USDA Natural Resources Conservation Service

Ecological site R236XY132AK
Subarctic Dwarf Scrub Dry Loamy Slopes

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).

Classification relationships

Alaska Vegetation Classification:
Open low scrubland (II.C.2 - level III) / Open low mesic shrub birch-ericaceous shrubland (II.C.2.c - level IV) (Viereck et al., 1992)

Ecological site concept

This ecological site is on linear to convex shoulders of hills and rolling glaciated plains. Site elevation is between 160 and 970 feet above sea level. Slopes are nearly level to strongly sloped. Site wind exposure, low water availability, limited soil development, and natural wildlife grazing pressure shape the vegetation on this landform.

The reference state supports three communities. The reference plant community is characterized as an open, low mesic scrubland (Viereck et al., 1992). It is composed of a mix of ericaceous and non-ericaceous shrubs with lichen throughout. The other communities on this site are a post-grazed community and a highly eroded community.

Associated sites

R236XY130AK	**Subarctic Scrub Scrub Tundra Loamy Plains and Hills** Both sites are on plains. R236XY130AK describes open, low scrublands on toeslopes. R236XY132AK describes a scrubland on exposed, convex rolling plain and hill shoulders.
R236XY131AK	**Subarctic Tussock-Scrub Frozen Plains** Both sites are on plains. R236XY132AK is primarily associated with shoulders of rolling plains and hills. R236XY131AK describes a tussock tundra community in concave areas of plain slopes.
R236XY140AK	**Subarctic Tussock Tundra Wet Loamy Plains** Both sites are on plain landscapes. R236XY140AK is on linear plain talfs, while R236XY132AK is on upslope, convex shoulders of rolling plains. Soils in R236XY140AK are comprised of organic material over loamy eolian deposits. This soil is poorly drained with frequent, brief ponding during the growing season. Soils in R236XY132AK are well drained and do not support the hydrophytic communities of R236XY140AK.

Similar sites

R236XY130AK	**Subarctic Scrub Scrub Tundra Loamy Plains and Hills** Both sites are on plains. R236XY130AK describes open, low scrublands on toeslopes. Soil is wetter in these positions than on the convex shoulder positions described by R236XY132AK. There is vegetative overlap in the species found in these sites but the community composition and community phases are different.
R236XY131AK	**Subarctic Tussock-Scrub Frozen Plains** Both sites are on plains. R236XY132AK is primarily associated with shoulders of rolling plains and hills. R236XY131AK describes a tussock tundra community on organic permafrost soils in concave areas. The soil hydrology in concave areas, along with frost heave due to underlying permafrost, are distinctly different than the well drained soils and corresponding vegetation of convex plain slopes.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Betula nana* (2) *Ledum palustre subsp. decumbens*
Herbaceous	(1) *Carex bigelowii*

Physiographic features

This site is on linear to convex shoulders of hills and rolling glaciated plains. Elevation ranges from 160 to 970 feet above sea level. Slopes are nearly level to strongly slopes (1 – 10 percent). This site is found at all aspects. Neither flooding nor ponding occur.

Table 2. Representative physiographic features

Slope shape across	(1) Linear
Slope shape up-down	(1) Convex
Geomorphic position, flats	(1) Talf (2) Rise
Hillslope profile	(1) Shoulder
Landforms	(1) Plains > Plain (2) Hills > Hill
Runoff class	Negligible to medium
Flooding frequency	None
Ponding frequency	None
Elevation	160–970 ft

Slope	1–10%
Water table depth	60 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to medium
Flooding frequency	None
Ponding frequency	None
Elevation	0–2,050 ft
Slope	0–20%
Water table depth	60 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

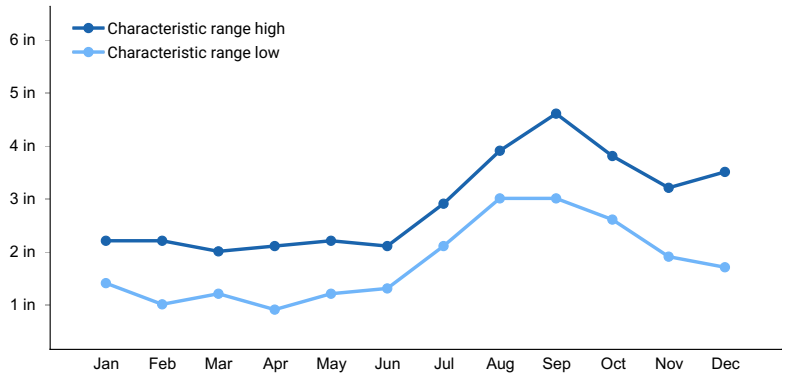


Figure 1. Monthly precipitation range

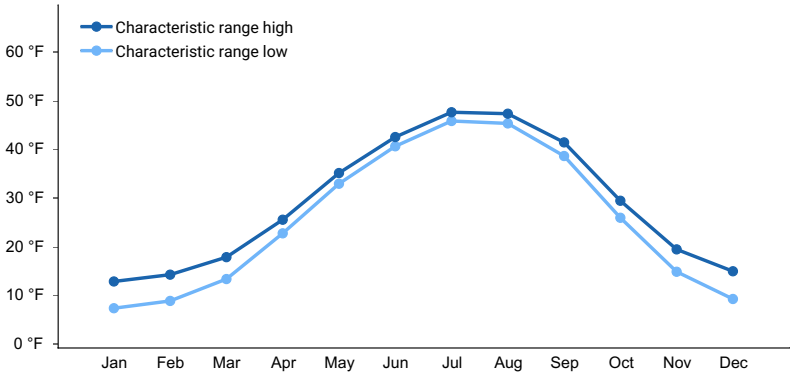


Figure 2. Monthly minimum temperature range

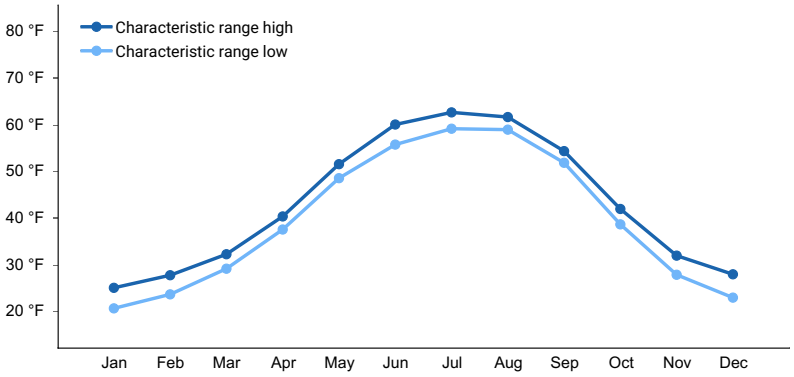


Figure 3. Monthly maximum temperature range

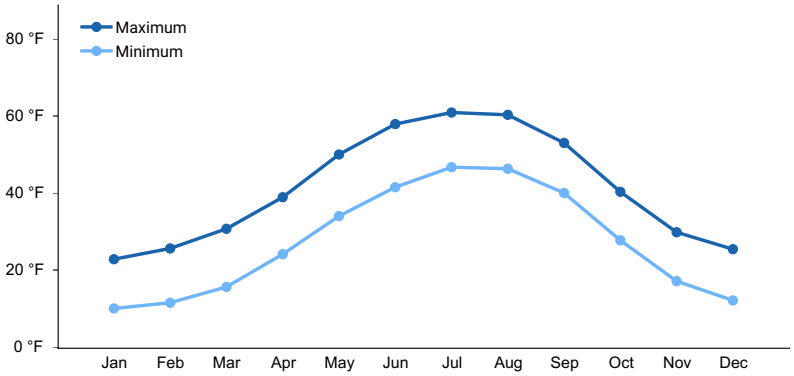


Figure 4. Monthly average minimum and maximum temperature

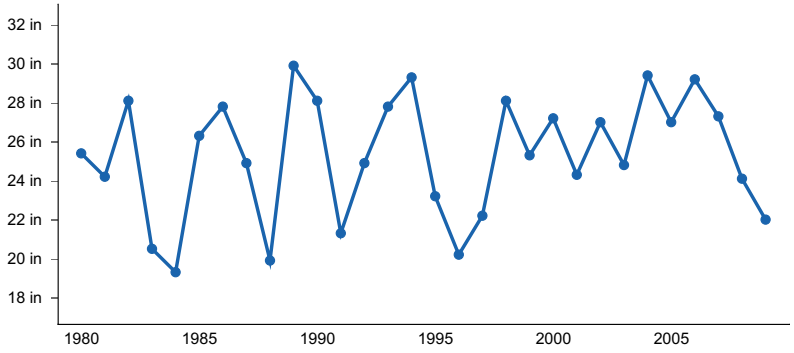


Figure 5. Annual precipitation pattern

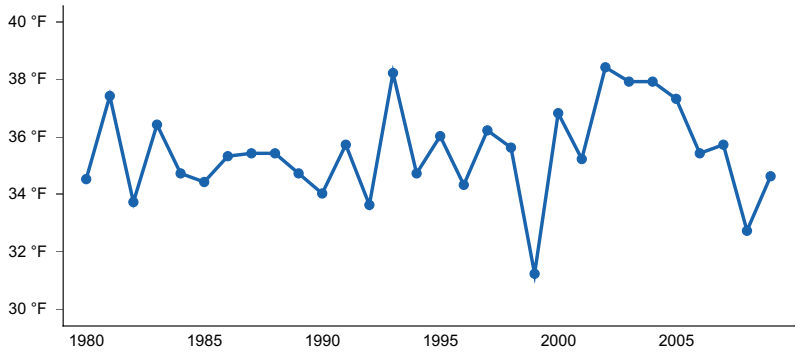


Figure 6. Annual average temperature pattern

Influencing water features

Due to its landscape position, this site is not influenced by wetland or riparian water features. Precipitation is the main source of water.

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 primarily eolian deposits over drift or till.

Vegetation is restricted by water availability and minimal soil development. Available water capacity is very low, particularly in the top ten inches of soil. Subsurface rock fragments contribute to increased water drainage. The minimally developed soil is exemplified by an ochric epipedon above a cambic horizon. Poor soil development mixed with exposed scouring restricts vegetation to primarily prostrate shrubs.

Correlated soil components in MLRA 236:
D36-Western maritime dwarf scrub gravelly glaciated slopes
D36-Western maritime dwarf scrub loamy glaciated slopes
D36-Western maritime dwarf scrub loamy eolian slopes
Stuyahok
E36-Maritime dwarf scrub-gravelly till slopes
E36-Maritime scrub-gravelly colluvial slopes

Table 5. Representative soil features

Parent material	(1) Eolian deposits (2) Drift
Surface texture	(1) Silt (2) Silt loam (3) Highly organic silt loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	1.8–2.4 in
Soil reaction (1:1 water) (0-10in)	4.5–6

Subsurface fragment volume <=3" (Depth not specified)	0–64%
Subsurface fragment volume >3" (Depth not specified)	0%

Table 6. Representative soil features (actual values)

Drainage class	Well drained
Permeability class	Moderate
Soil depth	60 in
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	0.5–2.6 in
Soil reaction (1:1 water) (0-10in)	3.3–6.2
Subsurface fragment volume <=3" (Depth not specified)	0–64%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site is on linear to convex shoulders of hills and rolling glaciated plains. Local site factors, including exposure, minimal soil development, and grazing pressures create three distinct communities on this site. The reference plant community is an open, low mesic scrubland comprised of mixed ericaceous and non-ericaceous shrubs.

Grazing is the major disturbance on this site. It is a natural disturbance and is typically unmanaged. Moderate to severe grazing by caribou on lichen decreases lichen community richness and biomass. Decreased lichen reduces competition for light and space, allowing forbs, graminoids, and extant shrubs to spread.

In rare instances, these exposed, convex areas are overgrazed and are eroded by high winds that scour and remove vegetation and soil. These areas are referred to as blowouts. Blowouts are comprised of large areas distinguished by bare soil and surface rock fragments (Sonnen, 2014). Further fieldwork is needed to investigate this disturbance on this site.

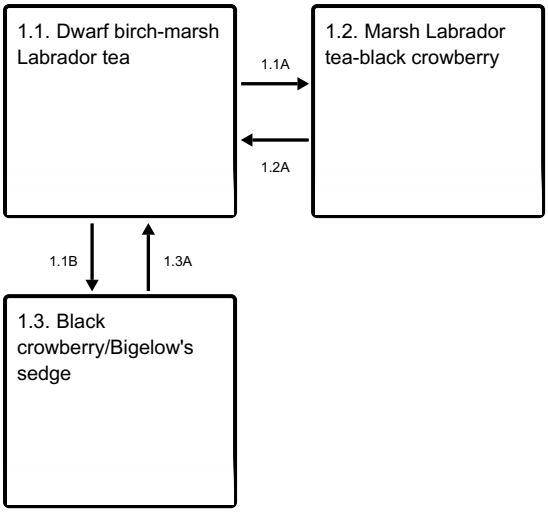
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant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

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities



1.1A - Grazing.

1.1B - Overgrazing and wind erosion.

1.2A - Decreased grazing pressure.

1.3A - Overgrazing and erosion recovery.

State 1
Reference State

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 scrubland. The presence of each community is dictated temporally by a disturbance regime of grazing and wind erosion. 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 regime that results 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
Dwarf birch-marsh Labrador tea

Figure 7. 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)
S	Dwarf birch	*Betula nana*	BENA	100	15
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100	15
S	Black crowberry	*Empetrum nigrum*	EMNI	96	15
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	96	6
S	Alpine azalea	*Loiseleuria procumbens*	LOPR	82	4
S	Alpine bearberry	*Arctostaphylos alpina*	ARAL2	78	3
L	Snow lichens	*Stereocaulon spp.*	STERE2	41	20
L	Reindeer lichens	*Cladina spp.*	CLADI3^	38	55

^ This does not include reindeer lichens (*Cladina spp.*) that were identified to the species level, including *Cladina arbuscula* (CLAR60), *Cladina rangiferina* (CLRA60), *Cladina stellaris* (CLST60), and *Cladina stygia* (CLST5).

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 8. Frequency and canopy cover of plants in community 1.1.

The reference plant community is open low scrubland (Viereck et al., 1992) that consists of low and dwarf shrubs with various dense lichens throughout. This community supports dwarf birch (*Betula nana*), marsh Labrador tea (*Ledum palustre* ssp. decumbens), black crowberry (*Empetrum nigrum*), bog blueberry (*Vaccinium uliginosum*), and lichens such as cup lichen (Cladonia spp.), reindeer lichen (Cladina spp.), and snow lichen (Stereocaulon spp.). Other species may include lingonberry (*Vaccinium vitis-idaea*), alpine azalea (*Loiseleuria procumbens*), alpine bearberry (*Arctostaphylos alpina*), Bigelow's sedge (*Carex bigelowii*), and variegated sedge (*Carex stylosa*). Individual stunted white spruce (*Picea glauca*) and quaking aspen (*Populus tremuloides*) trees may be present, but they are rare. Lichens are the major component of the ground cover. Other ground cover includes herbaceous litter, mosses, rock fragments, and woody litter. Some areas are bare soil.

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- alpine bearberry (*Arctostaphylos alpina*), shrub
- snow lichen (*Stereocaulon*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous

Community 1.2
Marsh Labrador tea-black crowberry

Figure 9. 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)
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100	10
S	Black crowberry	*Empetrum nigrum*	EMNI	94	35
S	Dwarf birch	*Betula nana*	BENA	94	10
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	94	5
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	78	15
S	Alpine azalea	*Loiseleuria procumbens*	LOPR	78	4
S	Alpine bearberry	*Arctostaphylos alpina*	ARAL2	78	2
L	Reindeer lichen	*Cladina spp.*	CLADI3^	39	25

^ This does not include reindeer lichens (*Cladina spp.*) that were identified to the species level, including *Cladina arbuscula*, *Cladina rangiferina*, *Cladina stellaris*, and *Cladina stygia*.

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 10. Frequency and canopy cover of plants in community 1.2.

The early grazing sere is open low scrubland (Viereck et al., 1992) that consists of low and dwarf shrubs with patches of graminoids and lichens. This community supports marsh Labrador tea, dwarf birch, black crowberry, and lingonberry. Other species commonly interspersed throughout include Bigelow's sedge, variegated sedge, alpine azalea, and bog blueberry. Lichens and mosses typically are present. The ground cover also commonly includes herbaceous litter, woody litter, and rock fragments. Some areas are bare soil.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- black crowberry (*Empetrum nigrum*), shrub
- dwarf birch (*Betula nana*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- alpine bearberry (*Arctostaphylos alpina*), shrub
- reindeer lichen (*Cladina*), other herbaceous

Community 1.3
Black crowberry/Bigelow's sedge

Figure 11. 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)
S	Black crowberry	*Empetrum nigrum*	EMNI	100	7
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	100	4
S	Dwarf birch	*Betula nana*	BENA	100	3
S	Alpine azalea	*Loiseleuria procumbens*	LOPR	75	5
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	75	2
G	Bigelow's sedge	*Carex bigelowii*	CABI5	100	2

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 12. Frequency and canopy cover of plants in community 1.3.

This highly disturbed community consists of large areas that have rock fragments on the surface and patches of low and dwarf shrubs. Black crowberry, alpine azalea, marsh Labrador tea, dwarf birch, Bigelow's sedge, and a small amount of other low and dwarf shrubs may be present. The ground cover includes rock fragments, lichens, mosses, and herbaceous litter. About 9 percent is bare soil.

Dominant plant species

- black crowberry (*Empetrum nigrum*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- Bigelow's sedge (*Carex bigelowii*), grass

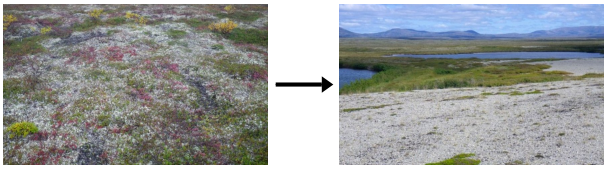
Pathway 1.1A
Community 1.1 to 1.2

Dwarf birch-marsh Labrador tea

Marsh Labrador tea-black crowberry

Grazing. Grazing of lichen by caribou can create open areas for graminoids and low-lying shrubs to colonize (K. Sonnen, 2014). The period needed for this transition currently is unknown, but it likely is dictated by the intensity and frequency of grazing.

Pathway 1.1B
Community 1.1 to 1.3



Dwarf birch-marsh Labrador tea

Black crowberry/Bigelow's sedge

Overgrazing and wind erosion. Rarely, the community may be susceptible to wind erosion as a result of severe grazing in the exposed convex areas. Scouring of the soil and vegetation by wind may expose surface rock fragments (K. Sonnen, 2014). The period needed for this transition currently is unknown.

Pathway 1.2A

Community 1.2 to 1.1

Marsh Labrador tea-black crowberry

Dwarf birch-marsh Labrador tea

Decreased grazing pressure. Over time, the populations of lichen will increase and the lichen will slowly outcompete shrubs for space (Sonnen, 2014). Based on the known growth rate of lichen, this transition is expected to be very slow.

Pathway 1.3A
Community 1.3 to 1.1

Black crowberry/Bigelow's sedge

Dwarf birch-marsh Labrador tea

For community phase 1.3 to return to the reference community phase, soil formation must be initiated by eolian processes and plant senescence. The colonization and spread of lichens, mosses, graminoids, and forbs may increase as soil formation continues. The period needed for this transition is expected to be very long. It is estimated that 50 to 75 years (Sonnen, 2014) is needed for soil formation to begin, but the period needed for this phase to return to the reference community phase is unknown.

Additional community tables

Inventory data references

Modal points for Community 1.1
07MM05201
07MM05303
07MM05305
07SS01805
07SS04502
07AO21701
10SS12102
10SS12401

Modal points for community 1.2
07MM22204
07AO02303
08AO05601
08AO06401
09AO03506
10SS13309

Modal points for community 1.3
07CS00601
09SS13903
10SS08905

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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:**

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:

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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:**
