# Ecological site R237XY210AK
# Western Alaska Maritime Scrubland Gravelly Flood Plains

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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): 237X–Ahklun Mountains

The Ahklun Mountains Major Land Resource Area (MLRA 237) is in western Alaska (fig. 2). This MLRA covers approximately 14,555 square miles, and it includes the mountains, hills, and valleys of the Kilbuck Mountains in the north and the Ahklun Mountains in the south. Except for the Kilbuck Mountains and the highest ridges of the Ahklun Mountains, the MLRA was extensively glaciated during the Pleistocene (Kautz et al., 2004). Today, a few small glaciers persist in mountainous cirques (Gallant et al., 1995). The present-day landscape and landforms reflect this glacial history; glacial moraines and glacial drift cover much of the area (USDA-NRCS, 2006). The landscape of the MLRA is primarily defined by low, steep, rugged mountains cut by narrow-to-broad valleys. Flood plains and terraces of varying sizes are common at the lower elevations in the valley bottoms. Glacially carved valleys host many lakes. Togiak Lake is one of the largest lakes in the region. It is 13 miles long and about 9,500 acres in size. Major rivers include the Goodnews, Togiak, Kanektok, Osviak, Eek, and Arolik Rivers. Where the Goodnews and Togiak Rivers reach the coast, the nearly level to rolling deltas support numerous small lakes.

This MLRA has two distinct climatic zones: subarctic continental and maritime continental (fig. 3). The high-elevation areas are in the subarctic continental zone. The mean annual precipitation is more than 75 inches, and the mean annual air temperature is below about 27 degrees F (-3 degrees C) in extreme locations. The warmer, drier areas at the lower elevations are in the maritime continental zone. The mean annual precipitation is 20 to 50 inches, and the mean annual air temperature is about 30 to 32 degrees F (-0.2 to 1.2 degrees C) (PRISM). This climatic zone is influenced by both maritime and continental factors. The temperatures in summer are moderated by the open waters of the Bering Sea, and the temperatures in winter are more continental due to the presence of ice in the sea (Western Regional Climate Center, 2017). The seasonal ice reaches its southernmost extent off the coast of Alaska in Bristol Bay (Alaska Climate Research Center, 2017). The western coast of Alaska is also influenced by high winds from strong storms and airmasses in the Interior Region of Alaska (Hartmann, 2002).

The Ahklun Mountains MLRA is principally undeveloped wilderness. Federally managed lands include the Togiak and Alaska Maritime National Wildlife Refuges. The MLRA is sparsely populated, but it has several communities, including Togiak, Manokotak, Twin Hills, and Goodnews Bay. Togiak is the largest village. It has a population of approximately 855, most of which are Yup’ik Alaska Natives (U.S. Census Bureau, 2016). Major land uses include subsistence activities (fishing, hunting, and gathering) and wildlife recreation (USDA-NRCS, 2006; Kautz et al., 2004).

## Ecological site concept

Ecological site R237XY210AK is on low flood plains confined by steep escarpments or mountainsides. The site is subject to frequent (more than 50 times in 100 years), very brief periods (4 to 48 hours) of flooding. The associated soils are moderately well drained. The reference state has two community phases related to flooding. An alternate state is related to beaver activity.

The reference plant community is open tall scrubland (fig. 1; Viereck et al., 1992) that consists dominantly of

facultative or obligate wetland species. The community is dominantly dense willows such as tealeaf willow (*Salix pulchra*), Barclay's willow (*S. barclayi*), grayleaf willow (S. glauca), and Bebb willow (S. bebbiana) and an understory of hydrophilic, shade-tolerant shrubs, graminoids, and forbs. These include Canadian burnet (*Sanguisorba canadensis*), shrubby cinquefoil (Dasiphora fruticosa), field horsetail (*Equisetum arvense*), and bluejoint (*Calamagrostis canadensis*).

## Associated sites

| | |
|---|---|
| R237XY212AK | **Western Alaska Maritime Scrubland Silty Flood Plains**<br>Ecological site R237XY210AK is dominantly on low flood plains throughout the Ahklun Mountains area. Other ecological sites on flood plains are distinguished by differences in elevation, disturbance, associated soils, and the type and amount of plants. These sites include R237XY211AK, R237XY212AK, and F237XY216AK. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut. |
| R237XY226AK | **Western Alaska Maritime Grassland Peat Flood Plains, Depression**<br>Ecological site R237XY226AK is in depressions of flood plains and is associated with site R237XY210AK. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut. |
| R237XY211AK | **Western Alaska Maritime Scrubland Loamy Flood Plains**<br>Ecological site R237XY210AK is dominantly on low flood plains throughout the Ahklun Mountains area. Other ecological sites on flood plains are distinguished by differences in elevation, disturbance, associated soils, and the type and amount of plants. These sites include R237XY211AK, R237XY212AK, and F237XY216AK. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut. |

## Similar sites

| | |
|---|---|
| R237XY212AK | **Western Alaska Maritime Scrubland Silty Flood Plains**<br>Several ecological sites in the Ahklun Mountains area support a reference plant community characterized as willow scrubland. Although these sites may have plant communities similar to those of site R237XY210AK, the sites are differentiated by the soils, disturbance regimes, and reference state communities. Site R237XY212AK is on broad flood plains that are subject to a different frequency and duration of flooding than are the flood plains of site R237XY210AK. These broad flood plains also are associated with different soils. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut. |
| F237XY216AK | **Boreal Woodland Loamy Flood Plains**<br>Several ecological sites in the Ahklun Mountains area support a reference plant community characterized as willow scrubland. Although these sites may have plant communities similar to those of site R237XY210AK, the sites are differentiated by the soils, disturbance regimes, and reference state communities. Site F237XY216AK is correlated to different soils and is subject to a different disturbance regime. The reference plant community in this site is noticeably different than that of site R237XY210AK. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut. |
| R237XY211AK | **Western Alaska Maritime Scrubland Loamy Flood Plains**<br>Several ecological sites in the Ahklun Mountains area support a reference plant community characterized as willow scrubland. Although these sites may have plant communities similar to those of site R237XY210AK, the sites are differentiated by the soils, disturbance regimes, and reference state communities. Site F237XY211AK is correlated to different soils and is subject to a different disturbance regime. The reference plant community in this site is noticeably different than that of site R237XY210AK. Ecotonal plant communities that have characteristics from more than one ecological site are in areas where these sites abut. |

**Figure 1. The reference plant community is an open tall scrubland. Very dense willow is in some areas.**

**Table 1. Dominant plant species**

| | |
|---|---|
| Tree | Not specified |
| Shrub | (1) *Salix pulchra*<br>(2) *Salix barclayi* |
| Herbaceous | (1) *Calamagrostis canadensis*<br>(2) *Equisetum arvense* |

## Physiographic features

Site characteristics specifically relate to the reference plant community phase. Each ecological site has a specific set of site characteristics and disturbance dynamics that results in a unique plant community composition, structure, and function. Site characteristics (climate, geology, topography, and soil characteristics) are dynamic across a landscape. Subtle changes in site characteristics can result in a different plant community phase or ecological site. Definitions of site characteristics are provided in the United States Department of Agriculture Handbook 296 (USDA-NRCS, 2006), Geomorphic Description System (Schoeneberger and Wysocki, 2012), Field Book for Describing and Sampling Soils (Schoeneberger et al., 2012), and Soil Survey Manual (Soil Science Division Staff, 2017).

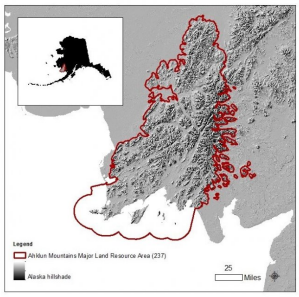


**Figure 2. The Ahklun Mountains area (MLRA 237) is in western Alaska.**

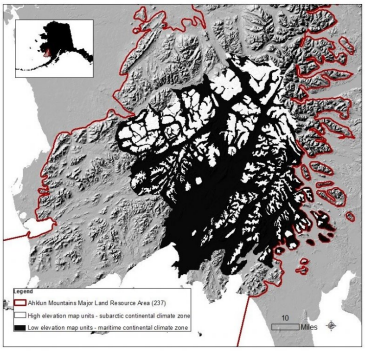


**Figure 3. High-elevation and low-elevation map units in the area, which illustrate the primary climatic influence.**

**Table 2. Representative physiographic features**

| | |
|---|---|
| Slope shape across | (1) Linear |
| Slope shape up-down | (1) Linear |
| Geomorphic position, flats | (1) Talf |
| Landforms | (1) Plains > Flood plain |
| Flooding duration | Very brief (4 to 48 hours) |
| Flooding frequency | Frequent |
| Ponding frequency | None |
| Elevation | 15–230 ft |
| Slope | 0–4% |
| Water table depth | 1–40 in |
| Aspect | W, NW, N, NE, E, SE, S, SW |

## Climatic features

Climate of land resource region (LLR): Maritime continental (Western Regional Climate Center, 2017); short, warm summers and long, cold winters (USDA-NRCS, 2006)

Climate of major land resource area (MLRA): Maritime continental in the lowlands and subarctic continental at higher elevations. The mean annual precipitation is 20 to 30 inches in the lowlands, and it increases to more than 45 inches at the higher elevations. The mean annual air temperature along the coast is about 34 degrees F (1 degree C) (PRISM, 2014). Strong winds are common throughout the year.

**Table 3. Representative climatic features**

| | |
|---|---|
| Frost-free period (characteristic range) | 70-135 days |
| Freeze-free period (characteristic range) | |
| Precipitation total (characteristic range) | |

## Influencing water features

Flooding

Flooding is the primary disturbance in the reference state. Flooding can create barren, moist areas ideal for colonization of new plants. Floods bury organic layers, add nutrients to the soil, deposit seed banks, and decrease

competition for light and space (Rood et al., 2007; Yarie et al., 1998). This ecological site is subject to frequent, very brief periods of flooding that greatly affect the distribution and abundance of vegetation in Alaska riverine systems (Wohl, 2007).

Field observations indicate that specific areas of this ecological site are subject to more frequent or severe periods of flooding than are other areas. Areas adjacent to the source of the floodwater undergo longer, more frequent periods of flooding. These areas typically support community 1.2. As the frequency and duration of flooding decreases, willow increases. Reference plant community 1.1 is in these areas.

Water Table Influences

The soils associated with this site are moderately well drained. During the early part of the growing season (May), the water table is at a very shallow depth (less than 10 inches). During the remainder of the growing season (June through August), the water table is at a moderate depth (20 to 40 inches). During heavy rains in fall (September and October), the water table generally rises again to a very shallow depth. Because of the depth to and persistence of the water table, wetland indicator plants are common in the reference state.

## Soil features

The Awayak soils are correlated to this ecological site. The saturated hydraulic conductivity is moderately high to a depth of 3 inches and very high below that depth. Reaction is moderately acid to neutral (pH 5.6 to 7.3).

**Table 4. Representative soil features**

| | |
|---|---|
| Drainage class | Moderately well drained |

## Ecological dynamics

Site R237XY210AK is dominantly on low flood plains confined by steep escarpments or mountainsides. The reference state supports the reference plant community and a distinct early flooding sere. These communities are shaped by the frequent, very brief periods of flooding, the moderately well drained soils, and the high water table during the growing season. Both communities of the reference state support facultative or obligate wetland species such as willows and hydrophilic graminoids and forbs (fig. 1).

Disturbance Dynamics

Flooding
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Beaver-Affected Areas
The sporadic presence of beavers in this ecological site can cause a vegetative shift to an alternate state. This shift is caused by a change in the water table and disturbance regime and the removal of certain shrubs for use as food

and construction material.

Other Observations
Browsing by moose on willow was documented in this ecological site. Browsing may occur during any season, but it is most common in winter. Moose browsing does not appear to significantly alter the vegetative community so an early browse sere is not needed.

One alternate state was observed in this ecological site. Beaver activity, particularly construction of dams, restructures the plant communities on these flood plains. Beavers are an introduced species in the Ahklun Mountains area, so their affect on this ecological site has not been researched fully.

## State and transition model

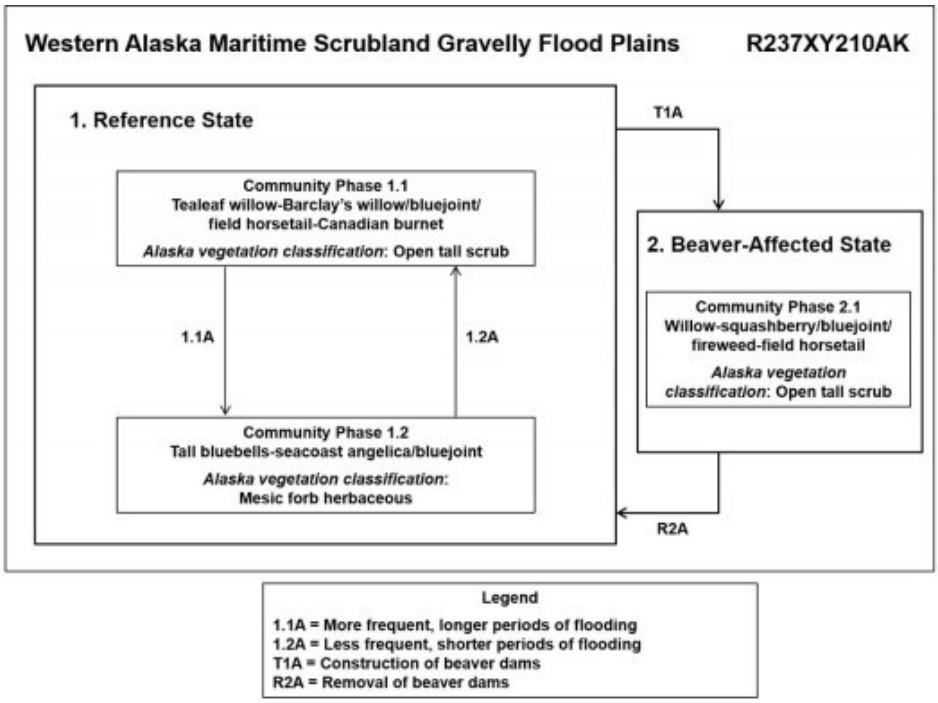



**Figure 4. State-and-transition model.**

## State 1
## Reference State

The reference state supports two community phases that are distinguished by the developed structure and dominance of the vegetation and the ecological function and stability of the community (fig. 4). The reference community phase consists of willows, graminoids, and forbs. The presence of the communities is spatially dictated by the flooding regime. This report provides baseline vegetation inventory data. 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
## Tealeaf willow-Barclay's willow/bluejoint/field horsetail-Canadian burnet (Salix pulchra-Salix barclayi/Calamagrostis canadensis/Equisetum arvense-Sanguisorba canadensis)

**Figure 5. Typical area of plant community 1.1.**

Community Phase 1.1 Canopy Cover Table

Vegetation data are aggregated across modal sample plots for this community phase and are provided as a frequency (percent) and mean canopy cover (percent) of the dominant and most 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 | Willow^ | *Salix* spp. | SALIX | 100 | 60 (30-95) |
| S | Tealeaf willow | *Salix pulchra* | SAPU15 | 80 | 20 (0-50) |
| S | Shrubby cinquefoil | *Dasiphora fruticosa* | DAFR3 | 60 | 6 (0-25) |
| S | Barclay's willow | *Salix barclayi* | SABA3 | 40 | 25 (0-95) |
| S | Grayleaf willow | *Salix glauca* | SAGL | 40 | 5 (0-15) |
| S | Bebb willow | *Salix bebbiana* | SABE2 | 40 | 3 (0-10) |
| G | Bluejoint | *Calamagrostis canadensis* | CACA4 | 100 | 25 (7-85) |
| F | Field horsetail | *Equisetum arvense* | EQAR | 100 | 4 (0.1-10) |
| F | Canadian burnet | *Sanguisorba canadensis* | SACA14 | 80 | 7 (0-20) |
| F | Ledge stonecrop | *Rhodiola integrifolia* | RHIN11 | 60 | 2 (0-7) |
| F | Woolly geranium | *Geranium erianthum* | GEER2 | 60 | 1 (0-3) |
| F | Fireweed | *Chamerion angustifolium* | CHAN9 | 40 | 2 (0-10) |
| F | Tall Jacob's-ladder | *Polemonium acutiflorum* | POAC | 40 | 1 (0-5) |
| B | Schreber's big red stem moss | *Pleurozium schreberi* | PLSC70 | 40 | 15 (0-35) |

^Willow includes all willow species, including tealeaf, Barclay's, and grayleaf willows.

This dataset includes data from five 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

Canopy cover data are based on ocular estimates and rounded, except trace (0.1 percent) cover. Data ranging from 1 to 9 percent cover are rounded to the nearest integer. Data ranging from 10 to 100 percent cover are rounded to the nearest factor of 5.

**Figure 6. Canopy cover and frequency of species in community 1.1.**

The reference plant community is characterized as open tall scrub (fig. 5) (Viereck et al., 1992). The major plant strata are medium shrubs (3 to 10 feet in height), medium forbs (4 to 24 inches), and tall graminoids (more than 24 inches) (fig. 6). This community supports one or more species of willow, including tealeaf willow, Barclay's willow, and grayleaf willow. Shrubby cinquefoil is throughout, and bluejoint is dominant in the understory. Various hydrophilic, shade-tolerant forbs are common, including Canadian burnet, field horsetail, fireweed (*Chamerion angustifolium*), tall Jacob's-ladder (*Polemonium acutiflorum*), woolly geranium (*Geranium erianthum*), and common yarrow (*Achillea millefolium*). The ground cover includes herbaceous litter and moss, woody litter, and sporadic areas of water. Some areas are bare soil.

## Community 1.2
## Tall bluebells-seacoast angelica/bluejoint (Mertensia paniculata-Angelica lucida/Calamagrostis canadensis)

**Figure 7. Typical area of plant community 1.2.**

Community Phase 1.2 Canopy Cover Table

Vegetation data are aggregated across modal sample plots for this community phase and are provided as a frequency (percent) and mean canopy cover (percent) of the dominant and most ecologically relevant species.

| Plant group | Common name | Scientific name | USDA plant code | Frequency (percent) | Mean canopy cover (percent) |
|---|---|---|---|---|---|
| G | Bluejoint | *Calamagrostis canadensis* | CACA4 | 100 | 15 |
| G | Bentgrass | *Agrostis* spp. | AGROS2 | 100 | 3 |
| F | Tall bluebells | *Mertensia paniculata* | MEPA | 100 | 20 |
| F | Seacoast angelica | *Angelica lucida* | ANLU | 100 | 10 |
| F | Canadian burnet | *Sanguisorba canadensis* | SACA14 | 100 | 7 |
| F | Willowherb | *Epilobium* spp. | EPILO | 100 | 7 |
| F | Dandelion | *Taraxacum* spp. | TARAX | 100 | 3 |
| F | Northern bedstraw | *Galium boreale* | GABO2 | 100 | 2 |
| F | Ragwort | *Senecio* spp. | SENEC | 100 | 2 |
| F | Larkspurleaf monkshood | *Aconitum delphiniifolium* | ACDE2 | 100 | 1 |

This dataset includes data from one sample plot. Due to the limited data available for this plant community phase, personal field observations were used to aid in describing the community.

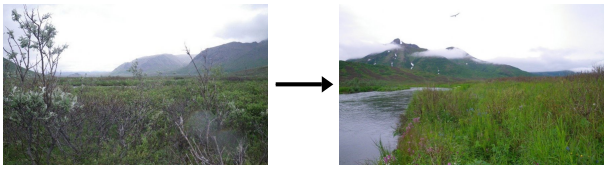
Plant functional group classifications—T = trees, S = shrubs, G = graminoids, F = forbs, B = bryophytes, L = lichens

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

**Figure 8. Canopy cover and frequency of species in community 1.2.**

This community is characterized as mesic forb herbaceous (fig. 7) (Viereck et al., 1992). The major vegetative strata are medium forbs (4 to 24 inches in height), tall forbs (more than 24 inches), tall graminoids (more than 24 inches), and mosses (fig. 8). This community supports a wide variety of forbs. The most common are tall bluebells (*Mertensia paniculata*), seacoast angelica (*Angelica lucida*), Canadian burnet, willowherbs (Epilobium spp.), larkspurleaf monkshood (*Aconitum delphiniifolium*), and common yarrow (*Achillea millefolium*). Bluejoint typically is the dominant graminoid species, although woodrushes (Luzula spp.) and bentgrasses (Agrostis spp.) are common. Colonizing willow or individual shrubs are present. The ground cover consists of herbaceous litter, mosses, water, and rock fragments. Some areas are bare soil.

## Pathway 1.1A
## Community 1.1 to 1.2

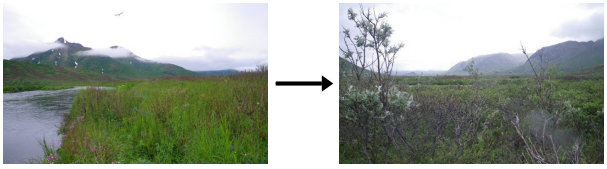


**Tealeaf willow-Barclay's willow/bluejoint/field horsetail-Canadian burnet (Salix pulchra-Salix barclayi/Calamagrostis canadensis/Equisetum arvense-Sanguisorba canadensis)**

**Tall bluebells-seacoast angelica/bluejoint (Mertensia paniculata-Angelica lucida/Calamagrostis canadensis)**

More frequent, longer periods of flooding. Areas close to the source of the floodwater are subject to more powerful flooding events and more frequent periods of flooding than are distal areas. Frequent flooding can scour vegetation and soil.

## Pathway 1.2A
## Community 1.2 to 1.1



**Tall bluebells-seacoast angelica/bluejoint (Mertensia paniculata-Angelica lucida/Calamagrostis canadensis)**

**Tealeaf willow-Barclay's willow/bluejoint/field horsetail-Canadian burnet (Salix pulchra-Salix barclayi/Calamagrostis canadensis/Equisetum arvense-Sanguisorba canadensis)**

Less frequent, shorter periods of flooding. Areas distal from the floodwater source experience less powerful and less frequent periods of flooding.

## State 2
## Beaver-Affected State

This alternative state is the result of beaver activity. Beavers (Castor canadensis) directly kill shrubs for food and dam material and also indirectly kill these and other species by raising the water table (USDA-Forest Service, 2013). Soil shifts caused by beavers (pond sediments versus alluvium) can cause spatial and temporal changes in willow establishment, further leading to changes in community structure (Wolf et al., 2007). The alternate state typically surrounds the beaver ponds or is upstream from them. Beaver dams change the disturbance regime from flooding to ponding. Ponding creates a vegetative community that is different from those of the reference state. This vegetative shift is highlighted by a taller, more diverse shrub community that has a more species-rich understory of facultative to wetland forbs than does the reference plant community (1.1). Moderate browsing of willow by moose and/or caribou has been observed in this community.

### Community 2.1
### Willow-squashberry/bluejoint/fireweed-field horsetail (Salix spp.-Viburnum edule/Calamagrostis canadensis/Chamerion angustifolium-Equisetum arvense)

**Figure 9. Typical plant community near beaver dams.**

Community 2.1 Canopy Cover Table

tation data is aggregated across modal sample plots for this community phase and is provide
uency (percent) and mean canopy cover (percent) of the most dominant and ecologically rele
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 | Willow^ | *Salix spp.* | SALIX | 100 | 55 |
| S | Squashberry | *Viburnum edule* | VIED | 100 | 15 |
| G | Bluejoint | *Calamagrostis canadensis* | CACA4 | 100 | 20 |
| F | Fireweed | *Chamerion angustifolium* | CHAN9 | 100 | 10 |
| F | Canadian burnet | *Sanguisorba canadensis* | SACA14 | 100 | 10 |
| F | Field horsetail | *Equisetum arvense* | EQAR | 100 | 10 |
| F | Arctic raspberry | *Rubus arcticus* | RUAR | 100 | 5 |
| F | Seacoast angelica | *Angelica lucida* | ANLU | 100 | 5 |
| F | Canada goldenrod | *Solidago canadensis* var. *lepida* | SOCAL | 100 | 5 |
| F | Arctic starflower | *Trientalis europaea* | TREU | 100 | 3 |

^ Willow (*Salix spp.*) includes all willows species recorded in this community.

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al field observations were used to aid in describing this plant community.
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t) cover. Data ranging from 1 to 9 percent cover is rounded to the nearest integer. Data rangi
0 to 100 percent cover is rounded to the nearest factor of 5.

**Figure 10. Canopy cover and frequency of species in community 2.1.**

This community is open tall scrub (fig. 9; Viereck et al., 1992). The major vegetative strata are medium forbs (4 to 24 inches in height), medium shrubs (3 to 10 feet), and tall shrubs (more than 10 feet) (fig. 10). Willows include grayleaf willow, tealeaf willow, feltleaf willow (*S. alaxensis*), and littletree willow (*S. arbusculoides*). Squashberry (*Viburnum edule*) may be present. The understory consists of bluejoint and a wide variety of forbs including fireweed, Canadian burnet, field horsetail, arctic starflower (*Trientalis europaea*), Canada goldenrod (*Solidago canadensis* var. lepida), and common cowparsnip (*Heracleum maximum*). The ground cover typically includes herbaceous and woody litter, moss, and water.

## Transition T1A
## State 1 to 2

This transition is caused by beavers damming a water source. Areas surrounding beaver ponds support plant assemblages distinct from those of the reference state. This vegetative community is comprised of species that are water tolerant and can grow and reproduce in wet soils. The time required for this transition to occur is dependent on the presence and activity of beavers.

## Restoration pathway R2A
## State 2 to 1

Currently, it is unknown whether an area will return to the reference state if a beaver dam is removed. Factors such as the duration of the dam and shifts in hydrology shifts may determine whether this process can occur naturally or would require human intervention. More observation is needed to determine the vegetative effects of dam removal.

## Additional community tables

## Other references

Alaska Climate Research Center. 2017. Climatological data–Bristol Bay. http://oldclimate.gi.alaska.edu. Accessed September 19, 2017.

Gallant, A.l., E.F. Binnian, J.M. Omernik, and M.B. Shasby. 1995. Ecoregions of Alaska. U.S. Geological Survey Professional Paper 1567. Government Printing Office, Washington, D.C.

Hartmann, B. 2002. Climate regions of Alaska. The Alaska Climate Research Center. http://oldclimate.gi.alaska.edu/ClimTrends/30year/regions1.html. Modified August 28, 2002. Accessed September 19, 2017.

Kautz, D.R., P. Taber, and S. Nield (editors). 2004. Land resource regions and major land resource areas of Alaska. U.S. Department of Agriculture, Natural Resources Conservation Service, Palmer, AK. Revised 2012.

PRISM Climate Group. 2014. PRISM climate data. Oregon State University. http://prism.oregonstate.edu. Accessed March 27, 2018.

Rood, S.B., L.A. Goater, J.M. Mahoney, C.M. Pearce, and D.G. Smith. 2007. Floods, fire, and ice: Disturbance ecology of riparian cottonwoods. Canadian Journal of Botany 85(11): 1,019-1,032.

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

Schoeneberger, P.J., D.A. Wysocki, E.C. Benham, and Soil Survey Staff. 2012. Field book for describing and sampling soils. Version 3.0. U.S. Department of Agriculture, Natural Resources Conservation Service, National Soil Survey Center, Lincoln, NE.

Soil Science Division Staff. 2017. Soil survey manual. Ditzler, C., K. Scheffe, and H.C Monger, editors. U.S. Department of Agriculture Handbook 18. Government Printing Office, Washington, D.C.

U.S. Census Bureau. 2016. Vintage 2016 population estimates: Population estimates. https://www.census.gov. Accessed August 14, 2017.

U.S. Department of Agriculture, Forest Service, Alaska Region. 2013. Forest health conditions in Alaska - 2012. Publication R10-PR-32.

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

Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wezlick. 1992. The Alaska vegetation classification. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station General Technical Report PNW-GTR-286. Portland, OR.

Western Regional Climate Center. 2017. Climate of Alaska. http://wrcc.dri.edu. Accessed September 19, 2017.

Wohl, E.E. 2007. Review of effects of large floods in resistant-boundary channels. In Gravel-Bed Rivers VI: From Process Understanding to River Restoration, Volume 11. H. Habersack, H. Piégay, and M. Rinaldi, editors. Elsevier Science, Amsterdam. Pages 181-211.

Wolf, E.C., D.J. Cooper, and N.T. Hobbs. 2007. Hydrological regime and herbivory stabilize an alternative state in Yellowstone National Park. Ecological Applications 17(6): 1572-1587.

Yarie, J., L. Viereck, K. Van Cleve, and P. Adams. 1998. Flooding and ecosystem dynamics along the Tanana River. BioScience 48(9): 690-695.

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## Approval

Michael Margo, 7/23/2020

## 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 | 05/11/2025 |
| 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:**