Ecological site F230XY615AK
Boreal Deciduous Forest Loamy Steep Slopes

Last updated: 6/11/2025
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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): 230X–Yukon-Kuskokwim Highlands

The Yukon-Kuskokwim Highlands (MLRA 230X) include the most western parts of Interior Alaska (Land Resource Region X2) and have a continental climate. MLRA 230X is approximately 42,300 square miles spread across mountain, hills, and valleys. Flood plain systems are common. The watershed drains into the Bering Sea to the west and Bristol Bay to the southwest. Major rivers include the Yukon, Innoko, Kuskokwim, Mulchatna, and Nushagak Rivers. This sparsely populated area is mostly undeveloped wildland. Residents use this remote area primarily for subsistence hunting, fishing, and gathering. Villages are primarily located along rivers along the MLRA 230X boundary and include Greyling, Nulato, and Koyukuk. Federally managed lands in the MLRA include parts of Innoko, Nowitna, and Koyukuk National Wildlife Refuges. Geology and Soils The Yukon-Kuskokwim Highlands MLRA was mostly unglaciated during the Pleistocene. Glaciers were limited to the Lime Hills in the southeast. Glacial moraines and drift are evident in areas of past glacial activity. Unglaciated upland areas are covered with colluvium and slope alluvium originating from bedrock. Loess deposits cover gentle sloping hills and footslopes of mountains near major rivers. Bedrock material is primarily sedimentary rocks with intrusive volcanic rock (USDA, 2022). This MLRA is in the zone of discontinuous permafrost. Permafrost is most common in finely textured soils on terraces, gently sloping hills, and cold mountain footslopes. It is typically absent from flood plains and mountain backslopes. Across the MLRA, permafrost presence decreases as proximity to the Yukon-Kuskokwim delta increases. The dominant soil orders are Gelisols, Entisols, Inceptisols, and Spodosols. Gelisols support shallow to deep permafrost and often have a perched water table for at least part of the growing season. Inceptisols, Spodosols, and Entisols lack permafrost. Two important factors that prevent permafrost aggradation are groundwater connectivity and thick bands of sandy and/or gravelly soil horizons. Inceptisols have minimal development and are common on alpine scrublands and high flood plains. Entisols are common on mountain backslopes and scoured flood plains. Spodosols support a spodic soil horizon and are common in the acidic soils underlying spruce forests and ericaceous shrublands. Non-soil areas such as rock outcrops, rubble lands and beaches make up approximately ten percent of the MLRA surface. Climate The Yukon-Kuskokwim Highlands MLRA has short, warm summers and cold, long winters. Mean annual precipitation is 10 to 15 inches at low elevations and increases to 20 to 40 inches at higher elevations (USDA, 2022). Annual snowfall is between 80 and 100 inches. Mean annual temperatures ranges from 25 to 32 degrees F (SNAP, 2014a; SNAP, 2014b). Vegetation Vegetation is mainly influenced by site and soil characteristics such as temperature-degree days, exposure, soil depth, and soil hydrology. Dwarf scrublands are prevalent on shallow soils on convex slopes and in the alpine. Mesic, lowland slopes are a mix of forests and shrublands of alder, willow, and ericaceous shrubs. Cold slopes generally support black spruce, while warm slopes support white spruce. Valley bottoms and steep slopes support a deciduous forest. Tussock tundra is associated with wet soils underlain by shallow permafrost and is ubiquitous across the lower footslopes of mountains and the coastal plain (USDA, 2022). Fire Fire is a major disturbance across the Yukon-Kuskokwim Highlands. Low severity fires destroy the canopy but leave the organic mat and rootstock mostly undisturbed. The vegetative community progresses directly back to a forest. Severe forest fires are stand replacement events. Post-first communities typically pass through an herbaceous meadow community before ericaceous shrubs, birch, and willows colonize. Drier soils may support a deciduous aspen or birch forest, while moist soils support cottonwoods and spruce. On all forest and woodland ecological sites, post-fire succession leads to a relatively rapid accumulation of organic matter and mosses on the surface. This accumulation results in decreases in soil temperature, biologic activity, and nutrient availability and a gradual decrease in site productivity.

LRU notes

MLRA 230X contains three life zones defined by the physiological limits of plant communities along an elevational gradient. The boreal life zone is the elevational band where forest communities dominate. Non-forested areas in the boreal life zone are often hydrologically driven, and are either too wet (i.e., bogs) or too dry (i.e., river bluffs) to support forest communities. Subalpine and alpine vegetation dominates at higher elevations. The subalpine zone is a transitional band between the boreal and the alpine life zones, and is characterized by sparse, stunted trees. Shrub height can be over four feet. Trees are absent from the alpine, and all shrubs are dwarf or prostrate. In general, the boreal life zone occurs below 1,200 feet of elevation. Within each life zone, there are plant assemblages associated with cold and warm slopes. Slope temperature is a factor of slope steepness, aspect, and shading from surrounding ridges

and mountains. Warm slopes occur on southeast to west aspects that are moderate to very steep and are not shaded by the surrounding landscape. Cold slopes occur on northwest to east facing slopes, occur in shaded slope positions, or occur in low-lying areas that are cold air sinks. Examples of shaded positions include head slopes, low relief backslopes of hills, and the base of hills and mountains shaded by adjacent mountain peaks. Warm boreal slopes have a cryic soil temperature regime and lack permafrost. White spruce forests are an indicator of warm boreal slopes. Cold boreal slope soils have a gelic soil temperature regime and commonly have permafrost. In this area, black spruce forests and woodlands are an indicator of cold boreal slopes.

Classification relationships

Alaska Vegetation Classification: Open broadleaf forest (I.B.2 - level III) / Open paper birch forest (I.B.2.a - level IV) (Viereck et al., 1992) Circumboreal Vegetation Map: Yukon Spruce-Birch-Aspen Forests (Jorgensen and Meidinger, 2015) BioPhysical Settings: 7316050 – Western North American Boreal Mesic Birch-Aspen Forest (Landfire, 2009)

Ecological site concept

Ecological Site characteristics: • Occurs in the boreal life zone on warm and steep slopes of hills and mountains. • Soils are very deep and lack root restrictions like permafrost • Soils formed in loess over colluvium and/or residuum and are capped with a thin layer of organic material. • Soils do not pond or flood. These well drained soils do not have a water table in the soil profile. • The reference plant community is a paper birch forest with medium shrubs, graminoids and mosses dominating the understory • Fire is the major disturbance in this ecological site and is responsible for four communities.

Associated sites

F230XY614AK	**Boreal Black Spruce Unfrozen Well Drained Slopes** Ecological site F230XY614AK describes black spruce forests on cold, forested slopes that are much less steep.
F230XY611AK	**Boreal Forest Loamy Frozen Slopes** Ecological site F230XY611AK describes black spruce forests on cold, forested slopes that are much less steep.
F230XY612AK	**Boreal Forest Loamy Slopes** Ecological site F230XY612AK describes white spruce forests on warm slopes that are much less steep.

Similar sites

F230XY614AK	**Boreal Black Spruce Unfrozen Well Drained Slopes** F230XY614AK can support a hardwood forest community as a post-fire successional plant community. However, that community will be replaced by a black spruce forest, which will not develop on the warm, steep slopes of this ecological site.
F230XY612AK	**Boreal Forest Loamy Slopes** F230XY615AK and F230XY612AK share similar hardwood successional plant communities. However, white spruce stands do not occur on the steep slopes associated with F230XY615AK.

Table 1. Dominant plant species

Tree	(1) *Betula papyrifera*
Shrub	(1) *Alnus* (2) *Ledum palustre ssp. decumbens*

Herbaceous	(1) *Calamagrostis canadensis*

Physiographic features

• This boreal ecological site occurs backslopes and hill slopes of mountains and hills.
• Elevation typically ranges between 100 and 1200 feet
• Slope gradients are steep to very steep (25 to 100 percent)
• This site occurs on warm slopes, generally on southeast to western aspects.
• Flooding and ponding do not occur. A water table does not occur in the soil profile.

Table 2. Representative physiographic features

Slope shape across	(1) Linear (2) Convex
Slope shape up-down	(1) Linear (2) Convex
Hillslope profile	(1) Backslope (2) Shoulder
Geomorphic position, mountains	(1) Lower third of mountainflank
Geomorphic position, hills	(1) Side Slope
Landforms	(1) Hills > Hill (2) Mountains > Mountain (3) Hills > Alluvial fan
Runoff class	Medium to high
Flooding frequency	None
Ponding frequency	None
Elevation	30 – 370 m
Slope	30 – 100 %
Aspect	W, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0 – 100 %

Climatic features

The Yukon-Kuskokwim Highlands MLRA has short, warm summers and long, cold winters. Mean annual temperature ranges from 25 to 32 degrees Fahrenheit, with temperatures typically below freezing from October through April. June through August are the warmest months of the year and constitute the heart of the growing season. Approximately 60 percent of total annual precipitation occurs from June through September (PRISM, 2018; SNAP, 2014a). Across the MLRA, snowfall ranges from 80 to 100 inches (USDA, 2022).

Table 4 Representative climatic features

Frost-free period (characteristic range)	80-100 days
Freeze-free period (characteristic range)	70-90 days
Precipitation total (characteristic range)	330-510 mm
Frost-free period (actual range)	60-110 days
Freeze-free period (actual range)	50-100 days
Precipitation total (actual range)	250-1,020 mm
Frost-free period (average)	80 days
Freeze-free period (average)	70 days
Precipitation total (average)	380 mm

Influencing water features

This site is not associated with or influenced by streams or wetlands. Precipitation and throughflow are the main source of water for this ecological site. Surface runoff and throughflow contribute water to downslope ecological sites.

Wetland description

This ecological site is not a wetland.

Soil features

• Common Inceptisol great groups are Dystrocryepts and Haplocryepts, while common Spodosol great groups are Haplocryods (Soil Survey Staff, 2013).
• Soils formed in loess over colluvium and/or residuum
• Rock fragments vary from 0 to over 20 percent on the soil surface. They are more prevalent on steep, eroding surfaces
• Soils have a thin, 3- to 4-inch-thick organic cap.
• Soils are very deep
• Subsurface rock fragments vary from zero to upwards of seventy percent volume
• Soil pH is extremely to slightly acidic
• Soils are considered well drained.

Table 5. Representative soil features

Parent material	(1) Loess (2) Colluvium (3) Residuum
Surface texture	(1) Silt loam (2) Gravelly silt loam
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	150 cm
Surface fragment cover <=3"	0 – 20 %
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	7.37 – 18.8 cm
Soil reaction (1:1 water) (0-25.4cm)	4.1 – 6.4
Subsurface fragment volume <=3" (0-152.4cm)	0 – 60 %

Subsurface fragment volume >3" (0-152.4cm)	0 – 30 %

Ecological dynamics

Fire

Fire has a major influence on vegetation across the Yukon-Kuskokwim Highlands MLRA. Wildland fire is a common and natural event that is unmanaged except near towns and villages. Fires are patchy and different locations within a single burn experience different levels of fire intensity, or no fire at all. In general, cooler and wetter areas experience low-severity fires, while warmer and drier areas experience high-severity fires. Other factors such as fire load and recent weather also affect fire characteristics. A typical fire event considerably alters vegetation, above ground biomass, and the organic soil cap.

This ecological site may act as a firebreak under certain conditions and readily burn under others. The typical fire return interval for this ecological site is between 50 and 200 years (Uchytil, 1991; Landfire, 2009). Paper birch forests are generally one of the least flammable forest types. However, increased temperatures on warm slopes and low soil moisture due to slope steepness and sun exposure may contribute to increased fire conditions. Paper birch is adapted to fire and typically recovers via seed propagation and above and below ground regeneration (Uchytil, 1991).

The typical post-fire successional pathway normally begins with an herbaceous meadow before progressing through a shrubland and ending in a hardwood paper birch forest. Other communities may develop, such as an aspen stands on very dry, mineral soils (Chapin et al., 2006). These slopes generally end up in a paper birch forest after 75 to 100 years.

Windthrow is a disturbance in this ecological site. It is a regular occurrence and keeps the canopy open. The light provided by canopy gaps contributes to higher shrub and forb diversity in the understory than might be found under a closed canopy.

Erosion occurs on the steep slopes of this ecological site. Post-fire erosion can be severe on steep slopes. Large erosion events can create face cliffs, which are best described as a non-vegetated miscellaneous area.

The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant species, disturbances, and ecological processes are described to inform land management decisions.

State and transition model

Additional community tables

Table 6. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 7. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 8. Community 1.3 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Table 9. Community 1.4 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)

Animal community

not available

Hydrological functions

not available

Recreational uses

not available

Wood products

not available

Other products

not available

Other information

not available

Inventory data references

Vegetative communities and transitions are described using existing models and expert knowledge. There are no vegetation inventory data points in NASIS associated with this ecological site. External model data sources: The Alaska-Yukon Region of the Circumboreal Vegetation Map (CBVM) (Jorgensen and Meidinger, 2015) LANDFIRE Biophysical Settings Models (Landfire, 2009) Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenzlick. 1992. The Alaska vegetation classification. Gen. Tech. Rep. PNW-GTR-286. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 278 p. (Viereck et al., 1992)

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Approval

Blaine Spellman, 6/11/2025

Acknowledgments

This ecological site description (ESD) fulfills the requirements of the Provisional Ecological Site (PES) national initiative. This ESD is published to fit current site-soil correlations as they are currently mapped and understood. Further data collection may provide the information to update this ESD from the provisional level to the approved level.

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	09/25/2026
Approved by	
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:**

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

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

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

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

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

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

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17. **Perennial plant reproductive capability:**
