USDA Natural Resources
Conservation Service

Ecological site R240XY721AK
Arctic Scrub Silt Lava Plains

Last updated: 6/05/2025
Accessed: 01/22/2026

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): 240X–Nulato Hills-Southern Seward Peninsula Highlands

The Nulato Hills-Southern Seward Peninsula Highlands (MLRA 240X) is in Western Alaska, which describes the mostly treeless zone of discontinuous permafrost in the arctic. This MLRA is approximately 18,500 square miles in size. The terrain is defined by rolling hills, low mountains and river valleys. Flood plains systems are common but generally narrow. This watershed drains into Norton Sound and Bering Sea. Major rivers include the Unalakleet, Koyuk, and Fish Rivers. The area is mostly undeveloped wild land that is sparsely populated. Residents use this remote area primarily for subsistence hunting, fishing, and gathering. Villages are primarily located along the coast and include the two larger municipalities of Nome and Unalakleet, and various other villages such as Koyuk and Saint Michael.

Geology and Soils

This MLRA was mostly unglaciated during the late Pleistocene. Glaciers were limited to upper elevations on the Seward Peninsula. Coastal lowlands are filled with Holocene deposits. Silty eolian deposits mantle coastal areas and the slopes of lower elevation hills and mountains. Flood plains and terraces are built on fluvial deposits. Modified glacial moraines are evident in areas of past glacial activity. Bedrock material is primarily a mix of sedimentary and volcanic rock (USDA, 2022).

This MLRA is in the zone of discontinuous permafrost. Shallow permafrost is most common on coastal plains, gentle footslopes, and organic swales. Permafrost constitutes a root- restrictive layer that perches water and creates poorly drained or poorly drained

soils.

Common soil orders include Gelisols that support permafrost and Entisols and Inceptisols which are marked by little to no development. The Gelisols are typically shallow or moderately deep to permafrost, occur on finer to gravelly textured sediments, and are poorly or very poorly drained. Common Gelisol suborders are Histels, Orthels, and Turbels. The Histels have thick accumulations of surface organic material and commonly occur on mounds of plains. The Orthels and Turbels have comparably thinner surface organic material. Turbels show signs of cryoturbation while Orthels do not. Entisols and Inceptisols are common on shallow rocky soils of the alpine and subalpine, as well as scoured flood plain soils. Non-soil areas (rock outcrop, rubble land and beaches) make up approximately five percent of the MLRA surface.

Climate

The climate is a mix of maritime in the summer and continental in the winter, which is a result of sea ice in Norton Sound. Summers are brief and cool summers and winters are long and cold. Mean annual precipitation is 15 to 20 inches at lower elevations, increasing to 20 to 40 inches at higher elevations (USDA, 2022). Mean annual temperatures ranges from 23 to 31 degrees F (SNAP, 2014a).

Vegetation

Vegetation is mainly influenced by site and soil characteristics such as temperature-degree days, exposure to wind, soil depth, and soil hydrology. Dwarf scrublands are present across much of the uplands. Lower elevations generally support more developed soils. Well drained soils support tall shrubs. Organic soils support mosses, graminoids and low shrubs. Forests occur on some low mountain slopes and river valleys but are associated with the Yukon-Kuskokwim Highlands (MLRA 230X). Tussock tundra is ubiquitous across much of the poorly drained, low gradient slopes and coastal plains (USDA, 2022).

LRU notes

There are two life zones delineated by plant communities along a temperature gradient driven by elevation. The predominant climate across MLRA 240X is arctic lowlands. Low mean annual air temperatures and a short growing season shape the vegetation across the landscape. The alpine climate zone is generally reserved for elevations above 1,200 feet. Decreased mean annual temperatures at these higher elevations support unique soils and vegetation.

Classification relationships

Alaska Vegetation Classification:
Dwarf ericaceous scrubland (II.D.2 - level III) / Vaccinium dwarf shrub tundra (II.D.2.b -

level IV)
(Viereck et al., 1992)

BioPhysical Settings:
6816870 – Alaska Arctic Lichen Tundra
(Landfire, 2009)

Circumpolar Arctic Vegetation Map:
B2.1 – Lichen community
(CAVM Team, 2003)

Ecological site concept

• Occurs on lava fields and south-facing slopes of volcanic cones
• Soils are ashy with high volumes of subsurface rock fragments.
• Soils are considered well drained and lack permafrost
• The reference plant community is a mix of dwarf shrubs and a diverse mix of foliose and crustose lichens.
• There is no major disturbance affecting vegetation in this ecological site

Associated sites

R240XY732AK	**Subalpine Tall Scrub Gravelly Slopes** R240XY732AK describes an alder community. This community is supported in depressions on the lava field.

Similar sites

R240XY730AK	**Alpine Dwarf Scrub Gravelly Slopes** R240XY730AK describes the alpine dwarf scrub community. Both ecological sites support dwarf scrublands, but community composition is different with more ericaceous species in this ecological site, and it is hypothesized that plant productivity differs as well.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Empetrum nigrum* (2) *Loiseleuria procumbens*
Herbaceous	(1) *Cladina stellaris* (2) *Bryocaulon*

Physiographic features

This ecological site occurs on arctic lava fields and volcanic cones. Elevation ranges from

800 to 2,000 feet above sea level. Slope gradients are nearly level to strongly sloped (0 to 10 percent) but may be steep on volcanic cones. This ecological site occurs on all aspects on lava fields, but is restricted to exposed, south-facing slopes of volcanic cones. There is no water table and ponding does not occur.

Table 2. Representative physiographic features

Slope shape across	(1) Convex (2) Concave
Slope shape up-down	(1) Convex (2) Concave
Geomorphic position, flats	(1) Talf (2) Dip
Hillslope profile	(1) Backslope
Landforms	(1) Lava field > Rise (2) Hills > Volcanic cone
Runoff class	Low to medium
Flooding frequency	None
Ponding frequency	None
Elevation	244–610 m
Slope	0–10%
Water table depth	152 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Low to high
Flooding frequency	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–40%
Water table depth	Not specified

Climatic features

The mixed maritime/continental climate in MLRA 240X includes short, cool summers and long, cold winters. Mean annual temperature ranges from 23 to 31 degrees Fahrenheit, with temperatures typically below freezing from November through March. Approximately 40 percent of total precipitation occurs during the June – August growing season (PRISM, 2018; SNAP, 2014a; SNAP, 2014b). Across the MLRA, snowfall ranges from 40 to 100

inches (USDA-NRCS, 2022).

Table 4. Representative climatic features

Frost-free period (characteristic range)	80-105 days
Freeze-free period (characteristic range)	100-130 days
Precipitation total (characteristic range)	330-508 mm
Frost-free period (actual range)	30-120 days
Freeze-free period (actual range)	90-135 days
Precipitation total (actual range)	254-584 mm
Frost-free period (average)	90 days
Freeze-free period (average)	115 days
Precipitation total (average)	356 mm

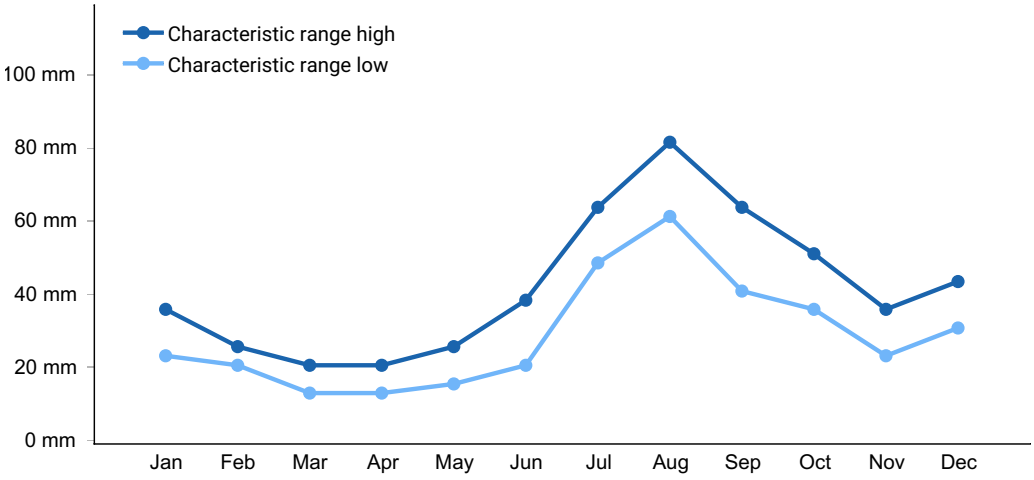

Figure 1. Monthly precipitation range

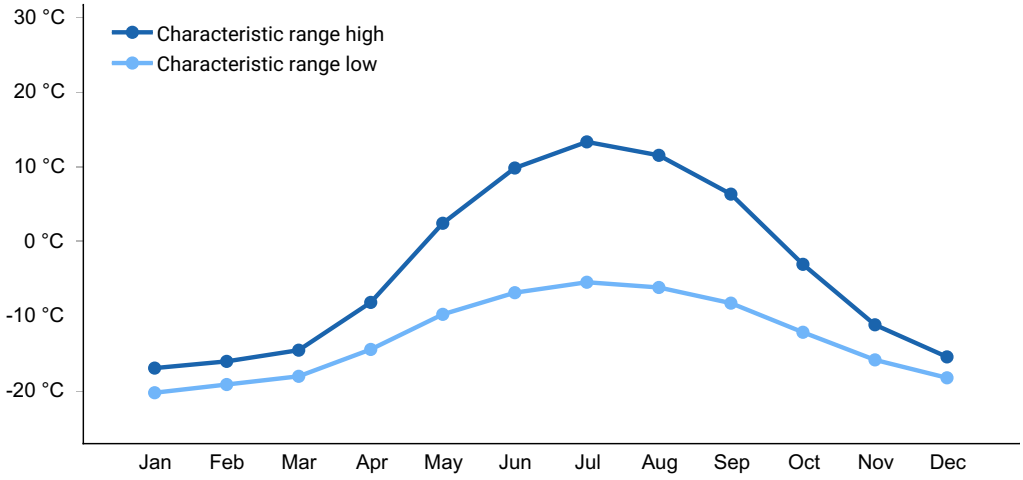

Figure 2. Monthly minimum temperature range

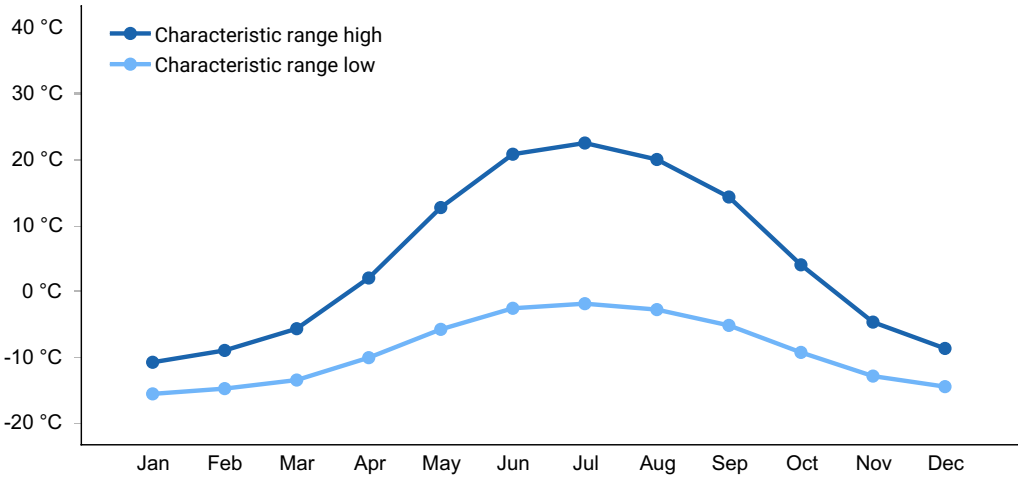

Figure 3. Monthly maximum temperature range

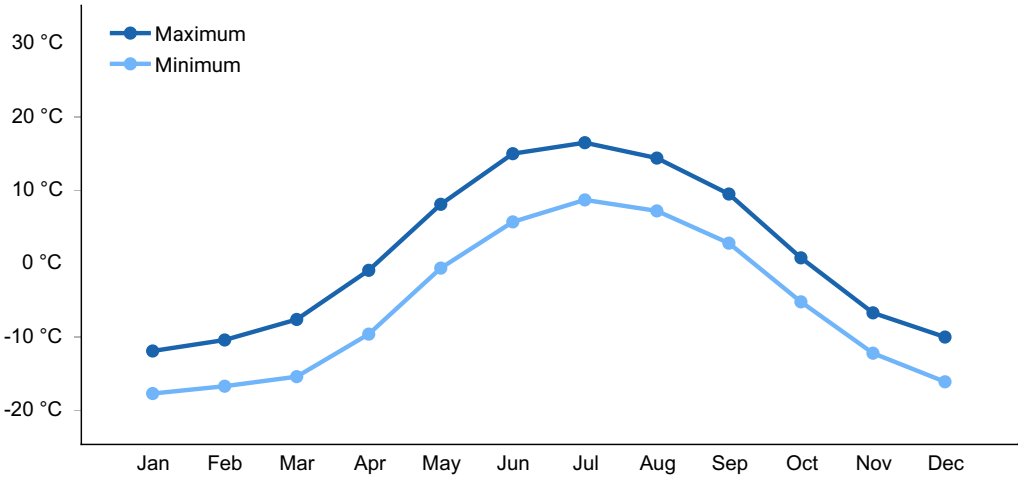

Figure 4. Monthly average minimum and maximum temperature

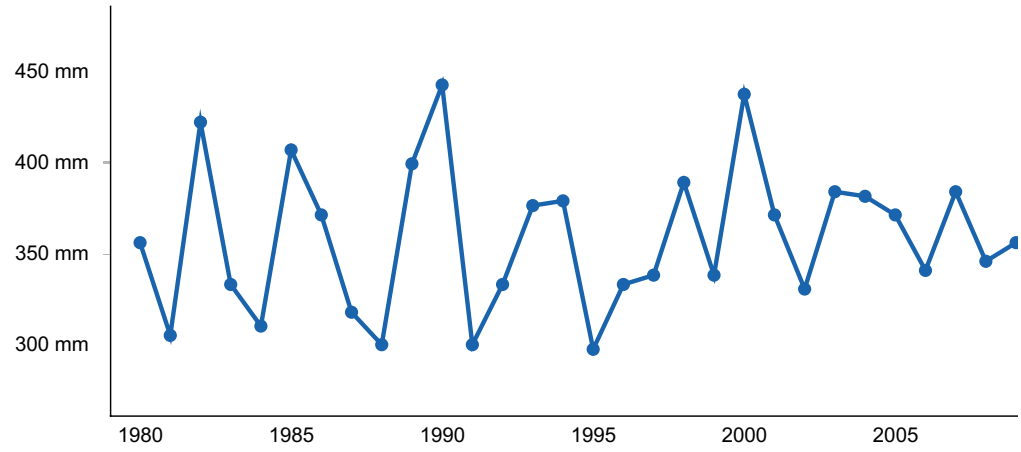

Figure 5. Annual precipitation pattern

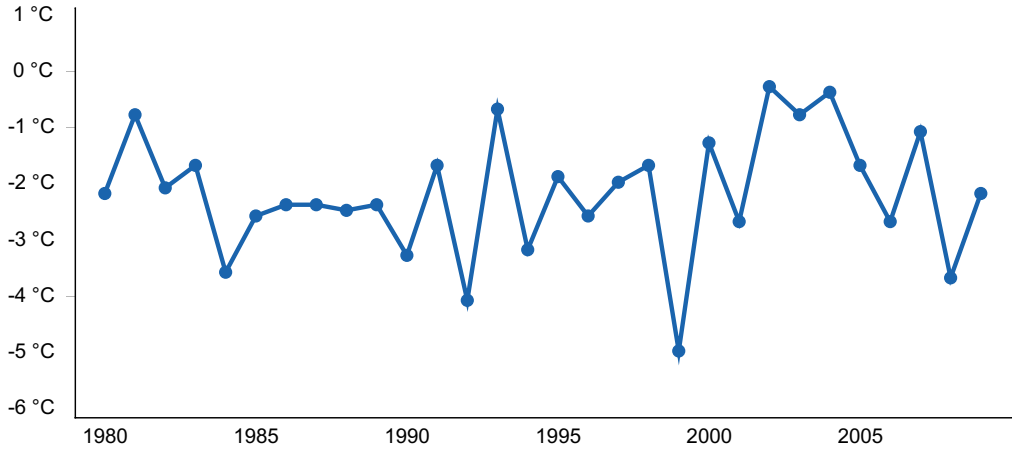

Figure 6. Annual average temperature pattern

Influencing water features

Precipitation and throughflow are the main source of water for this ecological site.

Wetland description

This ecological site is not associated with wetlands.

Soil features

Soils are minimally developed Cryepts and Orthents (Soil Survey Staff, 2013). They developed from volcanic ash and residuum. Rock fragments on the soil surface range up to 25 percent. Soils have a thin, two-to-three-inch organic cap. Soils are very deep but have shallow to moderately deep contrasting textural stratification restrictions. Subsurface rock fragment volume ranges from 20 to 55 percent. Soil pH is extremely acidic to neutral. Soils are well drained and dry during the growing season.

Table 5. Representative soil features

Parent material	(1) Volcanic ash (2) Residuum
Surface texture	(1) Extremely cobbly, medial silt (2) Ashy silt (3) Gravelly, ashy silt
Drainage class	Well drained
Permeability class	Moderate
Depth to restrictive layer	10–79 cm
Soil depth	152 cm
Surface fragment cover <=3"	1–15%

Surface fragment cover >3"	6–10%
Available water capacity (0-101.6cm)	2.03–12.7 cm
Soil reaction (1:1 water) (0-25.4cm)	4.3–6.6
Subsurface fragment volume <=3" (0-152.4cm)	22–53%
Subsurface fragment volume >3" (0-152.4cm)	11–54%

Table 6. Representative soil features (actual values)

Drainage class	Not specified
Permeability class	Not specified
Depth to restrictive layer	10–152 cm
Soil depth	152 cm
Surface fragment cover <=3"	Not specified
Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-25.4cm)	Not specified
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

The Nulato Hills-Southern Seward Peninsula Highlands MLRA (MLRA 240X) occurs in Western Alaska with arctic vegetation and has a harsh climate that limits the composition and structure of plant communities. This area has cool, short summers and long, cold winters. Trees are restricted to warmer slopes in mountain valleys and flood plains. The expansive tundra is comprised of a mosaic of shrubs, sedges, moss, and lichen.

Site and soil conditions support one community. The dwarf scrub reference plant community is shaped by cold temperatures, a minimally developed and gravelly soil substrate, and wind exposure. Cold temperatures and a shortened growing season support slow growing, often evergreen shrubs and lichens. The young, minimally developed soils contain a moderate amount of surface fragments, which are ideal for lichens but restrict vascular plants. Wind exposure limits plant height leading to most

shrubs growing prostrate.

There is no recognized disturbance that shifts community composition on this ecological site (Landfire, 2009; Viereck et al., 1992). Wind scouring and erosion shape the vegetation but do not result in a unique, post-disturbance community. Vegetation may differ slightly between convex highs and concave lows on the lava field. There is no evidence of fire on this ecological site, likely due to a low fuel load.

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

1.1. Black crowberry (Empetrum nigrum) - Alpine azalea (Loiseleuria procumbens) / Star reindeer lichen (Cladina stellaris) -

State 1
Reference State

Figure 7. Aerial view of the lava plain in the distance from atop a relict volcanic cone.

The reference state describes one vegetative community across the lava plains. This community is stable and does not appear to burn nor pond. There may be small differences in vegetation between micro-topographical high and low points on these shallow volcanic soils. This reference state is developed and characterized using available vegetation models, including Landfire BpS and the Alaska vegetation classification system (Landfire, 2009; Viereck et al., 1992).

Dominant plant species

- black crowberry (*Empetrum nigrum*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- star reindeer lichen (*Cladina stellaris*), other herbaceous
- bryocaulon lichen (*Bryocaulon*), other herbaceous

Community 1.1
Black crowberry (Empetrum nigrum) - Alpine azalea (Loiseleuria procumbens) / Star reindeer lichen (Cladina stellaris) - Brycaulon lichen (Bryocaulon spp.)

This community is an open low shrub scrubland (Viereck et al., 1992). The major plant groups are low shrubs, dwarf shrubs, and lichens. Forbs and graminoids are common buy low in total foliar cover. Total shrub cover appears to be higher in micro-low areas, while lichens dominate the exposed micro-high areas. Medium and low alder and willow may be present in closed concave areas where water collects, and soil development is greater. Ground cover is predominantly lichens and herbaceous litter.

Dominant plant species

- black crowberry (*Empetrum nigrum*), shrub
- alpine azalea (*Loiseleuria procumbens*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- alpine sweetgrass (*Anthoxanthum monticola ssp. alpinum*), grass
- star reindeer lichen (*Cladina stellaris*), other herbaceous
- bryocaulon lichen (*Bryocaulon*), other herbaceous
- (*Flavocetraria cucullata*), other herbaceous
- reindeer lichen (*Cladina stygia*), other herbaceous
- cetraria lichen (*Cetraria laevigata*), other herbaceous
- reindeer lichen (*Cladina*), other herbaceous
- cup lichen (*Cladonia*), other herbaceous

Additional community tables

Inventory data references

Vegetative communities and transitions are described using existing models and expert knowledge. There are no vegetation inventory data points in NASIS associated with this ecological site.

External model data sources:

The Alaska-Yukon Region of the Circumboreal Vegetation Map (CBVM) (Jorgensen and Meidinger, 2015)

Circumpolar Arctic Vegetation Mapping Project (CAVM, 2003).

LANDFIRE Biophysical Settings Models (Landfire, 2009)

The Alaska Vegetation Classification (Viereck et al., 1992)

References

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

Other references

CAVM Team. 2003. Circumpolar Arctic Vegetation Map. Scale 1:7,500,000. Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska

Jorgensen, T., and D. Meidinger. 2015. The Alaska Yukon Region of the Circumboreal Vegetation Map (CBVM). CAFF Strategies Series Report. Conservation of Arctic Flora and Fauna, Akureyri, Iceland. ISBN: 978-9935-431-48-6.

LANDFIRE Biophysical Settings (Landfire). 2009. Biophysical Setting 6816870 – Alaska Arctic Lichen Tundra. In: LANDFIRE Biophysical Setting Model: Map zone 68, [Online]. In: Vegetation Dynamics Models. In: LANDFIRE. Washington, DC: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory; U.S. Geological Survey; Arlington, VA: The Nature Conservancy (Producers). Available: https://www.landfire.gov/vegetation/bps. Accessed March 17, 2025.

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

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an

assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	01/22/2026
Approved by	Blaine Spellman
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most**

sites will show a range of values):

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

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17. **Perennial plant reproductive capability:**
