Ecological site R237XY219AK
Western Alaska Maritime Dwarf Scrubland Gravelly Slopes, Very Steep

Last updated: 7/23/2020
Accessed: 04/28/2024

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): 237X–Ahklun Mountains

The Ahklun Mountains Major Land Resource Area (MLRA 237) is in western Alaska (fig. 3). 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. 4). 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 R237XY219AK is associated with shallow, gravelly soils on steep, upper backslopes of mountains. Climate, landform, elevation, slope, and soil characteristics combine to create a unique ecological site. The reference state supports two plant communities, including the reference plant community and an early community phase created by erosion. An alternate state is caused by massive landslides.

The reference plant community is Dryas dwarf scrubland (Viereck et al., 1992). Shrub species include eightpetal

mountain-avens (*Dryas octopetala*) and black crowberry (*Empetrum nigrum*). Forbs and graminoids typically are throughout and include sedges (Carex spp.), hairgrasses (Deschampsia spp.), narcissus anemone (*Anemone narcissiflora*), and heartleaf saxifrage (*Saxifraga nelsoniana*).

Similar sites

R237XY204AK	**Western Alaska Maritime Scrubland Loamy Slopes** Several ecological sites in the Ahklun Mountains area support a reference community consisting of low and dwarf shrubs similar to those of site R237XY219AK. Ecological site R237XY204AK supports some of the same species, but site R237XY219AK is at much higher elevations and supports distinct alpine plants typically not in site R237XY204AK. Differences in landform and related disturbance regimes create unique vegetative communities that require separate ecological sites.
R237XY217AK	**Western Alaska Maritime Dwarf Scrubland Gravelly Slopes, High Elevation** Several ecological sites in the Ahklun Mountains area support a reference community consisting of low and dwarf shrubs similar to those of site R237XY219AK. Site R237XY217AK may support plants similar to those in site R237XY219AK; however, site R237XY217AK is on different mountain landforms. Differences in landform and related disturbance regimes create unique vegetative communities that require separate ecological sites.
R237XY218AK	**Western Alaska Maritime Dwarf Scrubland Gravelly Slopes, Concave** Several ecological sites in the Ahklun Mountains area support a reference community consisting of low and dwarf shrubs similar to those of site R237XY219AK. Site R237XY218AK may support plants similar to those in site R237XY219AK; however, site R237XY218AK is on different mountain landforms. Differences in landform and related disturbance regimes create unique vegetative communities that require separate ecological sites.

Figure 1. The reference plant community is on steep, upper backslopes of mountains.

Figure 2. A massive landslide spread downslope and across a mountain valley (Walsh, 2014b).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Dryas octopetala* (2) *Empetrum nigrum*
Herbaceous	(1) *Carex* (2) *Anemone narcissiflora*

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).

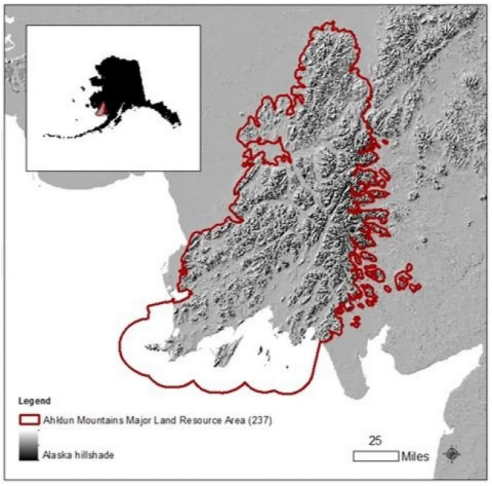

Figure 3. The Ahklun Mountains area (MLRA 237) is in western Alaska.

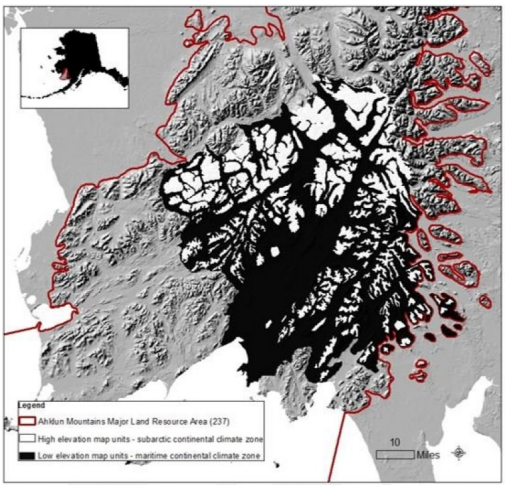

Figure 4. High-elevation and low-elevation map units in the area, which illustrate the primary climatic influence.

Table 2. Representative physiographic features

Slope shape across	(1) Convex
Slope shape up-down	(1) Linear
Geomorphic position, mountains	(1) Upper third of mountainflank (2) Center third of mountainflank
Landforms	(1) Mountains > Mountain slope

Flooding frequency	None
Ponding frequency	None
Elevation	660–4,590 ft
Slope	30–85%
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)	60-115 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	

Influencing water features

Soil features

There are two documented soils correlated with this ecological site.

The Highlake soil is extremely gravelly, somewhat excessively drained, and moderately deep to lithic bedrock. The characteristics of Highlake are described in the tables below.

R237XY219AK is correlated with E37-Maritime dwarf scrub-gravelly colluvial slopes. This is a STATSGO-level soil component that covers the same mountain landforms as Highlake but in areas mapped at a larger scale (NRCS mapping order 5).

Table 4. Representative soil features

Drainage class	Somewhat excessively drained
Depth to restrictive layer	20–40 in

Ecological dynamics

Ecological site R237XY219AK is on steep upper backslopes in the Ahklun Mountains area (fig. 1). Various ecological sites are on mountains. Sites R237XY204AK, R237XY202AK, and R237XY205AK are backslopes and footslopes. Sites R237XY217AK, R237XY206AK and R237XY219AK are in high-elevation, alpine areas. Site R237XY217AK is on alpine summits and shoulders, and site R237XY206AK is in upper drainageways.

Site R237XY219AK is defined by landform shape, slope, and soil characteristics. Alpine and subalpine dwarf shrubs are dominant. The soils exhibit minor development and are extremely gravelly and moderately deep to bedrock. Nitrogen-fixing plants such as mountain-avens (Dryas spp.) are common. These plants colonize barren areas and add nitrogen to the soil (Crocker and Major, 1955), which creates suitable conditions for seeds of alpine and subalpine forbs and graminoids. Alder (Alnus spp.) is a common nitrogen-fixing colonizer on many mountain slopes, but it is not at these high elevations.

Disturbance Dynamics

Erosion
Landslides are the major disturbance in this ecological site. Small-scale events can remove varying amounts of the existing vegetation. This disturbance results in one early community phase. Recently disturbed areas are stable enough to support fragmented patches of vegetation and provide for new colonization. The plant species in areas of post-erosion recovery can differ significantly from those in the reference plant community.

Wind Exposure
These steep, high-elevation slopes are exposed to high winds. Although this disturbance does not result in an early community phase, it can dictate the plants that can colonize by dispersing airborne seeds and scouring plants and soil.

Other Observations
A nonvegetated alternate state is in areas where massive landslides have created unstable talus slopes. This state is synonymous with the nonvegetated miscellaneous areas of the Ahklun Mountains area.

State and transition model

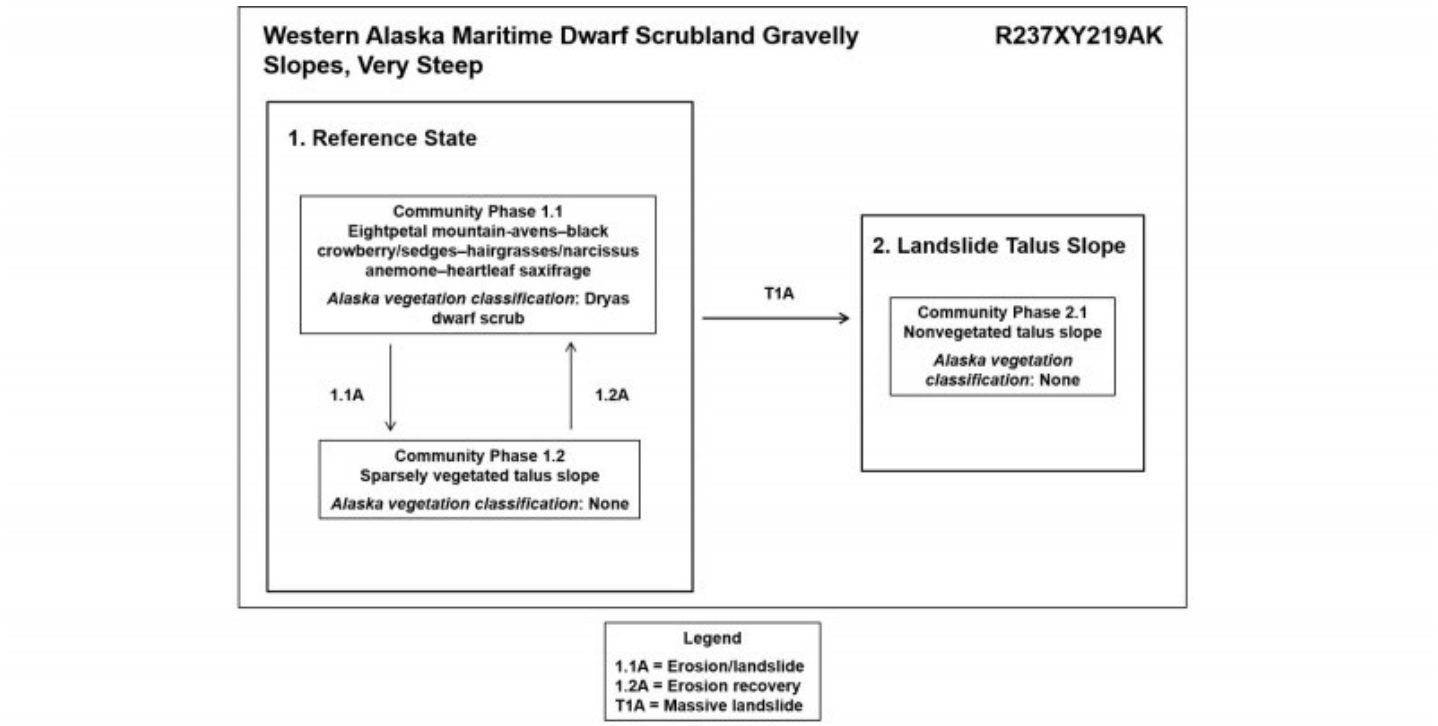

Figure 5. State-and-transition model.

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. 5). The reference community phase is scrubland consisting of shrubs, forbs, and graminoids. This report provides baseline vegetation inventory data. Future data collection is needed to provide more information about existing plant communities and the disturbance regimes that would result in transitions from one community to another. Common and scientific plant names are from the USDA PLANTS database. All community phases are characterized by the Alaska Vegetation Classification System (Viereck et al., 1992).

Community 1.1
Eightpetal mountain-avens–black crowberry/sedges–hairgrasses/narcissus anemone–heartleaf saxifrage (Dryas octopetala–Empetrum nigrum/Carex spp.–Deschampsia spp./Anemone narcissiflora–Saxifraga nelsoniana)

Figure 6. Typical area of the reference plant community on a steep, upper backslope in the Ahklun Mountains area.

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	Eightpetal mountain-avens	*Dryas octopetala*	DROC	50	20 (0-40)
S	Black crowberry	*Empetrum nigrum*	EMNI	50	8 (0-15)
G	Sedge	*Carex* spp.	CAREX	100	6 (3-8)
G	Hairgrass	*Deschampsia* spp.	DESCH	50	5 (0-10)
F	Narcissus anemone	*Anemone narcissiflora*	ANNA	50	4 (0-7)
F	Heartleaf saxifrage	*Saxifraga nelsoniana*	SANE3	50	3 (0-5)

This dataset includes data from two sample plots. The plots are distributed across the Ahklun Mountains area and are independent of one another. 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 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 7. Canopy cover and frequency of species in community 1.1.

The reference plant community is characterized by Dryas dwarf scrub (fig. 6) (Viereck et al., 1992). The major plant strata are dwarf shrubs (less than 8 inches in height), mosses, medium graminoids (4 to 24 inches), and medium forbs (4 to 24 inches) (fig. 7). This community commonly is a mix of alpine and low-elevation plant species. Typical plants include eightpetal mountain-avens, black crowberry, narcissus anemone, and heartleaf saxifrage. Other species include sedges, hairgrasses, ledge stonecrop (*Rhodiola integrifolia*), Ross' avens (*Geum rossii*), draba (Draba spp.), and boreal sagebrush (*Artemisia arctica*). The ground cover includes herbaceous litter, moss, lichen, and exposed bedrock. Some areas are bare soil. A high concentration of rock fragments may be on the surface in areas where this community abuts a talus slope.

Community 1.2
Sparsely vegetated talus slope

Figure 8. Post-disturbance vegetation may be patchy. Some vegetation has been removed, and the remaining vegetation takes advantage of the decreased competition for light and space.

This post-erosion community phase consists dominantly of exposed rock fragments on the surface and patchy areas of pre-disturbance vegetation (fig. 8). New plant species colonize from these patches and from nearby areas. Plants that are not in the reference plant community may colonize these slopes. Note: This community is described from field notes and personal observations.

Pathway 1.1A
Community 1.1 to 1.2

Eightpetal mountain-avens–black crowberry/sedges–hairgrasses/narcissus anemone–heartleaf saxifrage (Dryas octopetala–Empetrum nigrum/Carex spp.–Deschampsia spp./Anemone narcissiflora–Saxifraga nelsoniana)

Sparsely vegetated talus slope

Erosion Small, localized landslides can remove varying amounts of vegetation. These landslides are smaller than the major landslides that cause a transition to the alternate state.

Pathway 1.2A
Community 1.2 to 1.1

Sparsely vegetated talus slope

Eightpetal mountain-avens–black crowberry/sedges–hairgrasses/narcissus anemone–heartleaf saxifrage (Dryas octopetala–Empetrum nigrum/Carex spp.–Deschampsia spp./Anemone narcissiflora–Saxifraga nelsoniana)

Natural succession: Normal time and growth without disruptive erosion.

State 2
Landslide Talus Slopes

This alternate state is the result of massive landslides. Smaller scale landslides create stable talus slopes, which lead to a partially vegetated early community phase (community 1.2). Massive landslides result in large, non-vegetated talus slopes that remain unstable (figs. 2 and 9). These unstable slopes are susceptible to continuous landslides and are not expected to become vegetated within 100 years. This alternate state is synonymous with ecological site R237XY250AK.

Community 2.1
Nonvegetated talus slope

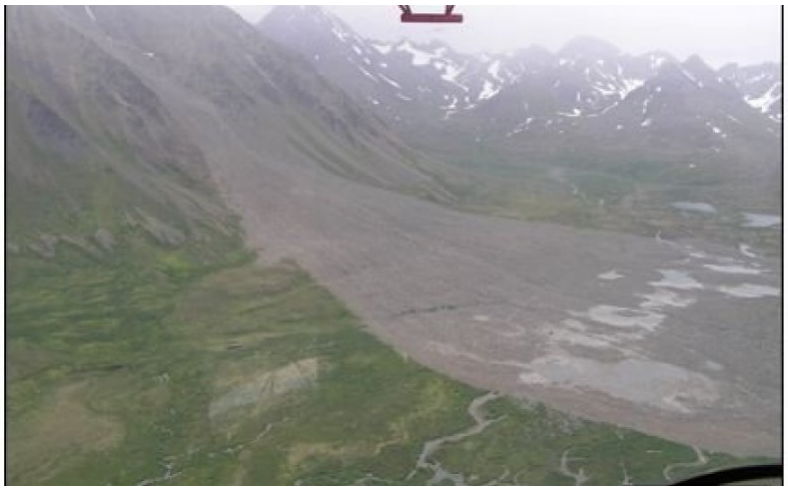

Figure 9. Massive landslide results in an unstable, nonvegetated talus slope on the upper mountain slope (Walsh, 2014a).

Unlike community 1.2 in the reference state, this unstable, nonvegetated community will not transition to the reference plant community within 100 years. Some small colonizing plants may be present. This community is synonymous with ecological site R237XY250AK.

Transition T1A
State 1 to 2

This transition is caused by massive landslides on the steep slopes. The slopes remain unstable and are susceptible to further erosion, which prevents revegetation.

Additional community tables

Other references

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

Crocker, R., and J. Major. 1955. Soil development in relation to vegetation and surface age at Glacier Bay, Alaska. The Journal of Ecology 43(2): 427-448.

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.

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, 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.

Walsh, Pat. 2014a. Photo of mountain landslide from south. Trail Creek, Togiak National Wildlife Refuge. Personal correspondence.

Walsh, Pat. 2014b. Photo of mountain landslide from north. Trail Creek, Togiak National Wildlife Refuge. Personal correspondence.

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

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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	04/28/2024
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:

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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:**
