

Ecological site R238XY408AK

Arctic Scrub Loamy Frozen Swales and Drainageways

Last updated: 6/05/2025

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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): 238X–Yukon-Kuskokwim Coastal Plain

Geography

The Yukon-Kuskokwim Coastal Plain area (MLRA 238x) consists of the broad, nearly level delta along the lower reaches of the Yukon and Kuskokwim rivers, where the rivers empty into the Bering Sea. The Yukon River runs along the northern edge of the area while the Kuskokwim River runs along the southern edge. This MLRA makes up 31,565 square miles. MLRA 238x is bordered by MLRA 240x (Nulato Hills-Southern Seward Peninsula Highlands) to the North, MLRA 237x (Ahklun Mountains) to the South, and MLRAs 230x (Yukon-Kuskokwim Highlands) and 229x (Interior Alaska Lowlands) to the East. Although the MLRA is mostly undeveloped wild land and is sparsely populated, there are 42 villages scattered along the coast or the banks of the Yukon and Kuskokwim Rivers. The principal communities are Aniak, Bethel, Emmonak, Hooper Bay, and Saint Mary's.

Physiography

Although primarily comprised of deltaic lowlands, in a few areas, isolated low hills rise above the surrounding coastal plain. Numerous low-gradient streams meander through this MLRA, many of which are tributaries or former channels of the Yukon and Kuskokwim Rivers. Depressions and shallow basins on the coastal plain are dotted with interconnecting stream channels, wetlands, and countless small and medium-size lakes. On the floodplains between channels and wetlands, low escarpments, meander scars, oxbow lakes, sloughs, and islands can be found. The coastline is broken by several large inlets and bays, including Baird Inlet, which forms a large inland sea behind Nelson Island.

Elevations generally range from sea level to 300 feet but reach heights of 2,342 feet at the

summit of Towak Mountain. A vast majority of the surface water from interior and western Alaska drains into the Bering Sea through MLRA 238x. Major rivers include the Yukon, Kuskokwim, Tovers, Black, Azun, Kashunuk, and Izaviknek Rivers. In addition to the various rivers and tributaries, lakes make up about 40 percent of this MLRA. This area is in the zone of discontinuous permafrost, where permafrost is thin to moderately thick and primarily occurs in fine textured soils. Permafrost does not generally occur on flood plains or in areas near bodies of water.

Geology

MLRA 238x was unglaciated during the Pleistocene, except for along the southern edge, where glaciers from the Ahklun mountains may have extended into portions of the lowlands. A majority of the sediments across the area are fine textured Holocene and Pleistocene deltaic deposits from the Yukon and Kuskokwim Rivers, and loamy and sandy Holocene fluvial deposits on flood plains and stream terraces. In the western part of the MLRA, low basalt hills, cinder cones, and volcanic craters from the Cretaceous and Tertiary can be found.

Climate

The climate of MLRA 238x is primarily maritime throughout the summer, and when Bering Sea ice pack forms in the winter, it becomes more characteristic of a continental climate. Summers are short, cloudy, and rainy while winters are long, cold, and foggy, especially in coastal areas. Windy conditions are common throughout the year. Mean annual precipitation is 12 to 30 inches and mean annual snowfall ranges from 40 to 90 inches. Freeze-free period range 116 to 150 days, but freezing temperatures can occur year-round, although rare in June, July, and August. This cold climate leads to MLRA 238x being included in the Arctic.

Soils

The dominant soil orders in MLRA 238x are Gelisols, Histosols, Inceptisols, and Entisols. Soils have a subgelic or cryic temperature regime, and an aquic or udic moisture regime. Fibristels, Hemistels, Histoturbels, and Aquiturbels are the most common Gelisol great groups. Fibristels and Hemistels have thick accumulations of organic material and occur in depressions and shallow basins. The Orthels and Turbels have comparably thinner surface organic material. The Histoturbels are common in elevated and convex areas and Aquiturbels are common on terraces and drainageways. Inceptisols, Entisols, and Histosols do not have permafrost within the soil profile. Histosols occur in depressions with thick accumulations of organic material. Inceptisols occur on the slopes of hills and mountains, swales, terraces, and flood plains. Entisols occur on shore complex and flood plains.

Vegetation

Lakes, ponds, and other types of surface water are common in this area and vegetation

near these water bodies include wet sedge meadows, sedge-shrub meadows, and sedge-moss meadows. Low uplands support low and dwarf ericaceous shrubs, tussock-forming sedges, other hydrophytic plants, and mosses. Sites with higher local relief and better drainage support low ericaceous scrub with mosses, lichens, willows, and forbs. Low ericaceous shrubs, willow, alder, and mosses are understory associated in these forests and woodlands.

Land use

Residents use this area primarily for subsistence hunting, fishing, and gathering. Less than one percent of the MLRA is urban, and most communities are along the coast or major rivers and lakes. Disturbance of fragile permafrost soils is the major soil resource concern in this area, resulting from damage of insulating organic material that allows permafrost in upper soil layers to thaw. This can lead to ponding, soil subsidence, erosion, and altered hydrologic function. In order to slow the thawing of permafrost, management is needed to protect organic material and promote thermal balance of soils.

Classification relationships

Landfire Biophysical Settings:

16830 – Alaska Arctic Mesic Sedge-Willow Tundra

16980 – Alaska Arctic Wet Sedge Meadow

(LANDIRE biophysical settings 2009)

Viereck Communities:

Willow-sedge shrub tundra – II.C.2.h

(Viereck et al. 1992)

Ecological site concept

- This arctic ecological site occurs in drainageways and swales.
- Soils formed in organic material over silty loess and/or alluvium.
- Swales pond frequently, while drainageways flood frequently. Soils have a very shallow water table throughout extended portions of the growing season and are considered very poorly and poorly drained.
- While soils are considered very deep, permafrost occurs at moderate depth.
- The reference plant community is characterized as willow-sedge shrub tundra (Viereck et al. 1992) with Alaska bog willow, tealeaf willow, water sedge, tall cottongrass, and Sphagnum as common plants.

Associated sites

R238XY101AK	Arctic Silty Shore Complex Ecological site 101 occurs downstream on shore complex with tidal influences that support halophytic sedge wet meadow.
R238XY402AK	Arctic Scrub Hills and Mountains Complex Ecological site 402 occurs on adjacent terraces and slopes but on drier soils without permafrost that support dwarf scrub communities.
R238XY404AK	Arctic Loamy Frozen Tussock Tundra Ecological site 404 occurs on adjacent stream terraces and slopes but with wetter soils underlain by permafrost that supports tussock tundra.

Similar sites

R238XY405AK	Arctic Scrub Loamy Flood Plain Occurs on flood plains with willow scrub communities but with different kinds and amounts of vegetation including much less sedge and other obligate wetland plants.
R238XY101AK	Arctic Silty Shore Complex Occurs on shore complex that support halophytic sedge wet meadow. Common graminoids include Hoppner's sedge, Ramensk's sedge, Lyngbye's sedge, looseflower alpine sedge, and Fisher's tundra grass.
R239XY032AK	Arctic Scrub Silty Frozen Slopes Wet Associated with similar swale and drainageway vegetation but to the West in the Northern Bering Sea Islands MLRA (239X).

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Salix fuscescens</i> (2) <i>Salix pulchra</i>
Herbaceous	(1) <i>Carex aquatilis</i> (2) <i>Eriophorum angustifolium</i>

Physiographic features

- This ecological site is associated with drainageways and swales, which occur on the slopes of hills and plains.
- Elevations range from 10 to to 300 feet above sea level.
- Slope is nearly level and occur on all aspects.
- Drainageways tend to flood, while swales tend to pond.
- Both landforms typically have a water table at very shallow depth throughout extended portions of the growing season.

Table 2. Representative physiographic features

Landforms	(1) Plains > Drainageway (2) Plains > Swale
Runoff class	Negligible to very low
Flooding duration	Long (7 to 30 days)
Flooding frequency	None to frequent
Ponding duration	Very long (more than 30 days)
Ponding frequency	None to frequent
Elevation	3–91 m
Slope	0–2%
Ponding depth	15 cm
Water table depth	0 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Not specified
Flooding duration	Not specified
Flooding frequency	Not specified
Ponding duration	Not specified
Ponding frequency	Not specified
Elevation	Not specified
Slope	0–5%
Ponding depth	Not specified
Water table depth	0–51 cm

Climatic features

Sea ice strongly influences the climate of MLRA 238x, as it does throughout Western Alaska. The climate is characteristically maritime throughout the summer months, where cool, moist air moves from the Bering Sea into coastal lowlands. As sea ice forms in the winter, the climate becomes more characteristic of a continental climate. These cold year-round conditions is the reason MLRA 238x is considered Arctic despite being approximately 500 miles south of the Arctic circle.

Winters are cold and long, with average low temperatures between 0 and 4 degrees (F) December through February. Winter and early spring is the driest time of the year with less than an inch of precipitation per month falling January through April. Summers in this area are cool, short, and often cloudy and rainy. June through October are considerably wetter,

with the most precipitation falling in August and September. This area receives, on average, 16 inches of precipitation and 116 frost free days per year.

Table 4. Representative climatic features

Frost-free period (characteristic range)	106-122 days
Freeze-free period (characteristic range)	129-142 days
Precipitation total (characteristic range)	381-457 mm
Frost-free period (actual range)	90-129 days
Freeze-free period (actual range)	116-150 days
Precipitation total (actual range)	305-762 mm
Frost-free period (average)	116 days
Freeze-free period (average)	136 days
Precipitation total (average)	406 mm

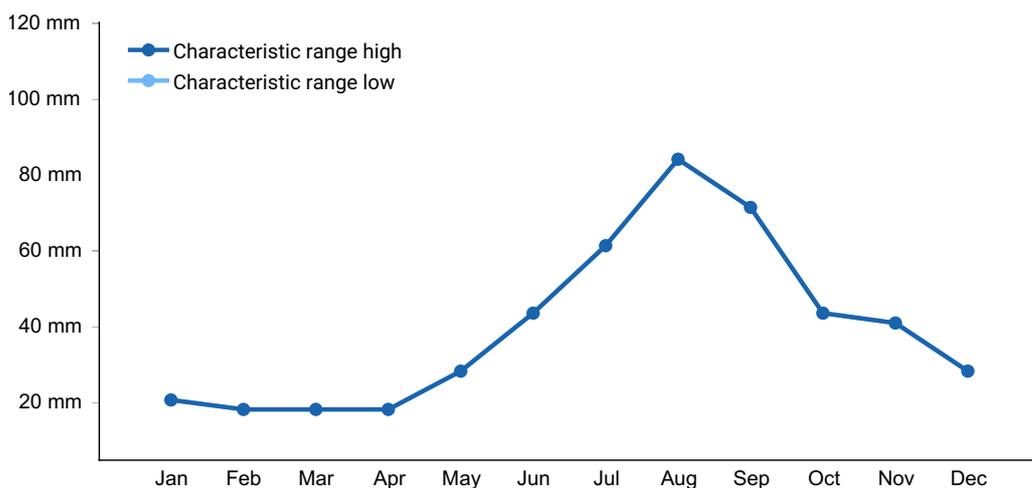


Figure 1. Monthly precipitation range

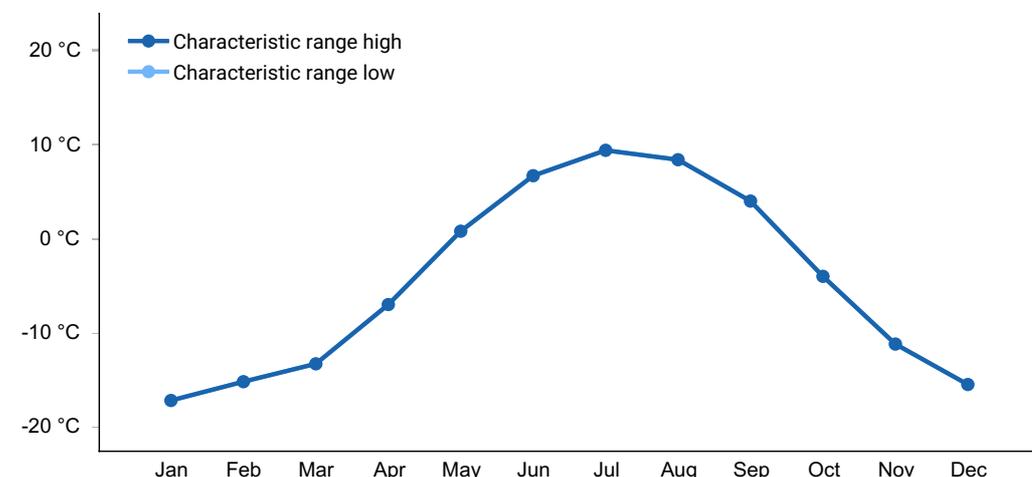


Figure 2. Monthly minimum temperature range

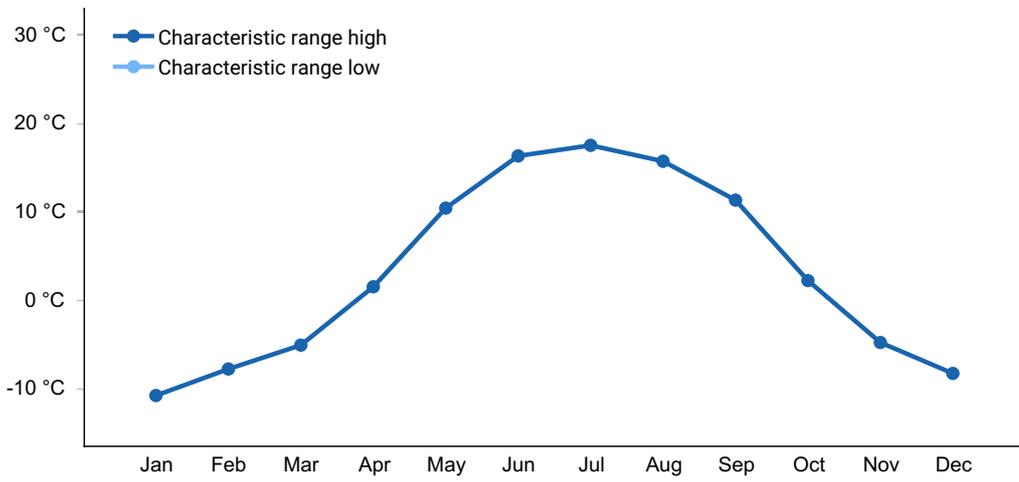


Figure 3. Monthly maximum temperature range

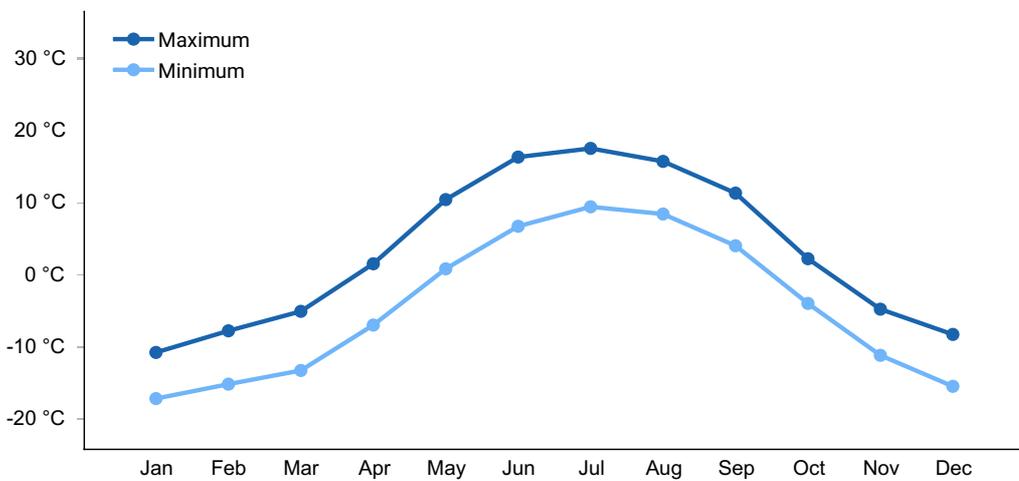


Figure 4. Monthly average minimum and maximum temperature

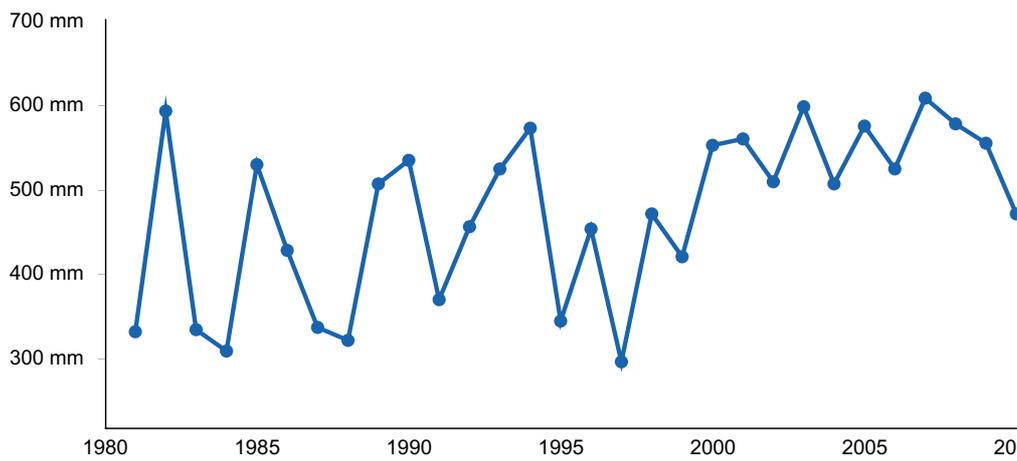


Figure 5. Annual precipitation pattern

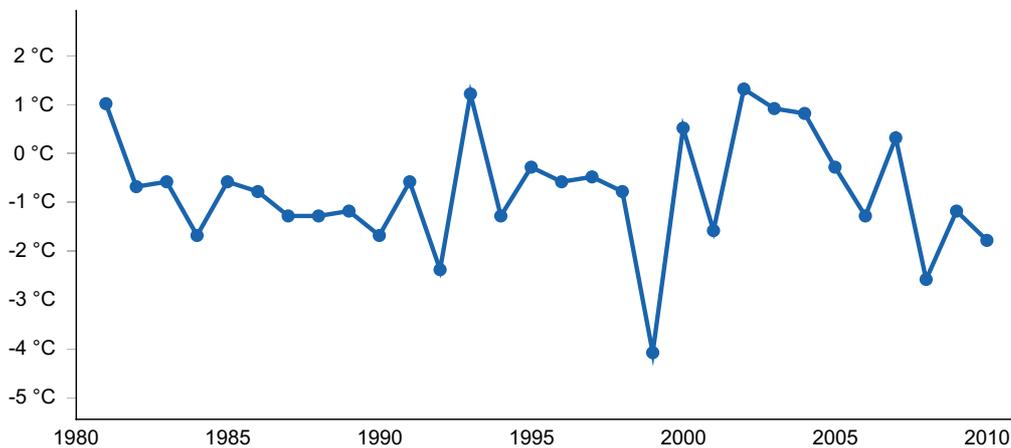


Figure 6. Annual average temperature pattern

Climate stations used

- (1) BETHEL AP [USW00026615], Bethel, AK

Influencing water features

This ecological site is considered a riverine wetland. Dominant water sources are often overbank flow from the channel or subsurface hydraulic connections between the stream channel and wetlands.

Wetland description

This ecological site is classified as a riverine wetland under the Hydrogeomorphic (HGM) classification system (Smith et al. 1995; USDA-NRCS 2008).

Soil features

- Soils formed in organic material over loess and/or alluvium
- Rock fragments do not occur on the soil surface or in the soil profile.
- The mineral soils are capped with 4 to 25 inches of peat and mucky peat. Surface mineral horizon texture is silt loam.
- While soils are considered very deep, permafrost commonly occurs at moderate depth (23 to 39 inches). On rare occasion, soils lack restrictions.
- Soil pH ranges from moderately acidic to slightly alkaline
- Soils are typically considered very poorly to poorly drained. On rare occasion, some swales are somewhat poorly drained.

The Arctic Scrub Loamy Frozen Swales and Drainageways ecological site is correlated to eight soil components. Soils are classified as Gelisols. Wetter swales and drainageways are in the taxonomic great groups Aquiturbels, Historthels, and Fibristels, while drier swales are Aquic Haploorthels.

Table 5. Representative soil features

Parent material	(1) Organic material (2) Loess (3) Alluvium
Surface texture	(1) Peat (2) Mucky peat (3) Silt loam
Family particle size	(1) Coarse-silty
Drainage class	Very poorly drained to poorly drained
Permeability class	Moderately rapid
Depth to restrictive layer	58–99 cm
Soil depth	152 cm
Surface fragment cover ≤3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	19.05–44.45 cm
Calcium carbonate equivalent (0-101.6cm)	0–1%
Clay content (0-50.8cm)	0–5%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–3
Soil reaction (1:1 water) (0-25.4cm)	4.9–6.6
Subsurface fragment volume ≤3" (0-152.4cm)	0%
Subsurface fragment volume >3" (0-152.4cm)	0%

Table 6. Representative soil features (actual values)

Drainage class	Very poorly drained to somewhat poorly drained
Permeability class	Not specified
Depth to restrictive layer	41–119 cm
Soil depth	Not specified
Surface fragment cover ≤3"	Not specified

Surface fragment cover >3"	Not specified
Available water capacity (0-101.6cm)	8.38–52.32 cm
Calcium carbonate equivalent (0-101.6cm)	Not specified
Clay content (0-50.8cm)	Not specified
Electrical conductivity (0-101.6cm)	Not specified
Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-25.4cm)	3.3–7.8
Subsurface fragment volume <=3" (0-152.4cm)	Not specified
Subsurface fragment volume >3" (0-152.4cm)	Not specified

Ecological dynamics

The Yukon-Kuskokwim Coastal Plain MLRA has a harsh climate and cold soils and occurs in the zone of discontinuous permafrost. This MLRA occurs in the arctic biome and has a growing season that is both short and cold. As a result, the vertical and horizontal structure of vegetation is severely limited. Vegetation within the arctic biome is typically restricted to dwarf shrubs, mosses, and lichens.

State and transition model

Ecosystem states

1. Reference state

State 1 submodel, plant communities

1.1. bog willow -
tealeaf willow / water
sedge - tall cottongrass
/ sphagnum

State 1 Reference state

The reference plant community is characterized as willow-sedge shrub tundra (Vioreck et al. 1992). This ecological site has no known associated disturbance regimes and has one plant community within the reference state. All plant communities associated with this ecological site have limited data, so the state-and-transition model is provisional.

Dominant plant species

- Alaska bog willow (*Salix fuscescens*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- bog rosemary (*Andromeda polifolia*), shrub
- tall cottongrass (*Eriophorum angustifolium*), grass
- lesser saltmarsh sedge (*Carex glareosa*), grass
- round sedge (*Carex rotundata*), grass
- sphagnum (*Sphagnum*), other herbaceous

Community 1.1

bog willow - tealeaf willow / water sedge - tall cottongrass / sphagnum

This plant community is characterized as a willow-sedge shrub tundra (Vioreck et al. 1992) with the dominant plants being bog willow, tealeaf willow, water sedge, tall cottongrass, and Sphagnum. The vegetative strata that characterize this community are low shrubs, graminoids, and moss. The binomial name of these and other less common associated plants can be found in the dominant plant species table below.

Dominant plant species

- Alaska bog willow (*Salix fuscescens*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- bog rosemary (*Andromeda polifolia*), shrub
- lesser saltmarsh sedge (*Carex glareosa*), grass
- round sedge (*Carex rotundata*), grass
- sphagnum (*Sphagnum*), other herbaceous
- drepanocladus moss (*Drepanocladus*), other herbaceous

Additional community tables

Animal community

Not available.

Hydrological functions

Not available.

Recreational uses

Not available.

Wood products

Not available.

Other products

Not available.

Other information

Not available.

Inventory data references

The vegetation modeled for this site has limited data and is considered provisional. The associated model was largely developed from NRCS staff with working knowledge of the area and literature review.

Other references

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Contributors

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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	03/14/2026
Approved by	Blaine Spellman
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:**
-