USDA Natural Resources Conservation Service

Ecological site F236XY157AK
Boreal Woodland Moist Loamy Plains

Last updated: 2/13/2024
Accessed: 04/29/2024

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): 236X–Bristol Bay-Northern Alaska Peninsula Lowlands

The Bristol Bay-Northern Alaska Peninsula Lowland Major Land Resource Area (MLRA 236) is located in Western Alaska. This MLRA covers approximately 19,500 square miles and is defined by an expanse of nearly level to rolling lowlands, uplands and low to moderate hills bordered by long, mountain footslopes. Major rivers include the Egegik, Mulchatna, Naknek, Nushagak, and Wood River. MLRA 236 is in the zone of discontinuous permafrost. It is primarily in areas with finer textured soils on terraces, rolling uplands and footslopes. This MLRA was glaciated during the early to middle Pleistocene. Moraine and glaciofluvial deposits cover around sixty percent of the MLRA. Alluvium and coastal deposits make up a large portion of the remaining area (Kautz et al., 2012; USDA, 2006).

Climate patterns across this MLRA shift as one moves away from the coast. A maritime climate is prominent along the coast, while continental weather, commonly associated with Interior Alaska, is more influential inland. Across the MLRA, summers are general short and warm while winters are long and cold. Mean annual precipitation is 13 to 50 inches, with increased precipitation at higher elevations and areas away from the coast. Mean annual temperatures is between 30 and 36 degrees F (USDA, 2006).

The Bristol Bay-Northern Alaska Peninsula MLRA is principally undeveloped wilderness. Federally managed land includes parts of the Katmai and Aniakchak National Parks, and the Alaska Peninsula, Becharof, Togiak and Alaska Maritime National Wildlife Refuges. The MLRA is sparsely populated. Principal communities include Dillingham, Naknek, and King Salmon. Commercial fishing in Bristol Bay and the Bering Sea comprises a major part of economic activity in the MLRA. Other land uses include subsistence activities (fishing, hunting, and gathering) and sport hunting and fishing (USDA, 2006).

Ecological site concept

This boreal ecological site is on convex to linear slopes on drift plain talfs, comprised of mineral materials transported by glacier. Site elevation is 20 to 920 feet above sea level. Slopes are nearly level to gentle (0 – 5 percent). Soil hydrology, fertility, and a fire regime shape the vegetation on this site. A deep water table likely discourages recruitment of upland species. Soil development is weak, negatives affecting plant recruitment and growth.

The reference state supports three communities. The reference plant community is characterized as a white spruce woodland (Viereck et al., 1992). It is composed of a white spruce canopy with an open understory of ericaceous shrubs, grasses, mosses and lichens. Two early communities are the result of a fire cycle comprised of often low-intensity burns.

Associated sites

R236XY109AK	**Subarctic Low Scrub Peat Drainages** R236XY109AK described organic depressions on drift plains. These are features on the plains described by this site.
F236XY115AK	**Boreal Forest Loamy Moist Slopes** F236XY115AK describes rises on drift plains. Rises have soils that do not support a water table, have aquic soil conditions or undergo cryoturbation. This differs from the soil associated with F236XY157AK and results in different vegetative communities.

Similar sites

F236XY115AK	**Boreal Forest Loamy Moist Slopes** Both sites are on drift plains. F236XY115AK is on rises, which are drier than the talf positions of this site. Site and soil conditions create a woodland in this site and a forest on F236XY115AK.

Table 1. Dominant plant species

Tree	(1) *Picea glauca*
Shrub	(1) *Betula nana* (2) *Empetrum nigrum*
Herbaceous	Not specified

Physiographic features

This site is on linear to convex slopes of drift plain talfs. Elevation ranges from 20 to 920 feet above sea level. Slopes are nearly level to gentle (0 – 5 percent). This site is found at all aspects. Ponding and flooding do not typically occur. A deep (39 – 59 inches) water table is present year-round.

Table 2. Representative physiographic features

Geomorphic position, flats	(1) Talf
Landforms	(1) Plains > Plain
Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None
Elevation	20–920 ft
Slope	0–5%
Water table depth	39–59 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to low
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None to rare
Elevation	0–980 ft
Slope	0–5%
Water table depth	11–59 in

Climatic features

The climate of this site reflects that of the MLRA, which is described as maritime polar (EPA, 2013). Temperatures are moderated by the nearby Bristol Bay and norther Pacific bodies of water. Annual precipitation ranges from 21 – 34 inches with approximately 40 percent occurring during the June-September growing season (PRISM, 2018).

Table 4. Representative climatic features

Frost-free period (characteristic range)	75-100 days
Freeze-free period (characteristic range)	65-90 days
Precipitation total (characteristic range)	21-34 in
Frost-free period (actual range)	75-100 days
Freeze-free period (actual range)	65-90 days
Precipitation total (actual range)	15-41 in
Frost-free period (average)	90 days
Freeze-free period (average)	75 days
Precipitation total (average)	29 in

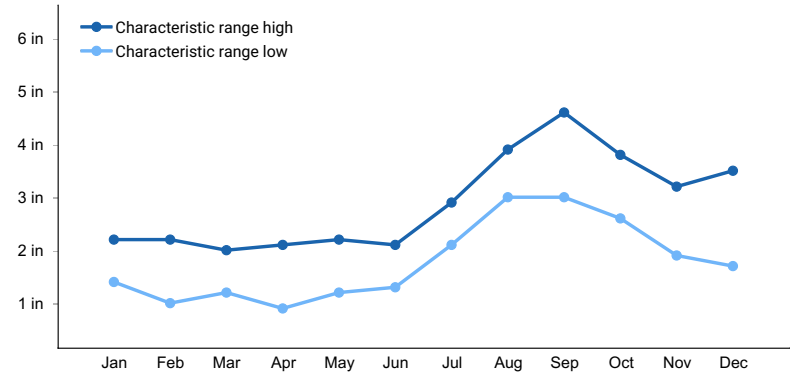


Figure 1. Monthly precipitation range

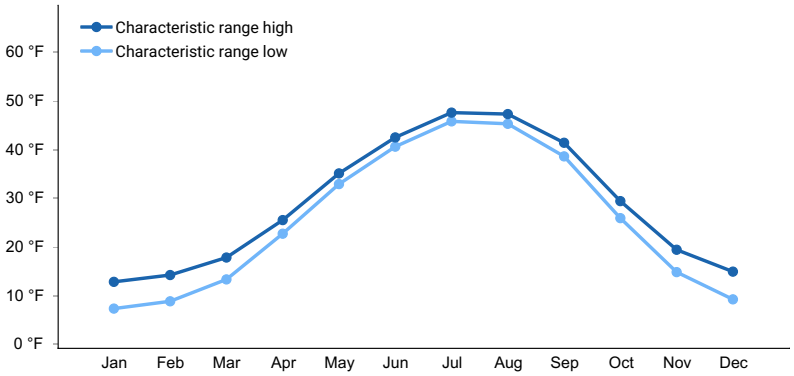


Figure 2. Monthly minimum temperature range

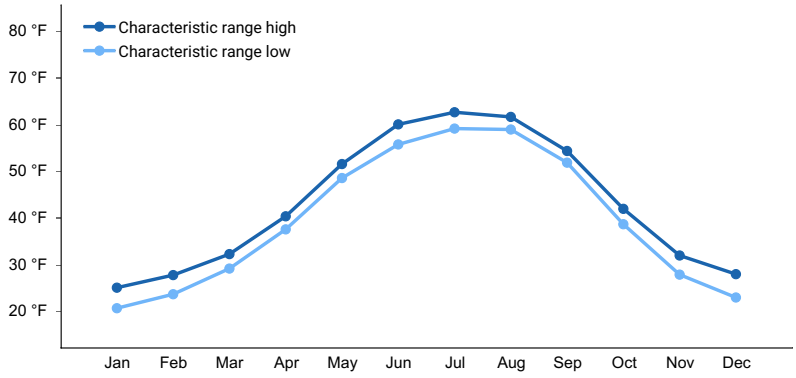


Figure 3. Monthly maximum temperature range

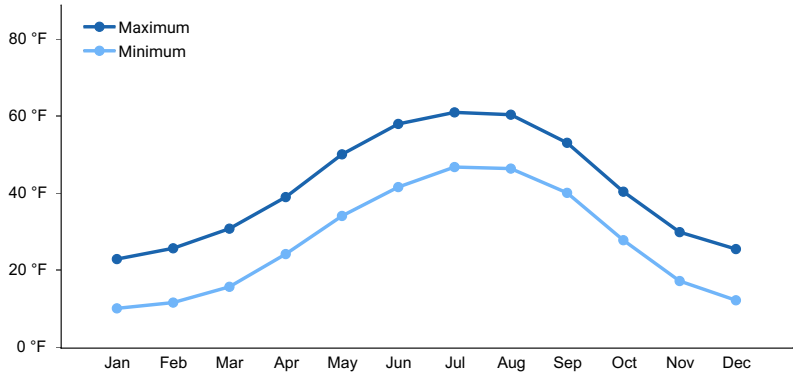


Figure 4. Monthly average minimum and maximum temperature

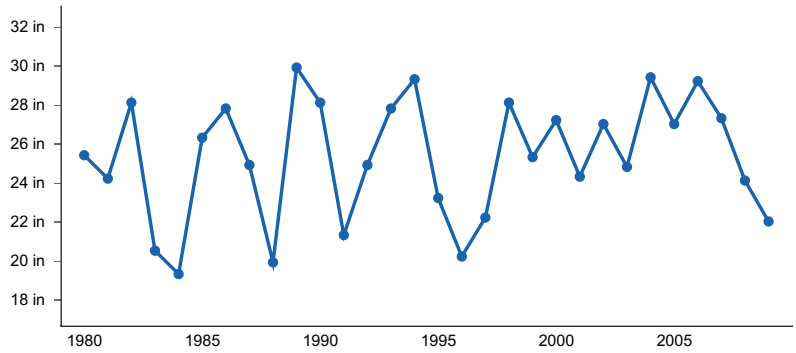


Figure 5. Annual precipitation pattern

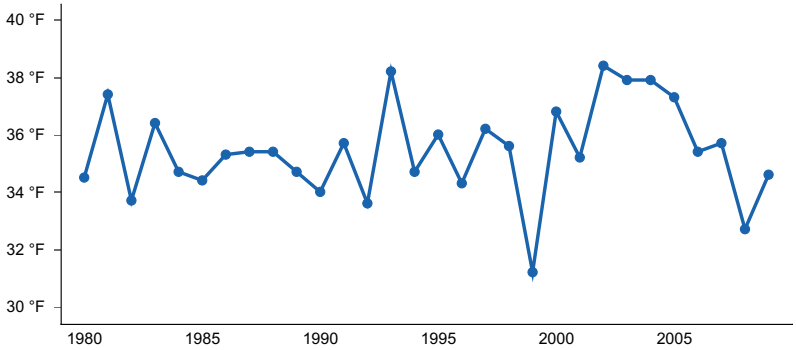


Figure 6. Annual average temperature pattern

Influencing water features

Due to its landscape position, this site is not influenced by wetland or riparian water features. Precipitation and through flow are the main sources of water on this site.

Soil features

Soils are young and weakly developed Inceptisols (Soil Survey Staff, 2013). They are very deep and well drained. They support a cryic temperature regime and an udic moisture regime. Parent material is volcanic ash over loess and/or drift.

Soil characteristics affecting vegetation include hydrology, development and fertility. A deep water table is present between 39 and 59 inches throughout the year. This is too deep to favor obligate wetland species, but likely discourages recruitment of upland species. Soil development affects plant recruitment and growth. Recruitment and growth are likely slow on weakly developed soils like this one, evidenced by an ochric epipedon and a cambic horizon. However, the presence of volcanic ash and andic soil properties likely increase soil fertility, increasing growth rates and recruitment possibilities. Further information is needed to determine the roles that soil development and fertility play on the vegetation on this site.

Correlated soil components in MLRA 236: D36-Boreal woodland loamy eolian slopes, moist; Okstukuk

Table 5. Representative soil features

Parent material	(1) Loess (2) Drift
Surface texture	(1) Silt loam (2) Highly organic silt loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	1.6–2.5 in
Soil reaction (1:1 water) (0-10in)	3.6–5.7
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Table 6. Representative soil features (actual values)

Drainage class	Moderately well drained to well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	1.6–2.5 in
Soil reaction (1:1 water) (0-10in)	3.6–5.7
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site is on linear to convex slopes of drift plain talfs. Local site factors such as hydrology, soil factors and fire support three communities on this site. The reference plant community is a white spruce woodland.

Vegetation reflects the underlying soil. A deep water table and aquic soil conditions are present throughout the year. This is too deep to favor obligate wetland species, but likely discourages recruitment of upland species. It also likely limits the growth of white spruce, preventing a forest from developing. Wet soils also can mitigate the effects of fire. Volcanic ash and andic soil properties likely increase soil fertility beyond typical weakly developed soils with an ochric epipedon and a cambic horizon.

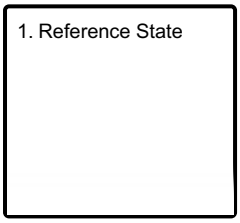
Fire is the major documented disturbance regime on this site. Fire is natural and typically is unmanaged. High-intensity and low-intensity fires affect the recovery of vegetation differently. The severity of a burn generally refers to the proportion of the surface organic mat and tree canopy consumed during a fire (Chapin et al., 2006). Fires in cooler and moister habitats tend to result in low-intensity burns, which is typical for this ecological site. A low intensity burn will result in a community similar to that of the reference plant community (1.1). High intensity burns occur less frequently. These fires burn the organic layer and kill most of the plant life. The post-fire community after an intense fire is very different from the reference plant community. The fire cycle is expected to be around 100 years on this site, based on tree ages and depth to charcoal in the soil.

Windthrow may contribute to keeping the forest canopy open and promoting plant diversity in the understory. Willows are slightly to moderately browsed by moose. This does not appear to affect the ecological processes of the site.

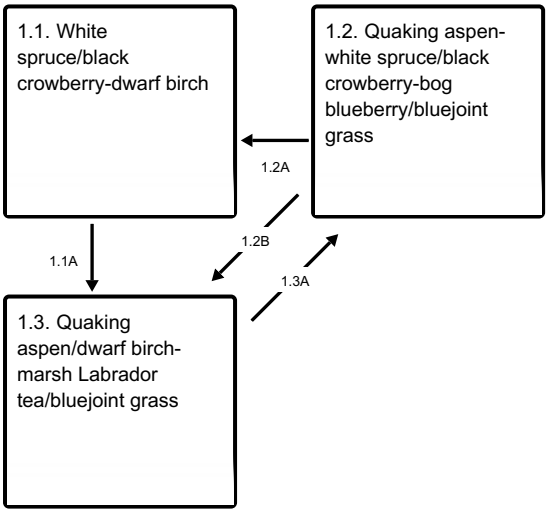
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant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

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Fire.

1.2A - Fire recovery.

1.2B - Fire.

1.3A - Fire recovery.

State 1
Reference State

Figure 7. Typical area of the reference plant community.

The reference state supports three community phases, which are distinguished by the developed structure and dominance of the vegetation and by their ecological function and stability. The reference community phase is needleleaf woodland. The presence of each community is dictated temporally by fire. This report provides baseline inventory data for the vegetation in this ecological site. Future data collection is needed to provide further information about existing plant communities and the disturbance regimes that result in transitions from one community to another. Common and scientific names are from the USDA PLANTS database. Community phases are characterized by the Alaska Vegetation Classification System (Viereck et al., 1992).

Community 1.1
White spruce/black crowberry-dwarf birch

Figure 8. Typical area of community 1.1.

Community Phase 1.1 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and 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	197^	15^
S	Black crowberry	*Empetrum nigrum*	EMNI	100	20
S	Dwarf birch	*Betula nana*	BENA	97	25
S	Beauverd spirea	*Spiraea stevenii*	SPST3	97	6
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	93	3
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	80	20
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	77	4
M	Feathermosses #	Includes 3 genera		50, 60, 40	30, 20, 7

* Trees may be present in multiple strata within one plot; therefore, it is possible for species of this plant group to have a constancy value of more than 100 percent.
^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.
# Feathermosses are represented by three species—*Hylocomium splendens, Pleurozium schreberi,* and *Ptilium crista-castrensis,* respectively.

This dataset includes data from 35 sample plots. The sample 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
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 9. Frequency and canopy cover of plants in community 1.1.

The reference plant community is needleleaf woodland (Viereck et al., 1992) with an understory of low and dwarf shrubs and mosses. Major species include white spruce (*Picea glauca*), black crowberry (*Empetrum nigrum*), dwarf birch (*Betula nana*), spirea (*Spiraea stevenii*), lingonberry (*Vaccinium vitis-idaea*), bog blueberry (*Vaccinium uliginosum*), and bluejoint grass (*Calamagrostis canadensis*). Slightly wetter areas may support high concentrations of willow (Salix spp.). Individual or small clusters of birch trees (Betula spp.) may be present. A diverse moss community is common, and it may include various sphagnum mosses (Sphagnum spp.), polytrichum mosses (Polytrichum spp.), splendid feathermoss (*Hylocomium splendens*), and Schreber's big redstem moss (*Pleurozium schreberi*). Lichens typically are in the ground cover. Other ground cover commonly includes herbaceous litter and woody litter.

Dominant plant species

- white spruce (*Picea glauca*), tree
- black crowberry (*Empetrum nigrum*), shrub
- dwarf birch (*Betula nana*), shrub
- beauverd spirea (*Spiraea stevenii*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- knights plume moss (*Ptilium crista-castrensis*), other herbaceous

Community 1.2
Quaking aspen-white spruce/black crowberry-bog blueberry/bluejoint grass

Figure 10. Typical area of community 1.2.

Community Phase 1.2 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and 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	200*	20^
T	Quaking aspen	*Populus tremuloides*	POTR5	100	40^
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	100	50
S	Black crowberry	*Empetrum nigrum*	EMNI	100	35
S	Resin birch	*Betula glandulosum*	BEGL	100	15
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	100	8
F	Fireweed	*Chamerion angustifolium*	CHAN9	100	5
M	Feathermosses#	Includes 3 genera		100, 100, 100	10, 35, 10

* Trees may be present in multiple strata within one plot; therefore, it is possible for species of this plant group to have a constancy value of more than 100 percent.

^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.

Feathermosses are represented by three species—Hylocomium splendens, Pleurozium schreberi, and Ptilium crista-castrensis, respectively.

This dataset includes data from 1 sample plot. The sample plots are distributed across the survey area and are independent of one another. Due to the limited data available for this community phase, personal field observations were also used to aid in describing the vegetative community.

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. Frequency and canopy cover of plants in community 1.2.

The late fire community phase is a closed mixed forest that has an understory of low and dwarf shrubs. The tree canopy cover may vary greatly depending on the period since the last fire and the point in transition between the early fire community phase and the reference community phase. This community supports an overstory of quaking aspen (*Populus tremuloides*) and white spruce and an understory of bog blueberry, black crowberry, resin birch (Betula glandulosum), and bluejoint grass. Other species include spirea, various willows, Altai fescue, fireweed, stiff clubmoss, and field horsetail (*Equisetum arvense*). Mosses, particularly feathermosses, generally are in the ground cover, and lichens typically are a minor component. The ground cover may include woody litter and herbaceous litter. Some areas are bare soil.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- white spruce (*Picea glauca*), tree
- bog blueberry (*Vaccinium uliginosum*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- resin birch (*Betula glandulosa*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- knights plume moss (*Ptilium crista-castrensis*), other herbaceous

Community 1.3
Quaking aspen/dwarf birch-marsh Labrador tea/bluejoint grass

Figure 12. Typical area of community 1.3.

Community Phase 1.3 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and 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	Quaking aspen	*Populus tremuloides*	POTR5	100	15^
S	Dwarf birch	*Betula nana*	BENA	100	25
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100	10
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	100	7
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	100	7
F	Fireweed	*Chamerion angustifolium*	CHAN9	100	3
M	Polytrichum spp.	*Polytrichum piliferum*	POPI10	100	35

^ Regenerative trees are not typically included in the canopy cover, but they have been included in this table because of the role colonizing quaking aspen plays in post-fire communities.

This dataset includes data from 2 sample plots. The sample plots are distributed across the survey area and are independent of one another. Due to the limited data available for this community phase, personal field observations were also used to aid in describing the vegetative community.

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. Frequency and canopy cover of plants in community 1.3.

The early fire community phase is open low scrubland that includes regenerative quaking aspen. Typically, this community consists of dwarf birch, marsh Labrador tea, bog blueberry, and halberd willow (*Salix hastata*) with regenerative quaking aspen throughout. Standing, dead white spruce trees are present. Other common species include bluejoint grass, sedges (Carex spp.), fireweed, and Nootka lupine (*Lupinus nootkatensis*). Mosses generally are in the ground cover, including polytrichum mosses (Polytrichum spp.). Other ground cover includes herbaceous litter and woody litter. Some areas are bare soil.

Dominant plant species

- quaking aspen (*Populus tremuloides*), tree
- dwarf birch (*Betula nana*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- fireweed (*Chamerion angustifolium*), other herbaceous
- polytrichum moss (*Polytrichum piliferum*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.3

White spruce/black crowberry-dwarf birch

Quaking aspen/dwarf birch-marsh Labrador tea/bluejoint grass

A high intensity fire removes trees and taller shrubs and burns the organic soil layer. Increased light and exposed mineral soil are ideal for quaking aspen seedlings to colonize, with is highly competitive in burned areas (DeByle et al., 1987). Pockets of shrubs in wet spots are likely to escape fire damage and remain a propagation source via seeding or vegetative spread. Based on burn evidence in the soil, the fire cycle is hypothesized to repeat every 100 years.

Pathway 1.2A
Community 1.2 to 1.1

Quaking aspen-white spruce/black crowberry-bog blueberry/bluejoint grass

White spruce/black crowberry-dwarf birch

White spruce (*Picea glauca*) continues to grow and spread, eventually shading out quaking aspen (Lavertu et al. 1994; Howard, 1996). The shrub community diversifies. The time required for this transition likely depends on various factors, including the reproduction rate of white spruce seeds and the growth rate of shrubs and trees.

Pathway 1.2B
Community 1.2 to 1.3

Quaking aspen-white spruce/black crowberry-bog blueberry/bluejoint grass

Quaking aspen/dwarf birch-marsh Labrador tea/bluejoint grass

Fire can remove trees and shrubs. Fuel load is relatively low in community 1.2. Typical fire intensity and frequency are unknown in this community.

Pathway 1.3A
Community 1.3 to 1.2

Quaking aspen/dwarf birch-marsh Labrador tea/bluejoint grass

Quaking aspen-white spruce/black crowberry-bog blueberry/bluejoint grass

The post-fire community is comprised of fast-growing herbaceous species and extant individuals that did not burn. Quaking aspen continues to grow as white spruce seedlings appear. This transition rate depends on several site and plant factors, including the growth rate of quaking aspen, distance to a seed source for white spruce, and the reproduction and growth rates of pioneer and extant shrubs.

Additional community tables

Inventory data references

Modal points for Community 1.1
07AO00402
07AO02202
10TD14102
10TD11501
10TD11502
07SS03603

Modal points for community 1.2
10TD11503

Modal points for community 1.3
07AO002501
07AO002502

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Approval

Kirt Walstad, 2/13/2024

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	04/29/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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

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

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial**

distribution on infiltration and runoff:

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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:**
