53	3 (0-20)
F	dwarf scouringrush	*Equisetum scirpoides*	EQSC	58	3 (0-35)
L	felt lichen	*Peltigera aphthosa*	PEAP60	79	3 (0-10)
L	greygreen reindeer lichen	*Cladina rangiferina*	CLRA60	68	3 (0-15)
L	cup lichen	*Cladonia spp.*	CLADO3	58	3 (0-25)
B	stairstep moss	*Hylocomium splendens*	HYSP70	89	20 (0-60)

This dataset includes data from 19 sample plots. The plots are distributed across the survey area and are independent of one another.

Figure 12. Canopy cover table for community 1.1.

Reference plant community 1.1 is characterized as a needleleaf woodland (10 to 25 percent cover) composed of black spruce and white spruce. Tree age was highly variable, which is likely due to patchy low-intensity fire events. Tree cover is primarily split between the stunted (less than 15 feet in height) and medium tree stratums (between 15 and 40 feet in height). Occasional live deciduous trees, primarily resin birch, are in the tree canopy, but most have been replaced by spruce. The soil surface is covered primarily with bryophytes, lichen, and herbaceous litter. Commonly observed understory species include grayleaf willow, red fruit bearberry, lingonberry, black crowberry, bog Labrador tea, dwarf scouringrush, and stairstep moss. The understory vegetative strata that characterize this community are bryophytes, dwarf shrubs (less than 8 inches in height), and low shrubs (between 8 and 36 inches in height). Black spruce and white spruce trees were sampled for diameter at breast height (dbh), height, and age at dbh (32 black spruce and 22 white spruce). The basal area of the stand was determined for each sample plot. The mean dbh of black spruce is 2.6 inches (ranging from 1.0 to 5.0), the mean height is 16 feet (ranging from 8 to 30 feet), and the mean age is 67 years (ranging from 28 to 135 years). The mean dbh of white spruce is 4.1 inches (ranging from 2.0 to 9.2), the mean height is 24 feet (ranging from 7 to 44 feet), and the mean age is 79 years (ranging from 22 to 195 years). The mean basal area of the stands is 42 (ranging from 5 to 90). Site index of white

spruce was determined for 9 of the sample plots; mean site index is 29 (ranging from 18 to 40) (Farr 1967).

Dominant plant species

- white spruce (*Picea glauca*), tree
- black spruce (*Picea mariana*), tree
- lingonberry (*Vaccinium vitis-idaea*), shrub
- grayleaf willow (*Salix glauca*), shrub
- red fruit bearberry (*Arctostaphylos rubra*), shrub
- prickly rose (*Rosa acicularis*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- littletree willow (*Salix arbusculoides*), shrub
- shrubby cinquefoil (*Dasiphora fruticosa*), shrub
- resin birch (*Betula glandulosa*), shrub
- sedge (*Carex*), grass
- bluejoint (*Calamagrostis canadensis*), grass
- dwarf scouringrush (*Equisetum scirpoides*), other herbaceous
- felt lichen (*Peltigera aphthosa*), other herbaceous
- greygreen reindeer lichen (*Cladina rangiferina*), other herbaceous
- cup lichen (*Cladonia*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous

Community 1.2
Black spruce-resin birch / lingonberry-bog Labrador tea / stairstep moss

Figure 13. Typical 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	black spruce	*Picea mariana*	PIMA	100	30 (7-60)
T	resin birch	*Betula neoalaskana*	BENE4	80	5 (0-40)
T	white spruce	*Picea glauca*	PIGL	20	7 (0-50)
S	lingonberry	*Vaccinium vitis-idaea*	VAVI	100	25 (2-80)
S	bog Labrador tea	*Ledum groenlandicum*	LEGR	80	10 (0-25)
S	willow	*Salix spp.*	SALIX	100	9 (0.1-35)
S	bog blueberry	*Vaccinium uliginosum*	VAUL	80	4 (0-15)
S	red fruit bearberry	*Arctostaphylos rubra*	ARRU	70	3 (0-20)
S	black crowberry	*Empetrum nigrum*	EMNI	50	3 (0-15)
S	prickly rose	*Rosa acicularis*	ROAC	60	1 (0-5)
L	greygreen reindeer lichen	*Cladina rangiferina*	CLRA60	70	2 (0-7)
L	star reindeer lichen	*Cladina stellaris*	CLST60	40	2 (0-7)
L	felt lichen	*Peltigera aphthosa*	PEAP60	50	1 (0-7)
G	Bigelow's sedge	*Carex bigelowii*	CABI5	50	2 (0-15)
G	reedgrass	*Calamagrostis spp.*	CALAM	50	1 (0-5)
F	horsetail	*Equisetum spp.*	EQUIS	70	1 (0-12)
B	stairstep moss	*Hylocomium splendens*	HYSP70	60	15 (0-45)
B	Aulacomnium moss	*Aulacomnium palustre*	AUPA70	40	9 (0-50)

This dataset includes data from ten 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 14. Canopy cover table for community 1.2.

Plant community 1.2 is in the late stage of fire-induced secondary succession for this ecological site. It is characterized as mixed woodland (Viereck et al. 1992) that is composed of immature spruce and resin birch. Tree cover is split between the tree regeneration (less than 15 feet in height) and medium tree stratums (between 15 and 40 feet in height). The soil surface is covered with a mixture of herbaceous litter, woody debris, and bryophytes. Commonly observed understory species include a mixture of willow (primarily S. glauca and S. arbusculoides), red fruit bearberry, lingonberry, bog Labrador tea, bog blueberry (*Vaccinium uliginosum*), horsetail, and stairstep moss. The understory vegetative strata that characterize this plant community are bryophytes, low shrubs (between 8 and 36 inches in height), and dwarf shrubs (less than 8 inches in height). Black spruce and white spruce trees were sampled for diameter at breast height (dbh), height, and age at dbh (23 black spruce and 5 white spruce). The basal area of the stand was determined for each sample plot. The mean dbh of black spruce is 2.2 inches (ranging from 0.8 to 4.6), the mean height is 14 feet (ranging from 2 to 25 feet), and the mean age is 47 years (ranging from 20 to 79 years). The mean dbh of white spruce is 3.7 inches (ranging from 1.3 to 6.8), the mean height is 22 feet (ranging from 5 to 38 feet), and the mean age is 50 years (ranging from 40 to 62 years). The mean basal area of the stands is 24 (ranging from 3 to 90).

Dominant plant species

- black spruce (*Picea mariana*), tree
- resin birch (*Betula neoalaskana*), tree
- white spruce (*Picea glauca*), tree
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- willow (*Salix*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- red fruit bearberry (*Arctostaphylos rubra*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- prickly rose (*Rosa acicularis*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass
- reedgrass (*Calamagrostis*), grass
- greygreen reindeer lichen (*Cladina rangiferina*), other herbaceous

- star reindeer lichen (*Cladina stellaris*), other herbaceous
- felt lichen (*Peltigera aphthosa*), other herbaceous
- horsetail (*Equisetum*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- aulacomnium moss (*Aulacomnium palustre*), other herbaceous

Community 1.3
Willow-bog blueberry/bluejoint-sedge

Figure 15. Typical plant community associated with community 1.3.

Community Phase 1.3 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	67	20 (0-30)
T	black spruce	*Picea mariana*	PIMA	67	20 (0-50)
T	white spruce	*Picea glauca*	PIGL	67	8 (0-20)
S	willow	*Salix spp.*	SALIX	100	30 (15-55)
S	bog blueberry	*Vaccinium uliginosum*	VAUL	100	15 (5-40)
S	leatherleaf	*Chamaedaphne calyculata*	CHCA2	67	15 (0-40)
S	bog birch	*Betula nana*	BENA	67	15 (0-45)
S	bog Labrador tea	*Ledum groenlandicum*	LEGR	67	7 (0-15)
S	lingonberry	*Vaccinium vitis-idaea*	VAVI	67	5 (0-10)
G	bluejoint	*Calamagrostis canadensis*	CACA4	100	35 (10-50)
G	sedge	*Carex spp.*	CAREX	100	20 (1-30)
F	dwarf scouringrush	*Equisetum scirpoides*	EQSC	67	10 (0-30)
F	fireweed	*Chamerion angustifolium*	CHAN9	67	25 (0-75)
B	*Polytrichum* moss	*Polytrichum spp.*	POLYT5	67	5 (0-15)

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

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

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.

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 16. Canopy cover table for community 1.3.

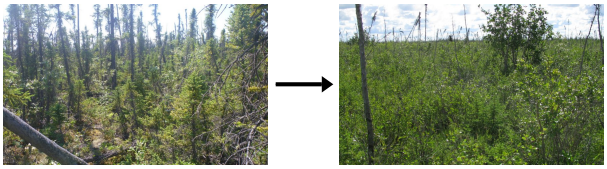
Plant community 1.3 is in the early stage of fire-induced secondary succession for this ecological site. It is characterized as open low scrub (Viereck et al. 1992). Tree cover occurs primarily in the regenerative tree stratum (less than 15 feet in height) and common species include resin birch, black spruce, and white spruce. The soil surface is covered with a mixture of herbaceous litter, woody debris, and bryophytes. Commonly observed understory species include a mixture of willow (primarily S. arbusculoides and S. bebbiana), bog blueberry, bluejoint

(*Calamagrostis canadensis*), a mixture of sedges (primarily *Carex bigelowii*), fireweed (*Chamerion angustifolium*), and Polytrichum moss.

Dominant plant species

- resin birch (*Betula neoalaskana*), tree
- black spruce (*Picea mariana*), tree
- white spruce (*Picea glauca*), tree
- littletree willow (*Salix arbusculoides*), shrub
- grayleaf willow (*Salix glauca*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- leatherleaf (*Chamaedaphne calyculata*), shrub
- dwarf birch (*Betula nana*), shrub
- bog Labrador tea (*Ledum groenlandicum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- Bigelow's sedge (*Carex bigelowii*), grass
- dwarf scouringrush (*Equisetum scirpoides*), other herbaceous
- fireweed (*Chamerion angustifolium*), other herbaceous
- polytrichum moss (*Polytrichum*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.3

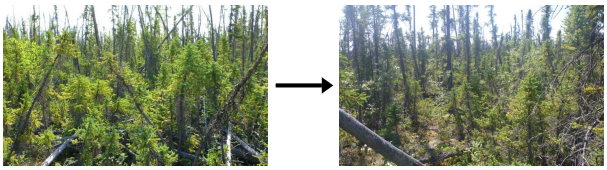


Black spruce-white spruce / lingonberry-bog Labrador tea / stairstep moss

Willow-bog blueberry/bluejoint-sedge

Fire.

Pathway 1.2b
Community 1.2 to 1.1

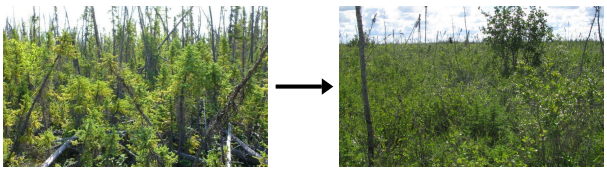


Black spruce-resin birch / lingonberry-bog Labrador tea / stairstep moss

Black spruce-white spruce / lingonberry-bog Labrador tea / stairstep moss

Time without fire.

Pathway 1.2a
Community 1.2 to 1.3



Black spruce-resin birch / lingonberry-bog Labrador tea / stairstep moss

Willow-bog blueberry/bluejoint-sedge

Fire.

Pathway 1.3a
Community 1.3 to 1.2

Willow-bog blueberry/bluejoint-sedge

Black spruce-resin birch / lingonberry-bog Labrador tea / stairstep moss

Time without fire.

Additional community tables

Table 5. Community 1.1 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
black spruce	PIMA	*Picea mariana*	Native	2.4–9.1	0–50	2.5–12.7	–
white spruce	PIGL	*Picea glauca*	Native	2.1–13.4	0–50	5.1–23.4	–

Table 6. Community 1.2 forest overstory composition

Common Name	Symbol	Scientific Name	Nativity	Height (M)	Canopy Cover (%)	Diameter (Cm)	Basal Area (Square M/Hectare)
Tree							
black spruce	PIMA	*Picea mariana*	Native	0.6–7.6	7–60	2–11.7	–
white spruce	PIGL	*Picea glauca*	Native	1.5–11.6	0–50	3.3–17.3	–
resin birch	BENE4	*Betula neoalaskana*	Native	–	0–40	–	–

Table 7. Representative site productivity

Common Name	Symbol	Site Index Low	Site Index High	CMAI Low	CMAI High	Age Of CMAI	Site Index Curve Code	Site Index Curve Basis	Citation
white spruce	*PIGL*	18	40	–	–	–	–	–	

Inventory data references

NASIS User Site ID / Modal Datasets
10BL01704 Plant Community 1.1
11BB07104 Plant Community 1.1
11SN03103 Plant Community 1.1
12NR00103 Plant Community 1.1
12NR00402 Plant Community 1.1
12NR01401 Plant Community 1.1
12NR01402 Plant Community 1.1
12NR02203 Plant Community 1.1
12NR02901 Plant Community 1.1
12NR04801 Plant Community 1.1
12SN01003 Plant Community 1.1
14NR01103 Plant Community 1.1
14NR02603 Plant Community 1.1
2015AK290401 Plant Community 1.1
2015AK290706 Plant Community 1.1
2015AK290708 Plant Community 1.1

2015AK290726 Plant Community 1.1
S2015AK290006 Plant Community 1.1
S2015AK290012 Plant Community 1.1
08DM05806 Plant Community 1.2
08DM08101 Plant Community 1.2
12NR00401 Plant Community 1.2
12NR00802 Plant Community 1.2
12NR02501 Plant Community 1.2
12NR02502 Plant Community 1.2
12SN01102 Plant Community 1.2
12SN01302 Plant Community 1.2
12SS02902 Plant Community 1.2
2015AK290414 Plant Community 1.2
08DM04505 Plant Community 1.3
08DM06605 Plant Community 1.3
08DM08103 Plant Community 1.3

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Contributors

Blaine 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:**
