USDA Natural Resources Conservation Service

Ecological site R236XY140AK
Subarctic Tussock Tundra Wet Loamy Plains

Last updated: 2/13/2024
Accessed: 05/14/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

MLRA notes

Major Land Resource Area (MLRA): 236X–Bristol Bay-Northern Alaska Peninsula Lowlands

The Bristol Bay-Northern Alaska Peninsula Lowland Major Land Resource Area (MLRA 236) is located in Western Alaska. This MLRA covers approximately 19,500 square miles and is defined by an expanse of nearly level to rolling lowlands, uplands and low to moderate hills bordered by long, mountain footslopes. Major rivers include the Egegik, Mulchatna, Naknek, Nushagak, and Wood River. MLRA 236 is in the zone of discontinuous permafrost. It is primarily in areas with finer textured soils on terraces, rolling uplands and footslopes. This MLRA was glaciated during the early to middle Pleistocene. Moraine and glaciofluvial deposits cover around sixty percent of the MLRA. Alluvium and coastal deposits make up a large portion of the remaining area (Kautz et al., 2012; USDA, 2006).

Climate patterns across this MLRA shift as one moves away from the coast. A maritime climate is prominent along the coast, while continental weather, commonly associated with Interior Alaska, is more influential inland. Across the MLRA, summers are general short and warm while winters are long and cold. Mean annual precipitation is 13 to 50 inches, with increased precipitation at higher elevations and areas away from the coast. Mean annual temperatures is between 30 and 36 degrees F (USDA, 2006).

The Bristol Bay-Northern Alaska Peninsula MLRA is principally undeveloped wilderness. Federally managed land includes parts of the Katmai and Aniakchak National Parks, and the Alaska Peninsula, Becharof, Togiak and Alaska Maritime National Wildlife Refuges. The MLRA is sparsely populated. Principal communities include Dillingham, Naknek, and King Salmon. Commercial fishing in Bristol Bay and the Bering Sea comprises a major part of economic activity in the MLRA. Other land uses include subsistence activities (fishing, hunting, and gathering) and sport hunting and fishing (USDA, 2006).

Classification relationships

laska Vegetation Classification:
Mesic graminoid herbaceous (III.A.2 - level III) / Tussock tundra (III.A.2.d - level IV)
(Viereck et al., 1992)

BioPhysical Settings: 7216280 - Western North American Boreal Low Scrub-Tussock Tundra
(LANDFIRE biophysical settings, 2009)

Ecological site concept

This ecological site is on linear to convex plain talf slopes. Site elevation is between 10 and 960 feet above sea level. Slopes are nearly level gentle (0 – 5 percent). Soil hydrology, low soil pH and a fire regime shape the vegetation on this landform. Soils support aquic conditions, with a water table during the growing season and frequent, brief ponding at the surface.

The reference state supports two communities. The reference plant community is characterized as a tussock tundra

(Viereck et al., 1992). It is composed of one or more species of cottongrass (Eriophorum spp.) with low and dwarf shrubs throughout. A post-fire community is comprised of fast-growing colonizing herbaceous species along with extant, surviving cottongrasses and shrubs.

Associated sites

R236XY109AK	**Subarctic Low Scrub Peat Drainages** R236XY109AK is in non-permafrost, concave dips on plains. These organic depressions are features on the plain talfs described by R236XY140AK.
R236XY132AK	**Subarctic Dwarf Scrub Dry Loamy Slopes** R236XY132AK describes the open low scrubland on convex slopes of rolling plains. These areas are upslope of R2136XY140AK.
R236XY131AK	**Subarctic Tussock-Scrub Frozen Plains** R236XY131AK describes depressions with permafrost on plains. The vegetation associated with the moderately well-drained soil and the associated frost heaving that occur differentiate it from R236XY140AK
R236XY130AK	**Subarctic Scrub Scrub Tundra Loamy Plains and Hills** R236XY130AK describes hill toeslopes and plain rises. Slopes are greater than in R236XY140AK and soils are better drained. The vegetation reflects these differences, with no tussocks in R236XK130AK.

Similar sites

R236XY130AK	**Subarctic Scrub Scrub Tundra Loamy Plains and Hills** These sites are adjacent to each other and the ecotonal areas between them may be large. R236XY130AK is better drained and supports a denser scrubland reference plant community. R236Xy140AK is flatter and has aquic soil conditions, which results in more tussocks and less shrub cover.
F236XY171AK	**Subarctic Woodland Loamy Slopes** Both sites are on linear plain talfs. F236XY171AK is proximal to Dillingham. Temperatures are warmer, allowing a woodland to develop on the plain talfs. Areas along the Nushagak River corridor are cooler in comparison, and support the tussock-scrub tundra described by R236XY140AK.

Table 1. Dominant plant species

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

Physiographic features

This site is on linear and convex plain talfs. Elevation generally ranges from 10 to 960 feet above sea level. Slopes are typically nearly level to gentle (0 – 5 percent). A water table is generally present at the soil surface at the beginning of the growing season (April through June), which affects vegetation. Ponding is frequent and brief (2 to 7 days). Flooding does not occur. This site is found at all aspects.

Table 2. Representative physiographic features

Slope shape across	(1) Linear (2) Convex
Geomorphic position, flats	(1) Talf
Slope shape up-down	(1) Linear
Landforms	(1) Plains > Plain
Runoff class	Negligible to low

Flooding frequency	None
Ponding duration	Brief (2 to 7 days)
Ponding frequency	Frequent
Elevation	3–293 m
Slope	0–5%
Water table depth	0 cm
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Negligible to medium
Flooding frequency	None
Ponding duration	Brief (2 to 7 days) to very long (more than 30 days)
Ponding frequency	Frequent
Elevation	0–555 m
Slope	0–20%
Water table depth	0 cm

Climatic features

The climate of this site reflects that of the MLRA, which is described as maritime polar (EPA, 2013). Temperatures are moderated by the nearby Bristol Bay and norther Pacific bodies of water. Annual precipitation ranges from 21 – 34 inches with approximately 40 percent occurring during the June-September growing season (PRISM, 2018).

Table 4. Representative climatic features

Frost-free period (characteristic range)	75-100 days
Freeze-free period (characteristic range)	65-90 days
Precipitation total (characteristic range)	533-864 mm
Frost-free period (actual range)	75-100 days
Freeze-free period (actual range)	65-90 days
Precipitation total (actual range)	381-1,041 mm
Frost-free period (average)	90 days
Freeze-free period (average)	75 days
Precipitation total (average)	737 mm

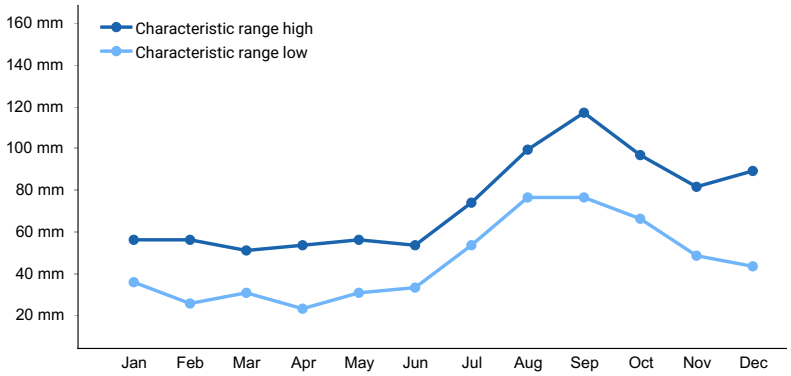


Figure 1. Monthly precipitation range

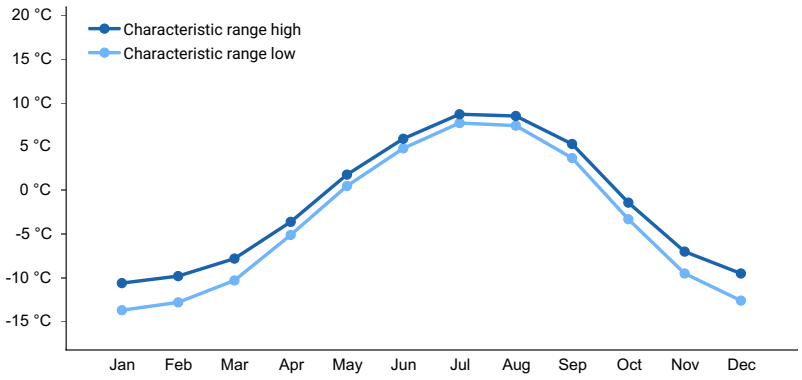


Figure 2. Monthly minimum temperature range

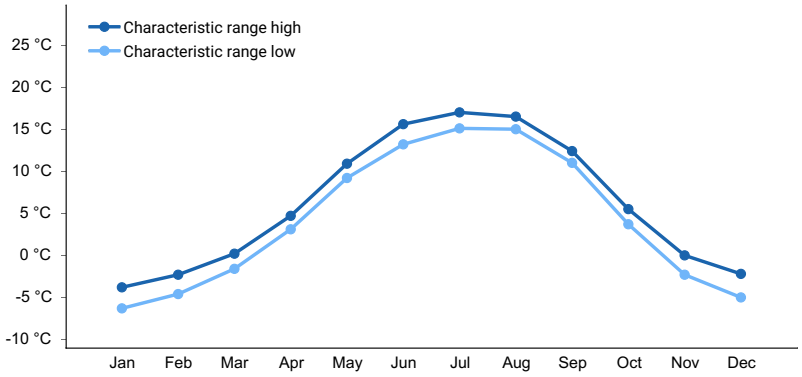


Figure 3. Monthly maximum temperature range

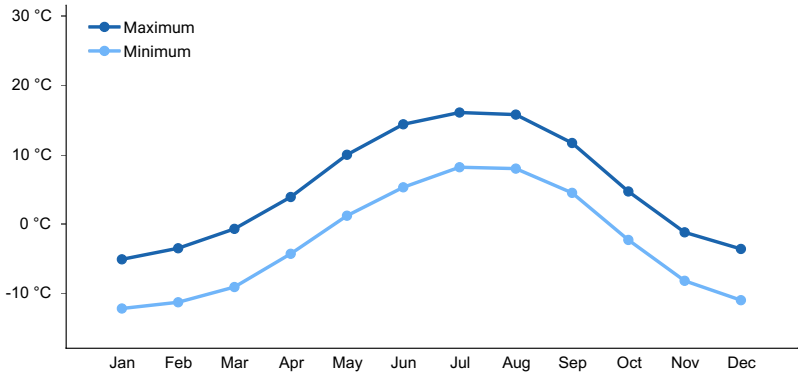


Figure 4. Monthly average minimum and maximum temperature

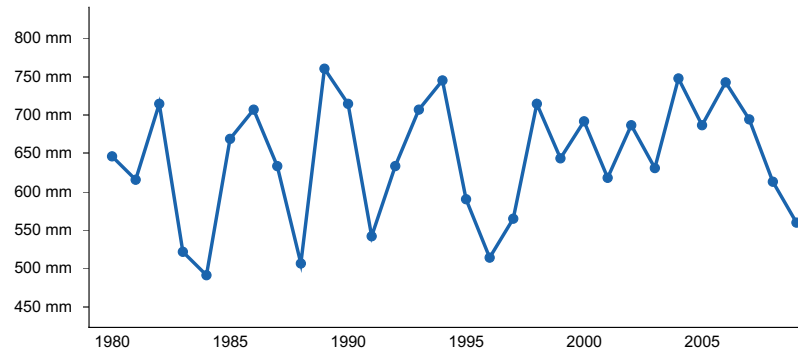


Figure 5. Annual precipitation pattern

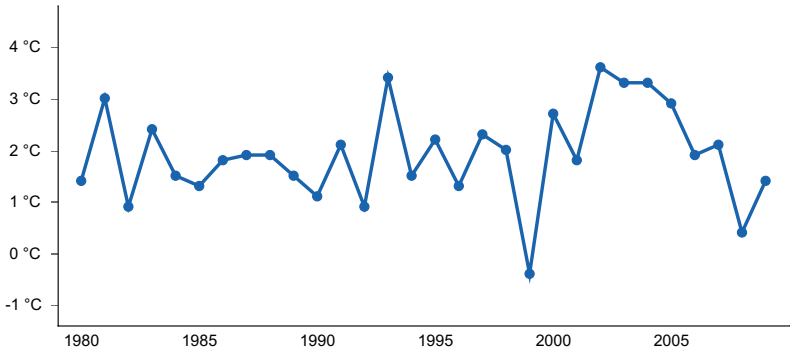


Figure 6. Annual average temperature pattern

Influencing water features

Due to its landscape position, this site is not influenced by wetland or riparian water features. Precipitation, snow melt and flow in from upslope positions are the main sources of water.

Soil features

Soils are young and weakly developed Inceptisols (Soil Survey Staff, 2013). They are very deep and poorly drained. They support a gelic temperature regime and an aquic moisture regime. Parent material is primarily mossy organic material over coarse-loamy eolian deposits.

Soil characteristics affecting vegetation include soil hydrology and an organic surface horizon. The poorly drained soil supports aquic conditions throughout the profile, with redox concentrations beginning at 13 inches. Aquic soil conditions and a surface level water table at the beginning of the growing season restrict the vegetation on this landform. A periodically saturated histic epipedon with low acidity further restrict the plant species that can be supported on this site. Of note, there is no permafrost in this site.

Correlated soil components in MLRA 236:
Kemuk
D36-Western maritime tussock scrub loamy eolian slopes

Table 5. Representative soil features

Parent material	(1) Eolian deposits
Surface texture	(1) Mucky peat
Drainage class	Poorly drained
Permeability class	Moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-25.4cm)	7.62–14.99 cm
Soil reaction (1:1 water) (0-25.4cm)	3.8–5.1
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Table 6. Representative soil features (actual values)

Drainage class	Poorly drained
Permeability class	Slow to moderate
Soil depth	152 cm
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-25.4cm)	7.62–14.99 cm
Soil reaction (1:1 water) (0-25.4cm)	3.8–5.1
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site is on linear to convex plain talf slopes. Local site factors including soil hydrology and a fire cycle support two vegetative communities on this site. The reference plant community is a tussock tundra with shrubs intermixed. Of note, it is likely that the associated soils once supported permafrost. The permafrost has since dropped out of this soil, but the tussock tundra often associated with permafrost soils remains.

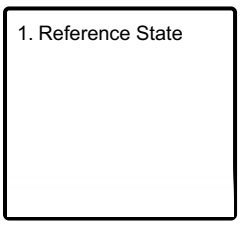
Fire is responsible for a unique post-fire community. Fire partially or fully removes surface biomass and the organic soil layer, depending on fire intensity. Post-fire ponding is common and vegetation reflects the increased effects of soil hydrology. Paludification (Sphagnum moss buildup) varies depending on location-specific factors such as slope shape and fire intensity. Grasses spread via rhizome while pre-fire extant shrubs resprout from rootstocks. It is expected that between 50 and 120 years are required for a complete return to the reference plant community (Landfire, 2009)

There is no evidence of browse or graze on this site.

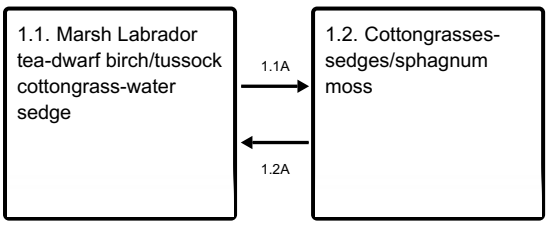
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant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

State and transition model

Ecosystem states



State 1 submodel, plant communities



1.1A - Fire

State 1
Reference State

The reference state supports two community phases grouped by the structure and dominance of the vegetation (e.g., shrubs, forbs, and graminoids) and their ecological function and stability. The reference plant community is characterized by a tussock tundra with cottongrasses and hydrophytic shrubs. The presence of this and related communities are dictated temporally and spatially by fire. All community phases in this report are characterized using the Alaska vegetation classification system (Viereck et al., 1992).

Dominant plant species

- dwarf birch (*Betula nana*), shrub
- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- tussock cottongrass (*Eriophorum vaginatum*), grass
- water sedge (*Carex aquatilis*), grass

Community 1.1
Marsh Labrador tea-dwarf birch/tussock cottongrass-water sedge

Figure 7. Typical area of community 1.1.

Community Phase 1.1 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	98	20
S	Dwarf birch	*Betula nana*	BENA	98	10
S	Bog blueberry	*Vaccinium uliginosum*	VAUL	94	10
S	Cloudberry	*Rubus chamaemorus*	RUCH	85	5
S	Bog rosemary	*Andromeda polifolia*	ANPO	83	2
G	Tussock cottongrass	*Eriophorum vaginatum*	ERVA4	83	30
G	Water sedge	*Carex aquatilis*	CAAQ	66	5
M	Sphagnum moss	*Sphagnum spp.*	SPHAG2#	81	35

Sphagnum mosses are identified at the genus level.

Sample plots are distributed across the survey area and are independent of one another.

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

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

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

The reference plant community phase is open low scrubland (Viereck et al., 1992). It consists of marsh Labrador tea (*Ledum palustre* ssp. decumbens), dwarf birch (*Betula nana*), bog blueberry (*Vaccinium uliginosum*), cloudberry (*Rubus chamaemorus*), and tussock cottongrass (*Eriophorum vaginatum*). Other extant species commonly include bog rosemary (*Andromeda polifolia*), bog cranberry (*Vaccinium oxycoccos*), lingonberry (*Vaccinium vitis-idaea*), red cottongrass (*Eriophorum russeolum*), and roundleaf sundew (*Drosera rotundifolia*). These species are facultative or obligate wetland species. Mosses, specifically sphagnum mosses (Sphagnum spp.), are in micro-low areas between tussocks. Lichens are in the raised areas of tussocks. Other ground cover includes herbaceous litter,

woody litter, and water. Some areas are bare soil.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- dwarf birch (*Betula nana*), shrub
- bog blueberry (*Vaccinium uliginosum*), shrub
- cloudberry (*Rubus chamaemorus*), shrub
- bog rosemary (*Andromeda polifolia*), shrub
- tussock cottongrass (*Eriophorum vaginatum*), grass
- water sedge (*Carex aquatilis*), grass
- sphagnum (*Sphagnum*), other herbaceous

Community 1.2
Cottongrasses-sedges/sphagnum moss

Figure 9. Typical area of community 1.3.

Community Phase 1.3 Canopy Cover Table

Vegetation data is aggregated across modal sample plots for this community phase and is provided as frequency (percent) and mean canopy cover (percent) of the most dominant and ecologically relevant species. Canopy cover is represented as a mean with the range in parentheses.

Plant group	Common name	Scientific name	USDA plant code	Frequency (percent)	Mean canopy cover (percent)
S	Marsh Labrador tea	*Ledum palustre* ssp. *decumbens*	LEPAD	86	8
G	Red cottongrass	*Eriophorum russeolum*	ERRU2	57	25
G	Tussock cottongrass	*Eriophorum vaginatum*	ERVA4	57	15
G	Water sedge	*Carex aquatilis*	CAAQ	57	8
G	White cottongrass	*Eriophorum scheuchzeri*	ERSC2	29	45
M	Sphagnum moss	*Sphagnum spp.*	SPHAG2 #	100	75

Sphagnum mosses are identified at the genus level.

The sample plots are distributed across the survey area and are independent of one another.

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

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

Figure 10. Frequency and canopy cover of plants in community 1.3.

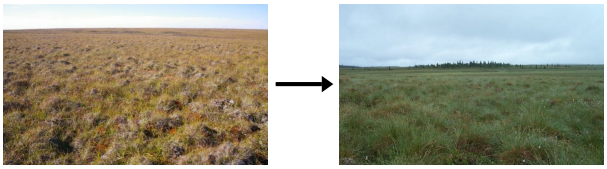
This early ponding community phase is a mesic graminoid herbaceous meadow (Viereck et al., 1992). It consists of hydrophilic graminoids such as red cottongrass, tussock cottongrass, and water sedge and small areas of marsh Labrador tea and bog rosemary. Other species may include white cottongrass (*Eriophorum scheuchzeri*), various sedges (Carex spp.), bog blueberry, dwarf birch, and bog cranberry. Sphagnum moss (Sphagnum spp.) is the dominant type of moss. Other ground cover includes herbaceous litter, lichens, and water.

Dominant plant species

- marsh Labrador tea (*Ledum palustre ssp. decumbens*), shrub
- red cottongrass (*Eriophorum russeolum*), grass
- tussock cottongrass (*Eriophorum vaginatum*), grass
- water sedge (*Carex aquatilis*), grass
- white cottongrass (*Eriophorum scheuchzeri*), grass

- sphagnum (*Sphagnum*), other herbaceous

Pathway 1.1A
Community 1.1 to 1.2

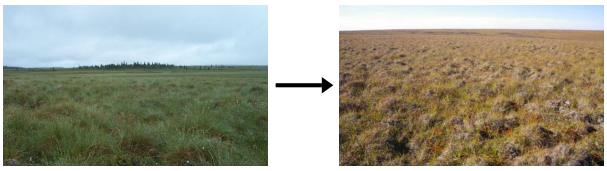


Marsh Labrador tea-dwarf birch/tussock cottongrass-water sedge

Cottongrasses-sedges/sphagnum moss

Fire is a variable disturbance on this site. Fire is usually patchy, with fire size and intensity determined by local conditions. Post-fire ponding and subsequent paludification (Sphagnum buildup) vary depending on location-specific factors such as slope shape and fire intensity (Landfire, 2009).

Pathway 1.2A
Community 1.2 to 1.1



Cottongrasses-sedges/sphagnum moss

Marsh Labrador tea-dwarf birch/tussock cottongrass-water sedge

Grasses spread via rhizome while pre-fire extant shrubs resprout from rootstocks. Lichen recovery begins. It is expected that between 50 and 120 years are required for a complete return to the reference plant community (Landfire, 2009).

Additional community tables

Inventory data references

Modal points for Community 1.1
07MM05202
07SS04103
07SS04901
07AO02801
10SS13307
10TD13401
10TD13405

Modal points for community 1.2
07MM05407
07AO01205
07DM00708
10SS12807

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Approval

Kirt Walstad, 2/13/2024

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	
Contact for lead author	
Date	05/14/2024
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

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

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

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

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

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

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

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

8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):**

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

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

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

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

    Dominant:

    Sub-dominant:

    Other:

    Additional:

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

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

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

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

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17. **Perennial plant reproductive capability:**
