USDA Natural Resources Conservation Service

Ecological site R034AA201UT
Semi-desert Saline Well-Drained Terraces (Indian ricegrass/ Greasewood)

Last updated: 9/07/2023
Accessed: 04/25/2024

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): 034A–Cool Central Desertic Basins and Plateaus

Major Land Resource Area (MLRA) 34A, Cool Central Desertic Basins and Plateaus, consists of approximately 21 million acres in Wyoming, Colorado and Utah, it consists of 11 Land Resource Units (LRU). These units are divisions of the MLRA based on geology, landscape, common soils, water resources and plant community potentials. The elevation spans from approximately 5600 feet (1700 m) along the Green River in UT and CO to approximately 9500 feet (2900m) near Jeffrey City, WY. Annual precipitation ranges from 7 to 16 inches (177 to 406 mm), with the driest areas in the Green River and Great Divide Basins and the wettest areas in northern Carbon County, southeast Fremont County and Albany County. There is a seasonal weather pattern that trends west to east, with more winter precipitation in the west and more spring and summer in the east, illustrated by diminishing amounts of big sagebrush in the eastern part of the MLRA.

LRU notes

The Bear River Valley LRU is located on the far western side of MLRA 34A between the Bear River Divide and the Monte Cristo Range, from Woodruff, Utah at the southern end to Cokeville, Wyoming at the northern end. The total area of the LRU is approximately 340,000 acres. It shares a boundary with MLRA 47, 43B and 46 (proposed).
This LRU differs from the others in its geology, which is comprised mostly of alluvium and colluvium from the Stump Formation. Its weather patterns are such that the soil moisture is xeric, there is a slight peak in winter precipitation in this LRU, with typical yearly precipitation between 9 to 15 inches (230 to 380 mm). The soil temperature regime of this LRU is frigid with mean annual soil temperatures ranging from 44 to 48 degree Fahrenheit (6.7 to 8.8°C).
The elevation range is from 5700 to 7000 feet (1730 to 2130 m). The soils in the Bear River Valley are dominated by young aged very deep soils developed from sandstone and shale parent material re-worked with recent alluvium. Soils are dominated by Alfisols with young argillic horizons and by Fluvents in more recent alluvium.
The Bear River runs through this LRU, allowing for ample amounts of irrigation water used in the lowland areas to produce hay. Smaller tributaries originating from the neighboring mountains.

Ecological site concept

• This site does not receive any additional water.
• These soils:
o may be slightly saline or saline-sodic
o are moderately deep, deep, or very deep
o are not skeletal within 20” of the soil surface; and have minimal rock fragments at the soil surface
o are not strongly or violently effervescent in the surface mineral layer (within top 10”)
o have surface textures that usually range from fine sandy loam to loam in surface mineral layer (4”)
• have slopes less than 30 percent
• clay content is not greater than 35% in mineral soil surface layer (1-2”)

Associated sites

R034AA203UT	**Semi-desert Saline Terraces (Gardner's saltbush/ Bluebunch wheatgrass)**

Similar sites

R034AA203UT	**Semi-desert Saline Terraces (Gardner's saltbush/ Bluebunch wheatgrass)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Sarcobatus vermiculatus*
Herbaceous	(1) *Stipa hymenoides*

Physiographic features

This site occurs on stream or river terraces, alluvial fans, and alluvial bottoms. It is found on all aspects at elevations between 5,700 and 7,000 feet. The water table is at least 5 feet below the soil surface. Runoff is low to medium and flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Alluvial flat (3) Stream terrace
Flooding frequency	None
Ponding frequency	None
Elevation	5,700–7,000 ft
Slope	0–3%
Water table depth	60 in
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by warm, dry summers and cold, snowy winters. This climate is modified by local topographic conditions. The mountains appreciably modify both the precipitation and temperature patterns. April, May, September and October are the wettest months; December, January, February and July are the driest months.

Table 3. Representative climatic features

Frost-free period (average)	79 days
Freeze-free period (average)	112 days
Precipitation total (average)	13 in

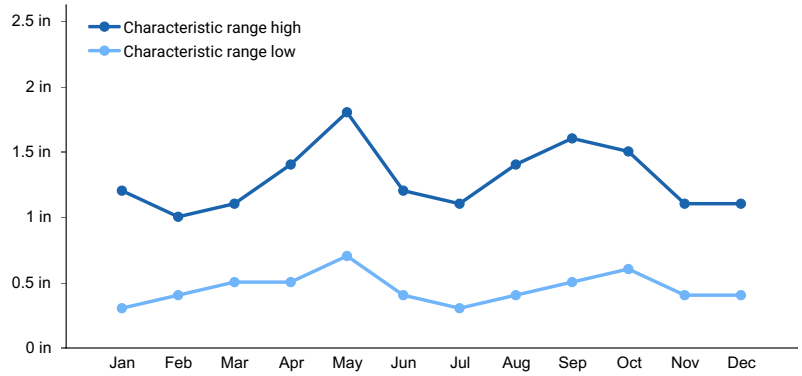


Figure 1. Monthly precipitation range

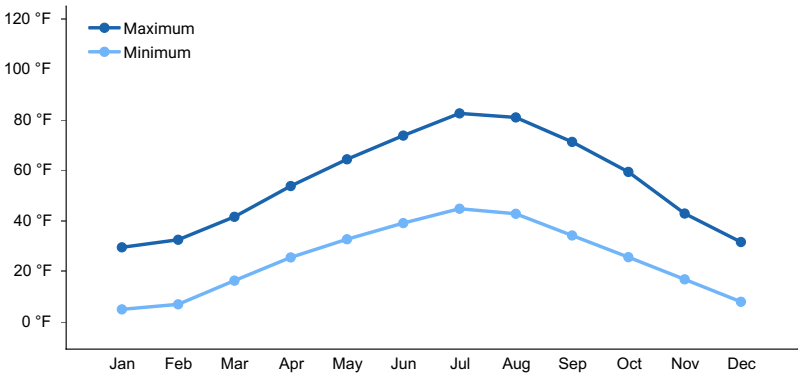


Figure 2. Monthly average minimum and maximum temperature

Influencing water features

This site is not typically influenced by streams or wetlands.

Wetland description

N/A

Soil features

These soils are moderately deep to deep and well drained. They formed in alluvium derived from sandstone, shale or quartzite. The surface layer is typically a loam, fine sandy loam, or silt loam. Subsurface layers typically have slightly finer texture. Few rock fragments occur in these soils. Water holding capacity is about 3 inches of water in the upper 40 inches of soil. The soil moisture regime is xeric and the soil temperature regime is frigid.

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Alluvium–quartzite
Surface texture	(1) Loam (2) Fine sandy loam (3) Silt loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderately slow
Soil depth	20–60 in
Surface fragment cover <=3"	0–15%
Surface fragment cover >3"	0–15%

Available water capacity (0-40in)	3 in
Soil reaction (1:1 water) (0-40in)	6.6–9
Subsurface fragment volume <=3" (Depth not specified)	0–15%
Subsurface fragment volume >3" (Depth not specified)	0–15%

Ecological dynamics

It is impossible to determine in any quantitative detail the Reference Plant Community for this ecological site because of the lack of direct historical documentation preceding all human influence. In some areas, the earliest reports of dominant plants include the cadastral survey conducted by the General Land Office, which began in the late 19th century for this area (Galatowitsch 1990). However, up to the 1870s the Shoshone Indians, prevalent in northern Utah and neighboring states, grazed horses and set fires to alter the vegetation for their needs (Parson 1996). In the 1860s, Europeans brought cattle and horses to the area, grazing large numbers of them on unfenced parcels year-long (Parson 1996). Itinerant and local sheep flocks followed, largely replacing cattle as the browse component increased.

Below is a State and Transition Model diagram to illustrate the “phases” (common plant communities), and “states” (aggregations of those plant communities) that can occur on the site. Differences between phases and states depend primarily upon observations of a range of disturbance histories in areas where this ESD is represented. These situations include grazing gradients to water sources, fence-line contrasts, patches with differing dates of fire, herbicide treatment, tillage, etc. Reference State 1 illustrates the common plant communities that probably existed immediately prior to European settlement.

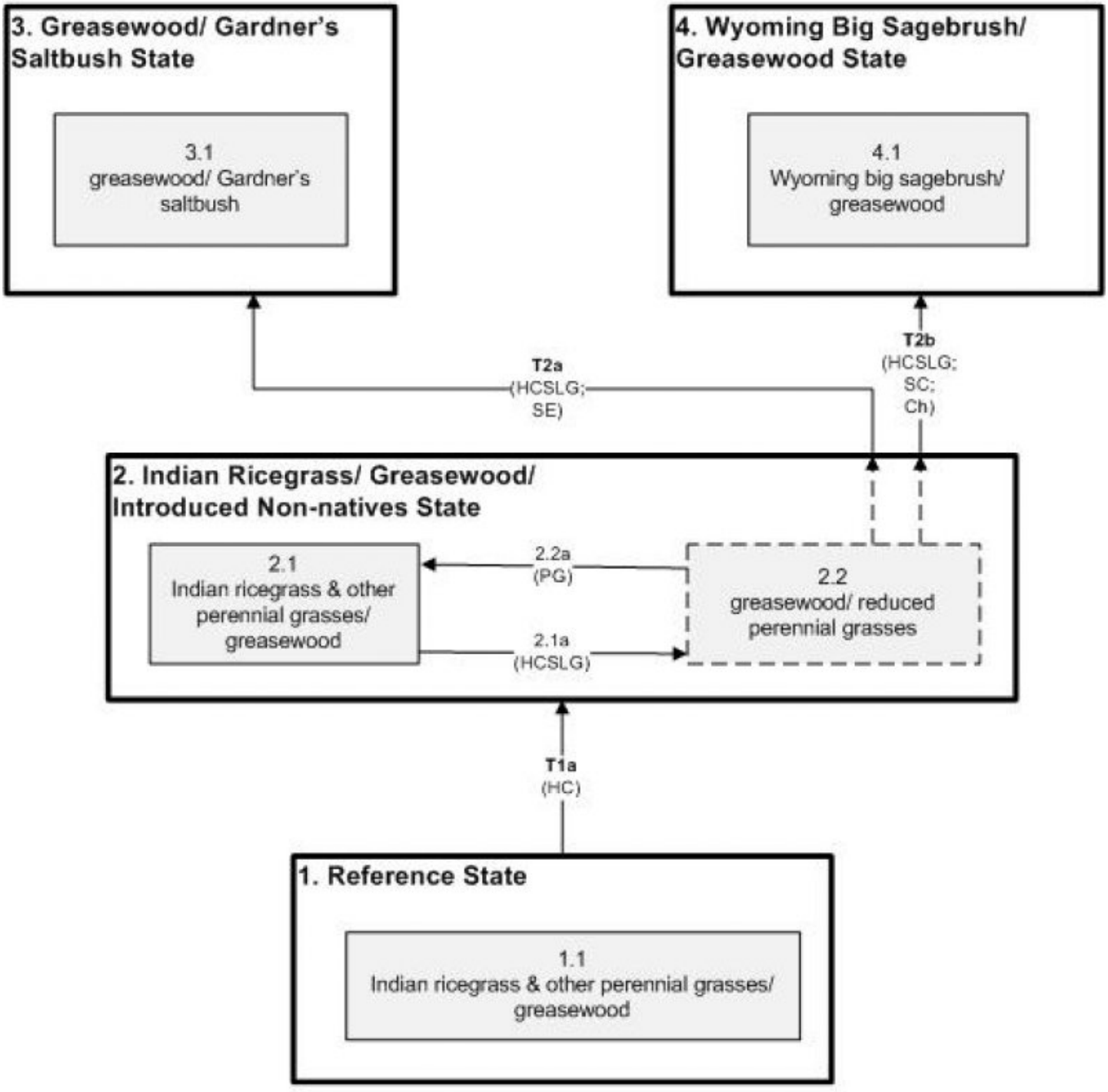
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the detailed narratives that follow the diagram. The transition between Reference State 1 and State 2 is considered irreversible because of the naturalization of exotic species of both flora and fauna, possible extinction of native species, and climate change. There may have also been accelerated soil erosion.

When available, monitoring data (of various types) were employed to validate more subjective inferences made in this diagram. See the complete files in the office of the State Range Conservationist for more details.

The plant communities shown in this State and Transition Model may not represent every possibility, but are probably the most prevalent and recurring plant communities. As more monitoring data are collected, some phases or states may be revised, removed, and new ones may be added. None of these plant communities should necessarily be thought of as “Desired Plant Communities.” According to the USDA NRCS National Range & Pasture Handbook (USDA-NRCS 2003), Desired Plant Communities (DPC’s) will be determined by the decision-makers and will meet minimum quality criteria established by the NRCS. The main purpose for including descriptions of a plant community is to capture the current knowledge at the time of this revision.

State and transition model

R034AY201UT: Semi-desert Saline Well-drained Terraces (Indian Ricegrass/ Greasewood)



Ch	Channelization (down-cutting)
HC	Historic Change
HCSLG	Heavy Continuous Season Long Grazing
PG	Prescribed Grazing
SC	Soil Compaction
SE	Soil Erosion

Figure 3. State and Transition Model

State 1
Reference State

The Reference State is a description of this ecological site just prior to Euro-American settlement but long after the arrival of Native Americans. The description of the Reference State was determined by NRCS Soil Survey Type Site Location information and familiarity with rangeland relict areas where they exist. The plant community (1.1) within the Reference State would have been co-dominated by Indian ricegrass (*Achnatherum hymenoides*) and greasewood (*Sarcobatus vermiculatus*). Other perennial grasses such as Western wheatgrass (*Pascopyrum smithii*) and basin wildrye (*Leymus cinereus*) would also have been common. A more complete list of species by lifeform for the Reference State is available in the accompanying tables in the “Plant Community Composition by Weight and Percentage” section of this document.

Community 1.1
Indian ricegrass & other perennial grasses/ Greasewood

Community Phase 1.1: Indian ricegrass & other perennial grasses/ Greasewood This plant community (1.1) would have been characterized by a co-dominance of Indian ricegrass and greasewood. Other perennial grasses such as Western wheatgrass and basin wildrye would have been common as well.

State 2
Indian Ricegrass/ Greasewood/ Introduced Non-natives State

State 2 is very similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement. This state can be regarded as the current potential. The least modified plant community (2.1) is co-dominated by Indian ricegrass and greasewood. Other perennial grasses such as Western wheatgrass and basin wildrye may also be common. The relative cover of the perennial grasses may be reduced with heavy grazing by livestock (2.1a) resulting in a greasewood-dominated phase (2.2). Provided there is some remaining perennial grass seed source and compaction from livestock has not occurred, these sites may return to a co-dominant plant community of native perennial grasses and greasewood (2.1) after the pressure from livestock has been minimized (2.2a). With the proper balance between shrub and perennial grass cover, the site will be resilient to moderate to light grazing effects. The resiliency of this state is maintained by ground cover, provided by both grasses and leaf litter, which helps maintain soil stability and retention of water at the site. Reduction of perennial grass cover puts this state at risk for further degradation due to lack of soil stabilization and reduction soil moisture retention. Protection from heavy grazing may prevent loss of the understory component and soil compaction, both of which make the site more susceptible to down-cutting of gullies. Severe channelization, or where erosional movement of fines covering sands and gravels in the soil subsurface allow for better drainage, could lead to a permanent lowering of the water table. This change in hydrologic regime will result in decreasing the salinity of surface soils, thus allowing the invasion of Wyoming big sagebrush (*Artemisia tridentata* spp. wyomingensis) into what was otherwise a chenopod-dominated (greasewood) shrubland rooted in saltier surface fines.

Community 2.1
Indian Ricegrass/ Greasewood/ Introduced Non-natives State

Community Phase 2.1: Indian ricegrass & other perennial grasses/ Greasewood This plant community (2.1) is characterized by a co-dominance of Indian ricegrass and greasewood. Other perennial grasses such as Western wheatgrass and basin wildrye are also common.

Community 2.2

Pathway CP 2.1A
Community 2.1 to 2.2

Community Pathway 2.1a Heavy continuous season-long grazing by livestock will reduce the perennial grass component, shifting the community towards greasewood dominance and expansion of introduced exotics such as burningbush (Kochia scoparia), prickly Russian thistle (*Salsola tragus*) and saltlover (*Halogeton glomeratus*).

Pathway CP 2.2A
Community 2.2 to 2.1

Community Pathway 2.2a A release from livestock grazing pressure will allow the perennial grasses to re-establish and bring the plant community back to a co-dominance of Indian ricegrass & greasewood (2.1).

State 3
Greasewood/ Gardner's Saltbush State

Greasewood and Gardner's saltbush (*Atriplex gardneri*) are found on sites where heavy continuous season-long grazing and some soil erosion have occurred. Site resiliency (resistance to change) is maintained by the absence of perennial grass seed source and partial soil surface loss, preventing the re-establishment of the understory component.

Community 3.1
Greasewood/ Gardner's Saltbush State

Community Phase 3.1: Greasewood/Gardner's saltbush This plant community (3.1) is characterized by a co-dominance of greasewood and Gardner's saltbush.

State 4
Wyoming Big Sagebrush/ Greasewood State

Where extreme down-cutting and channelization of these saline terraces has taken place, the water table will drop allowing glycophytic (not salinity tolerant) species such as Wyoming big sagebrush to move in and occupy the site in addition to the deeply tap-rooted greasewood. The resiliency (resistance to change) of this state is maintained by a lower water table and the associated change in soil chemistry (reduction is soil surface salts), which allows the establishment of Wyoming big sagebrush. The lack of native perennial grasses is maintained by the lack or depletion of seed source for those species.

Community 4.1
Wyoming Big Sagebrush/ Greasewood State

Community Phase 4.1: Wyoming big sagebrush/ greasewood This plant community (4.1) is characterized by a co-dominance of Wyoming big sagebrush and greasewood.

Transition T1A
State 1 to 2

Transition T1a: from State 1 to State 2 (Reference State to Indian Ricegrass/ Greasewood/ Introduced Non-natives State) The simultaneous introduction of exotic species, both plants and animals, and possible extinctions of native flora and fauna, along with climate change, has caused State 1 to transition to State 2. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

Transition T2A
State 2 to 3

Transition T2a: from State 2 to State 3 (Indian Ricegrass/ Greasewood/ Introduced Non-natives State to Greasewood/Gardner's Saltbush State) The Indian Ricegrass/ Greasewood/ Introduced Non-natives State will transition to the Greasewood/ Gardner's Saltbush State following heavy continuous season-long grazing and partial erosional loss of the upper part of the soil profile. The approach to this transition is indicated by a loss of perennial understory grass, an increase in the shrub component relative to grasses, in increase in bare soil, and/or soil loss. Sustained heavy grazing, especially during the growth season for grasses, will trigger the transition. Restoration (return to State 2) is impracticable due to the lack of native perennial grass seed source and partial soil loss.

Transition T2B

State 2 to 4

Transition T2b: from State 2 to State 4 (Indian Ricegrass/ Greasewood/ Introduced Non-natives State to Wyoming Big Sagebrush/ Greasewood State) The Indian Ricegrass/ Greasewood/ Introduced Non-natives State will transition to the Wyoming Big Sagebrush/ Greasewood State following extreme down-cutting and channelization of arroyos. The approach to this transition is indicated by a loss of the perennial grass understory and by soil compaction (evidenced by the presence of terracettes and mounded micro-relief around shrubs, with depressions between shrubs). The combined effect of sustained heavy grazing and soil compaction over time, coupled with a sudden flash flood event (or a sudden flash flood event alone), will trigger the transition. Restoration (return to State 2) is impracticable due to severe soil erosion and changes in soil chemistry, and due to the lack of native perennial grass seed source.

Additional community tables

Animal community

The suitability for livestock grazing is fair to good. This site provides grazing for cattle and sheep during all seasons, but spring grazing results in eventual loss of the native perennial grasses, increases less palatable shrubs, and encourages invasion of exotics.

Inventory data references

Data gathered by qualified range professionals within NRCS and cooperating partners.

Other references

Galatowitsch, S.M. 1990. Using the original land survey notes to reconstruct pre-settlement landscapes in the American West. Great Basin Naturalist: 50(2): 181-191. Keywords: [Western U.S., conservation, history, human impact]

Parson, R. E. 1996. A History of Rich County. Utah State Historical Society, County Commission, Rich County, Utah. Keywords: [Rich County, Utah, Historic land use, European settlements]

USDA-NRCS. 2003. National Range and Pasture Handbook. in USDA, editor, USDA-Natural Resources Conservation Service-Grazing Lands Technology Institute. Keywords: [Western US, Federal guidelines, Range pasture management]

Contributors

USU

Approval

Kirt Walstad, 9/07/2023

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	04/25/2024

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:**
