USDA Natural Resources Conservation Service

Ecological site F236XY116AK
Boreal Forest Loamy Wet Slopes

Last updated: 2/13/2024
Accessed: 04/29/2024

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).

Ecological site concept

This boreal ecological site is on linear to convex plains slopes. Site elevation is between 40 and 150 feet above sea level. Slopes are nearly level to gentle (0 – 4 percent). Site hydrology and soil development and fertility shape the vegetation on this landform. Ponding is an occasional and brief event. A shallow (17 – 33 inches) water table is present in June, restricting plant species during the important early growing season. While hydrologically influenced, the understory of this site is less restricted by wet soils than other similar sites, like R236XY117AK. Soil development is weak, characterized by an ochric epipedon, but is likely balanced by the presence of volcanic ash deposits that may increase soil fertility.

The reference state supports two communities. The reference plant community is characterized as a mixed open forest (Viereck et al., 1992). It is composed of an open canopy of white spruce and paper birch with an open understory of facultative upland to facultative wetland shrub and herbaceous species. The second community is a closed willow scrubland.

Associated sites

F236XY117AK	**Boreal Forest Wet Loamy Plain Drainageways** Both are forested sites on wet plain soils. F236XY117AK is associated with wetter soils that are somewhat poorly drained and support a shallow water table throughout the growing season. Vegetation is restricted to facultative wet to obligate species in the understory. This site is moderately well drained with a water table in June. While hydrologically influenced, the understory is less restricted by wet soils.
F236XY115AK	**Boreal Forest Loamy Moist Slopes** Both sites are on plains and hills. F236XY115AK describes similar areas that are not adjacent to wetlands. Wetland hydrology influences the site characteristics, disturbances, and supported vegetation of F236Xy116AK, differentiating it from F236XY115AK.

Similar sites

F236XY117AK	**Boreal Forest Wet Loamy Plain Drainageways** Both are forested sites on wet plain soils. F236XY117AK is associated with wetter soils that are somewhat poorly drained and support a shallow water table throughout the growing season. Vegetation is restricted to facultative wet to obligate species in the understory. This site is moderately well drained with a water table in June. While hydrologically influenced, the understory is less restricted by wet soils.

Table 1. Dominant plant species

Tree	(1) *Betula papyrifera* (2) *Picea glauca*
Shrub	(1) *Spiraea stevenii* (2) *Vaccinium vitis-idaea*
Herbaceous	(1) *Dryopteris expansa* (2) *Calamagrostis canadensis*

Physiographic features

This site is on linear to convex slopes of plains. Elevation typically ranges from 40 to 150 feet above sea level. Slopes are nearly level to gentle (0 – 4 percent). This site is found at all aspects. Ponding is an occasional and brief occurrence and a shallow (17 – 33 inches) water table is present in June.

Table 2. Representative physiographic features

Geomorphic position, flats	(1) Talf (2) Rise
Landforms	(1) Plains > Plain (2) Plains > Rise
Runoff class	Low to medium
Flooding frequency	None
Ponding duration	Brief (2 to 7 days)
Ponding frequency	Occasional
Elevation	40–150 ft
Slope	0–4%
Water table depth	17–33 in
Aspect	W, NW, N, NE, E, SE, S, SW

Table 3. Representative physiographic features (actual ranges)

Runoff class	Low to high
Flooding frequency	None
Ponding duration	Brief (2 to 7 days)

Ponding frequency	None to occasional
Elevation	0–980 ft
Slope	0–16%
Water table depth	17–39 in

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)	21-34 in
Frost-free period (actual range)	75-100 days
Freeze-free period (actual range)	65-90 days
Precipitation total (actual range)	15-41 in
Frost-free period (average)	90 days
Freeze-free period (average)	75 days
Precipitation total (average)	29 in

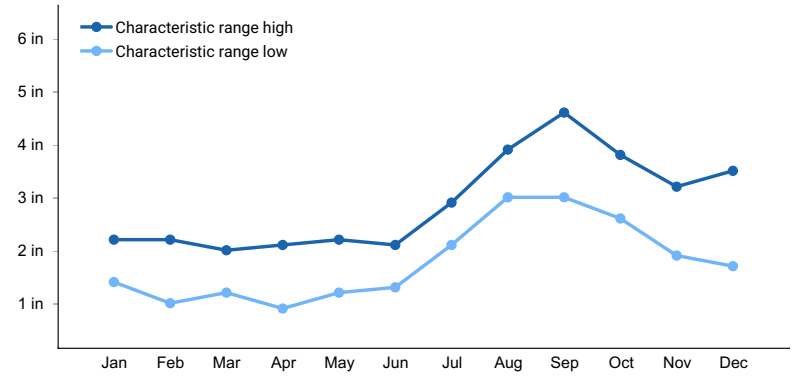


Figure 1. Monthly precipitation range

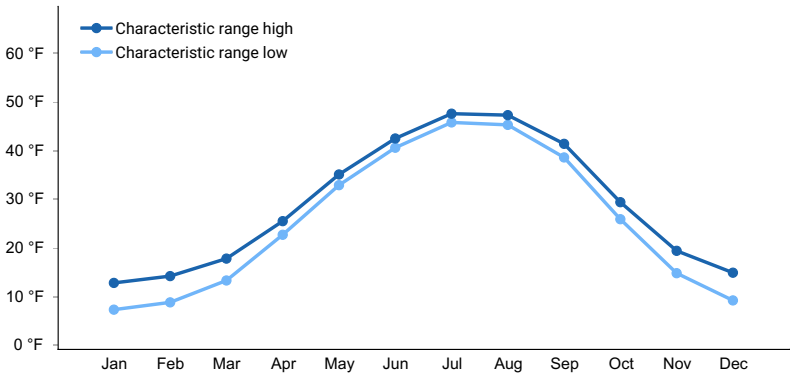


Figure 2. Monthly minimum temperature range

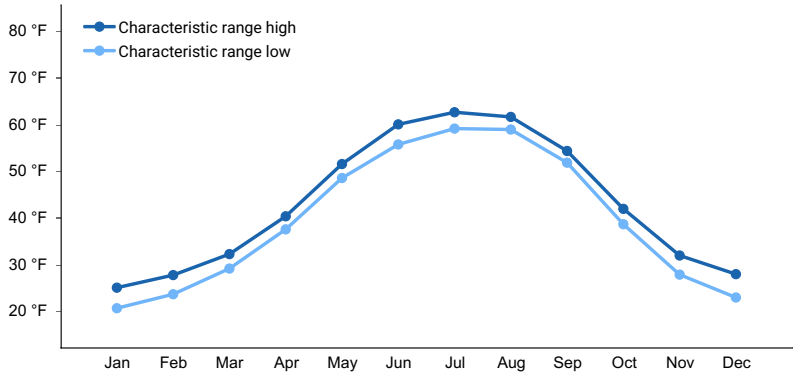


Figure 3. Monthly maximum temperature range

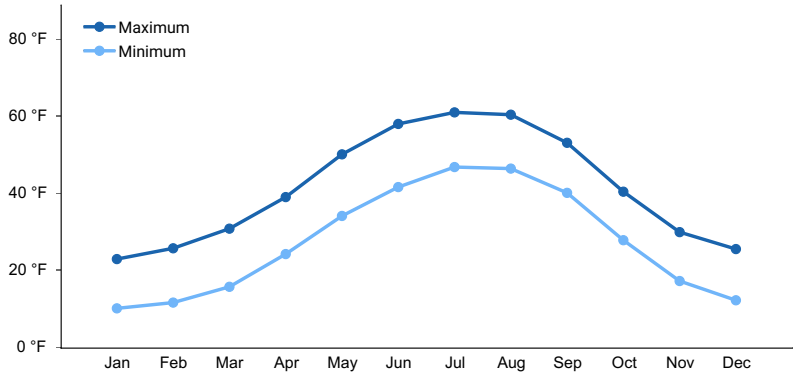


Figure 4. Monthly average minimum and maximum temperature

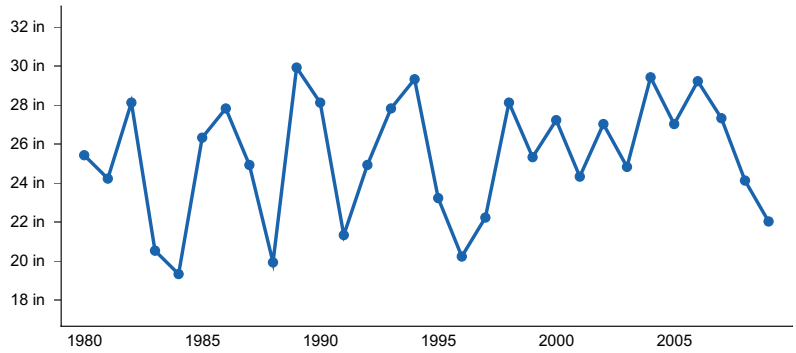


Figure 5. Annual precipitation pattern

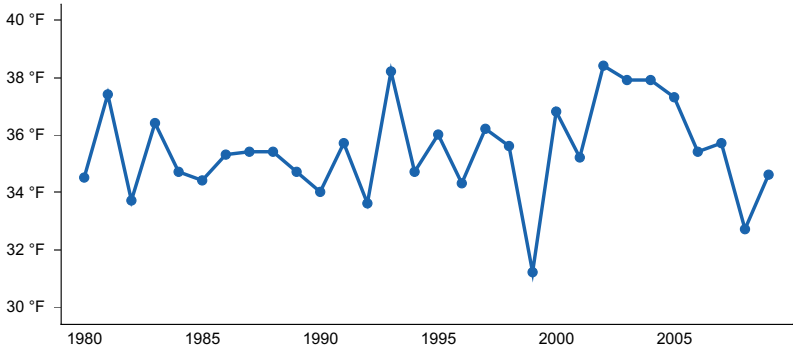


Figure 6. Annual average temperature pattern

Influencing water features

Site hydrology shapes the vegetation found in the forest understory. However, due to its landscape position, this site is not influenced by wetland or riparian water features. Precipitation and throughflow are the main sources of water.

Soil features

Soils are weakly developed and weakly weather Spodosols (Soil Survey Staff, 2013). Soils are very deep and moderately well drained. They support a cryic temperature regime and an udic moisture regime. Parent material is organic material over volcanic ash over loess.

Soil characteristics affecting vegetation include hydrology, soil development and the presence of volcanic ash. A moderately deep water table is present in June and aquic conditions are present beginning at 33 inches. Wet soils restrict which plant species can grow here during the important early growing season. Soil development is weak, characterized by an ochric epipedon. Weak soil development typically restricts plant recruitment. However, the presences of andic soil properties, the result of volcanic ash deposits, likely increase soil fertility and the resulting vegetation.

Correlated soil components in MLRA 236: Muklung, Oxyaquic Haplocryods

Table 5. Representative soil features

Parent material	(1) Loess (2) Volcanic ash
Surface texture	(1) Highly organic silt loam
Drainage class	Moderately well drained
Permeability class	Slow
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	2.1–2.5 in
Soil reaction (1:1 water) (0-10in)	4.2–5.8
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	Moderately well drained
Permeability class	Slow
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	0%
Available water capacity (0-10in)	2.1–3 in
Soil reaction (1:1 water) (0-10in)	4.2–5.9
Subsurface fragment volume <=3" (Depth not specified)	0–17%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

The boreal upland plains and hills support several ecological sites. The swales and areas near the Nushagak River support unique sites, primarily due to differences in the soils, disturbances, and local climate.

F236XY116AK is in linear to convex areas of upland plains. It generally is at the edge of tree islands and is surrounded by low-lying wetlands. The soils and hydrology in these areas support a unique ecological site. The annual precipitation is 24 to 55 inches, and the annual frost-free period is 85 to 140 days.

Spatial patterns in soil and site hydrology create two communities. The typical soil in this site supports a aquic conditions below 33 inches and a moderately deep water table in June. This soil supports a mixed forest canopy, while the understory is a mix of facultative upland to facultative wet wetland species. Low-lying areas on this site have wetter soils. Wetter soils are typically along the tree island edges, though they can be within the tree island. These wet areas do not support trees and the vegetation is comprised of facultative to obligate wetland species.

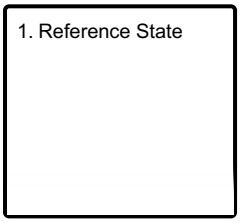
The communities on this site are stable. The communities on this site are primarily shaped by soil wetness. Site hydrology appear to be stable over short periods. Site hydrology is typically regulated by the surrounding wetland. Long term changes to wetland hydrology may influence this site, causing a community shift.

Willows are likely browsed by moose throughout the year. This does not appear to affect the ecological processes of the site.

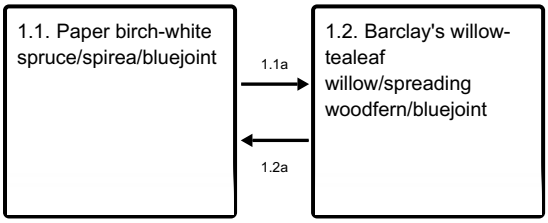
The information in this Ecological Dynamics section, including the state-and-transition model (STM), was developed based on current field data, professional experience, and a review of the scientific literature. As a result, all possible scenarios or plant species may not be included. Key indicator plant 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 - More frequent, longer periods of ponding.

1.2a - Less frequent, shorter periods of ponding.

State 1
Reference State

The reference state supports two community phases, which are distinguished by the developed structure and dominance of the vegetation and the ecological function and stability of the communities. The reference community phase is an open mixed forest. The presence of each community is dictated temporally by ponding. This report provides baseline inventory data on the vegetation. Future data collection is needed to provide further information about existing plant communities and the disturbance regimes that result 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
Paper birch-white spruce/spirea/bluejoint

Figure 7. Typical area of community 1.1.

Community Phase 1.1 Canopy Cover Table

Vegetation data are aggregated across modal sample plots for this community phase. Data 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)
T	White spruce	*Picea glauca*	PIGL	200^	15^
T	Paper birch	*Betula papyrifera*	BEPA	175^	20^
S	Spirea	*Spiraea stevenii*	SPST3	96	9
S	Lingonberry	*Vaccinium vitis-idaea*	VAVI	89	4
S	Lapland cornel	*Cornus suecica*	COSU4	89	4
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	89	15
F	Spreading woodfern	*Dryopteris expansa*	DREX2	93	20
F	Woodland horsetail	*Equisetum sylvaticum*	EQSY	82	3
M	Feathermosses	Includes 3 genera		76, 76, 80#	15, 20, 9

* Trees may be in multiple strata in a plot; therefore, species of this plant group may have a constancy value of more than 100 percent.

^ Tall, medium, and stunted individuals are counted as canopy trees. Regenerative individuals are not included.

Feathermosses are represented by three species—*Hylocomium splendens*, *Pleurozium schreberi*, and *Ptilium crista-castrensis*, respectively.

This dataset includes data from 35 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 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. Frequency and canopy cover of plants in community 1.1.

The reference plant community is characterized as an open mixed forest (Viereck et al., 1992). The overstory consists of paper birch and white spruce, and the understory commonly consists of willow (Salix spp.), strawberryleaf raspberry (*Rubus pedatus*), spirea, bluejoint, spreading woodfern (*Dryopteris expansa*), and woodland horsetail (*Equisetum sylvaticum*). Other plants may include Lapland cornel (*Cornus suecica*), twinflower (*Linnaea borealis*), variegated sedge (*Carex stylosa*), sidebells wintergreen (*Orthilia secunda*), and stiff clubmoss (*Lycopodium annotinum*). Mosses, including feathermosses, sphagnum mosses, and polytrichum mosses (Polytrichum spp.), generally make up a large percentage of the ground cover, and lichens are a minor component. Other ground cover commonly includes herbaceous litter and woody litter.

Dominant plant species

- white spruce (*Picea glauca*), tree
- paper birch (*Betula papyrifera*), tree
- beauverd spirea (*Spiraea stevenii*), shrub
- lingonberry (*Vaccinium vitis-idaea*), shrub
- Lapland cornel (*Cornus suecica*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- spreading woodfern (*Dryopteris expansa*), other herbaceous
- woodland horsetail (*Equisetum sylvaticum*), other herbaceous
- splendid feather moss (*Hylocomium splendens*), other herbaceous
- Schreber's big red stem moss (*Pleurozium schreberi*), other herbaceous
- knights plume moss (*Ptilium crista-castrensis*), other herbaceous

Community 1.2

Barclay's willow-tealeaf willow/spreading woodfern/bluejoint

Figure 9. Typical area of community 1.2.

Community Phase 1.2 Canopy Cover Table

Vegetation data are aggregated across modal sample plots for this community phase. Data 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	Barclay's willow	*Salix barclayi*	SABA3	83	30
S	Tealeaf willow	*Salix pulchra*	SAPU15	83	20
G	Bluejoint grass	*Calamagrostis canadensis*	CACA4	83	15
F	Spreading woodfern	*Dryopteris expansa*	DREX2	67	25
F	Field horsetail	*Equisetum arvense*	EQAR	50	4

This dataset includes data from 15 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 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 10. Frequency and canopy cover of plants in community 1.2.

This early ponding phase is characterized as open tall scrub (Viereck et al., 1992) that has an understory of shade-tolerant species. Typically, this community consists of dense thickets of shrubs, including Barclay's willow (*Salix barclayi*) and tealeaf willow (*S. pulchra*). Bluegrass, spreading woodfern, and horsetails are beneath the canopy of the shrubs. Other species include Sitka alder (*Alnus viridis* ssp. sinuata), spirea, dwarf birch (*Betula nana*), and claspleaf twistedstalk (*Streptopus amplexifolius*). Resilient, individual white spruce and paper birch trees may be in this community. Mosses and lichens typically are in the ground cover. Other ground cover commonly includes herbaceous litter and woody litter.

Dominant plant species

- Barclay's willow (*Salix barclayi*), shrub
- tealeaf willow (*Salix pulchra*), shrub
- bluejoint (*Calamagrostis canadensis*), grass
- spreading woodfern (*Dryopteris expansa*), other herbaceous
- field horsetail (*Equisetum arvense*), other herbaceous

Pathway 1.1a
Community 1.1 to 1.2

Paper birch-white spruce/spirea/bluejoint

Barclay's willow-tealeaf willow/spreading woodfern/bluejoint

More frequent, longer periods of ponding. Areas that are subject to longer or more frequent periods of ponding likely support community 1.2. The hypoxic or anoxic condition may drown species in the reference community phase that are not hydrophilic. Occasional, brief periods of ponding occur in April through October.

Pathway 1.2a
Community 1.2 to 1.1

Barclay's willow-tealeaf willow/spreading woodfern/bluejoint

Paper birch-white spruce/spirea/bluejoint

Less frequent, shorter periods of ponding. Over time, tree species may colonize and shade the understory in areas that are subject to less frequent, shorter periods of ponding. The colonization of trees and the drier soils may result in a decrease in the population of hydrophilic shrubs and allow shade-tolerant forbs, graminoids, and smaller shrubs to increase in abundance and richness. The period needed is unknown. It likely depends on several factors, including the rates of reproduction and growth of trees and the amount of moisture in the soils.

Additional community tables

Inventory data references

Modal points for Community 1.1
07CS11204
07CS12004
07CS17705
07SS08601
07SS11305
07SS12506
08SS15301

Modal points for community 1.2
07SS06209
07CS15204
10SS01804

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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	04/29/2024
Approved by	Kirt Walstad
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:**
