USDA Natural Resources
Conservation Service

Ecological site R034BY250UT
Semidesert Very Steep Loam (Salina Wildrye)

Last updated: 3/05/2022
Accessed: 05/04/2024

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): 034B–Warm Central Desertic Basins and Plateaus

MLRA 34B occurs in is in Utah (70 percent) and Colorado (30 percent). It makes up about 12,850 square miles (33,290 square kilometers). A small part of the area is in the High Plateaus of Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. The northern part of the MLRA occurs in the Uinta Basin Section, which is bounded by the Uinta Mountains to the north, the Wasatch Range to the west, the Roan Plateau to the south, and the Rabbit Hills to the east. The southern part of the MLRA occurs in the northern third of the Canyon Lands Section. This section is bounded by the Roan Plateau to the north, the Wasatch Plateau to the west, the southern end of the San Rafael Swell to the south, and the western slope of the Rocky Mountains to the east. Elevation ranges from 4,100 feet (1,250 meters) near Green River, Utah, to 7,500 feet (2,285 meters) at the base of the Wasatch Range and the Roan Plateau.

Most of this area is covered by residual basin-floor materials and materials washed in from the surrounding mountains and plateaus. Shale and sandstone are the dominant rock types. The Tertiary-age Green River, Uinta, and Duchesne Formations dominate the northern part of the MLRA. The southern part is dominated by Cretaceous-age materials with lesser amounts of Jurassic and Triassic materials. The dominant Cretaceous formations are Mancos Shale, Dakota Sandstone, and the members of the Mesa Verde Group. The dominant Jurassic formations are the Morrison, Entrada, and Navajo. The dominant Triassic formations are the Chinle and Moenkopi. Quaternary alluvial, eolian, and glacial deposits occur in both parts of the MLRA.

The average annual precipitation in most of this area ranges from 6 to 10 inches (150 to 255 millimeters). A small part of this area receives as much as 24 inches of annual precipitation.
Much of the precipitation occurs as high-intensity, convective thunderstorms during the period July through September. May and June are usually the drier months. Precipitation is more evenly distributed throughout the year in the northern part of the MLRA than in the southern part, where there is a significant peak in late summer. The northern part of the MLRA receives more precipitation as snow during winter than the southern part. The average annual temperature ranges from 41 to 54 degrees F (5 to 12 degrees C). The freeze-free period averages 170 days and ranges from 110 to 235 days.

The dominant soil orders in this MLRA are Aridisols and Entisols. Mollisols occur at the higher elevations, particularly in the northern part of the MLRA. The dominant soil temperature regime is mesic, and the dominant soil moisture regime is aridic. The soils receiving less than 8 inches (205 millimeters) of precipitation annually have an aridic soil moisture regime. The soils receiving 8 to 12 inches (205 to 305 millimeters) have an aridic soil moisture regime that borders on ustic. The soils receiving 12 to 16 inches (305 to 405 millimeters) generally have an ustic soil moisture regime that borders on aridic. The dominant soil mineralogy is mixed and soils are formed in slope alluvium or residuum derived from shale or sandstone. Many of the soils are shallow or moderately deep to shale or sandstone bedrock. The soils at the lower elevations generally have significant amounts of calcium carbonate, salts, and gypsum.

Ecological site concept

The soil is moderately deep and well drained. It formed in colluvium and residuum derived dominantly from shale and sandstone. The soil commonly has 47 percent of the surface covered with rock fragments, made up of boulders, stones, channery fragments, and pebbles. The surface soil texture is very bouldery loam, permeability is slow, and available water capacity is about 3.4 to 3.9 inches. The effective rooting depth is 20 to 40 inches. Runoff potential is very high. The soil moisture regime is mostly ustic aridic and the soil temperature regime is mesic. Precipitation ranges from 8-12 inches annually.

Associated sites

R034BY248UT	**Semidesert Very Steep Loam (Shadscale)** Semidesert Very Steep Loam (Shadscale)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia*
Herbaceous	(1) *Leymus salinus ssp. salinus*

Physiographic features

This site occurs on canyon escarpments at lower elevations.

Table 2. Representative physiographic features

Landforms	(1) Escarpment
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–2,134 m
Slope	50–70%
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

Approximately 35 percent of the precipitation (8 to 12 inches) occurs as snow from November through February. On the average, May through June are the driest months and August through October are the wettest months. Due to steepness of slope, slow soil permeability, and rock fragments, a substantial amount of water leaves this site as runoff. Plant growth begins about March first and ends about October 30.

Table 3. Representative climatic features

Frost-free period (average)	
Freeze-free period (average)	160 days
Precipitation total (average)	279 mm

Influencing water features

Due to its landscape position, this site is not influenced by streams or wetlands.

Soil features

The soil is moderately deep and well drained. It formed in colluvium and residuum derived dominantly from shale and sandstone. The soil commonly has approximately 45 percent of the surface covered with rock fragments, made up of boulders, stones, channery fragments, and pebbles. The surface soil texture is very bouldery loam, permeability is slow, and available water capacity is about 3.4 to 3.9 inches. The effective rooting depth is 20 to 40 inches. Runoff potential is very high. The soil moisture regime is mostly ustic aridic and the soil temperature regime is mesic. Precipitation ranges from 8-12 inches annually.

Modal Soil: Thedalund Family Stony — fine-loamy, mixed (calc.), mesic Ustic Torriorthents

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Residuum–sandstone and shale
Surface texture	(1) Very bouldery loam
Family particle size	(1) Fine-loamy
Drainage class	Well drained
Permeability class	Slow
Depth to restrictive layer	51–102 cm
Soil depth	51–102 cm
Surface fragment cover <=3"	13%
Surface fragment cover >3"	35%
Available water capacity (Depth not specified)	8.64–9.91 cm
Calcium carbonate equivalent (Depth not specified)	1–3%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Sodium adsorption ratio (Depth not specified)	0–1
Soil reaction (1:1 water) (Depth not specified)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	6%
Subsurface fragment volume >3" (Depth not specified)	2%

Ecological dynamics

State 1: Reference State
The reference state was determined by documenting rangeland relic areas that have been protected from excessive disturbance, such as grazing and recreation. Historical accounts were also considered.

The reference state represents the natural range of variability in the plant community dynamics of this ecological site. This state includes the biotic community that can establish on the ecological site if all successional sequences were completed under the present environmental conditions, without interferences by man; natural disturbances are inherent in its development. This state is dominated by native perennial warm season and cool season grasses, shadscale, and native annual and perennial forbs. Perennial warm and cool season grass composition depends primarily on slope aspect or soil moisture content. If present, Utah juniper is sparse and most common under relatively moist soil conditions (usually north-facing slopes). Soil moisture is the most important driver of plant community change in this state. When natural disturbances occur, the rate of recovery is relatively rapid due to niches being filled with highly adapted native vegetation.

Community Phase 1.1: Moist phase
This plant community phase is characterized by perennial warm and cool season grasses and native shrubs. The dominant cool season grasses include Salina wildrye and Indian ricegrass and the dominant warm season grass is galleta. Dominant native shrubs include shadscale and Torrey jointfir, with some Utah juniper present at times. Forb composition is variable. Other shrubs, forbs, and grasses may be present and cover is variable. Biological crust is more common in this community phase than in phase 1.2 and is characterized by isolated or continuous lichen and moss pinnacles.

Community Phase Pathway 1.1
This pathway occurs when soil moisture decreases, favoring plants species that can tolerate dryer conditions. Events leading to this pathway may include extended periods of drought and/or increased temperatures.

Community Phase 1.2: Dry phase
This plant community phase is characterized by perennial warm and cool season grasses and native shrubs. The dominant cool season grass is Indian ricegrass, and the dominant warm season grass is galleta. Dominant shrubs are shadscale and Torrey jointfir. Forb composition is variable. Other shrubs, forbs, and grasses may be present and cover is variable.

Community Phase Pathway 1.2
This pathway occurs when events favor plant species with higher cool-season moisture requirements such as Salina wildrye. Events may include extended periods of higher than normal precipitation and may be coupled with cooler temperatures.

Transition 1
This transition occurs when cheatgrass and/or other invasive plant species are dispersed to the site and allowed to germinate, establish and reproduce on site. Events triggering this transition may include improperly managed livestock grazing or recreational activities that disperse non-native seeds to safe microsites that are suitable for establishment of the invaders. Invasive species are also known to establish in undisturbed native plant communities due to their ability to adapt and compete with native vegetation. Eradication of these species once established is considered infeasible.

At-risk Community Phase – All communities are at risk of invasive plant establishment.

Trigger – Dispersal, germination and establishment of invasive species.

State 2: Current Potential State
This state is very similar to the reference state in nutrient cycling and disturbance regime; however it now includes invasive plant species, particularly cheatgrass. This state is dominated by native perennial warm and cool season grasses, shadscale, and native annual and perennial forbs. Invasive plants are present but not dominant. Perennial warm and cool season grass composition depends primarily on slope, aspect and soil moisture. If present, Utah juniper is sparse and most common under relatively moist soil conditions (usually north and east-facing slopes). Soil moisture is the most important driver of plant community change in this state. This state has lower resistance to disturbances and resilience after disturbance than the reference state. Invasive plants are beginning to fill the niches and establish on the site.

Community Phase 2.1: Moist Phase with Invasives
This plant community phase is characterized by perennial warm and cool season grasses and native shrubs. The dominant cool season grasses are Salina wildrye and Indian ricegrass, and the dominant warm season grass is galleta. Dominant native shrubs include shadscale and Torrey jointfir, with some Utah juniper present at times. Forb composition is variable. Cheatgrass or other non-native species are present but not dominant. Other shrubs, forbs, and grasses may be present and cover is variable.

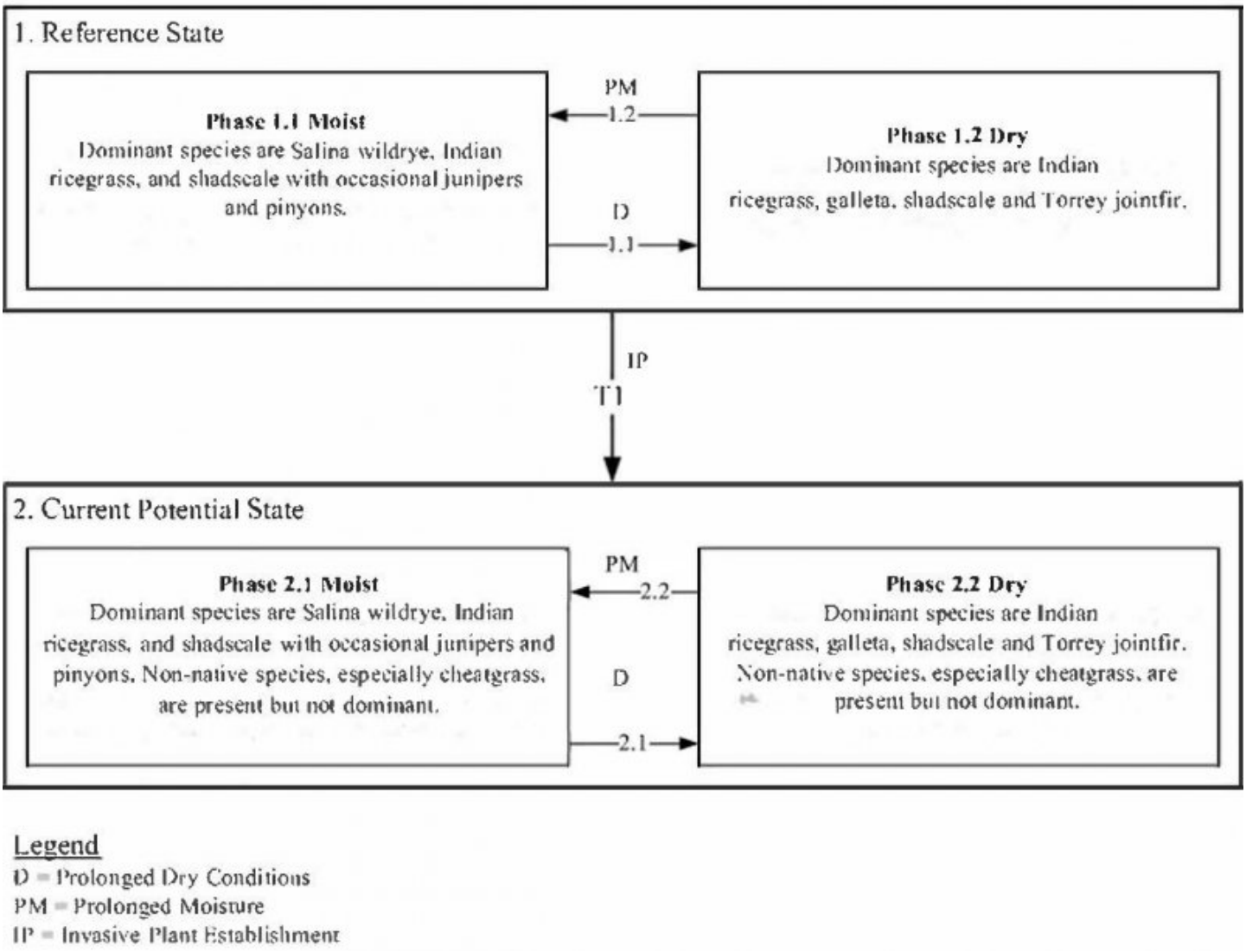
Community Phase Pathway 2.1
This pathway occurs when soil moisture decreases, favoring plants species that can tolerate dryer conditions. Events leading to this pathway may include extended periods of drought and/or increased temperatures.

Community Phase 2.2: Dry Phase with Invasives

This plant community phase is characterized by perennial warm and cool season grasses and native shrubs. The dominant cool season grass is Indian ricegrass, and the dominant warm season grass is galleta. Dominant shrubs are shadscale and Torrey jointfir. Forb composition is variable. Cheatgrass or other non-native species are present but not dominant. Other shrubs, forbs, and grasses may be present and cover is variable.

Community Phase Pathway 2.2
This pathway occurs when events favor plant species with higher cool-season moisture requirements such as Salina wildrye. Events may include extended periods of higher than normal precipitation and may be coupled with cooler temperatures.

State and transition model



Legend
D = Prolonged Dry Conditions
PM = Prolonged Moisture
IP = Invasive Plant Establishment

State 1
Reference State

Community 1.1
Reference State

The dominant aspect of the plant community is Salina wildrye. The composition by air-dry weight is approximately 55 percent perennial grasses, 10 percent forbs and 35 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	200	293	354
Shrub/Vine	128	186	225
Forb	37	54	65
Total	**365**	**533**	**644**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	14-16%
Grass/grasslike foliar cover	19-21%
Forb foliar cover	4-6%
Non-vascular plants	0%
Biological crusts	0%
Litter	0%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0%
Bedrock	0%
Water	0%
Bare ground	0%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	–	–	–
>0.15 <= 0.3	–	–	–	4-6%
>0.3 <= 0.6	–	14-16%	19-21%	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			140–168	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	140–168	–
3	**Sub-Dominant Shrubs**			78–207	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	28–56	–
	valley saltbush	ATCU	*Atriplex cuneata*	6–17	–
	littleleaf brickellbush	BRMI	*Brickellia microphylla*	6–17	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	6–17	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	6–17	–
	pretty buckwheat	ERBI	*Eriogonum bicolor*	6–17	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–17	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	6–17	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	6–17	–
Grass/Grasslike					
0	**Dominant Grasses**			179–280	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	112–140	–
	western wheatgrass	PASM	*Pascopyrum smithii*	17–28	–
	muttongrass	POFE	*Poa fendleriana*	6–28	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	6–28	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	17–28	–
	James' galleta	PLJA	*Pleuraphis jamesii*	22–28	–
1	**Sub-Dominant Grasses**			11–22	
	Forb, annual	2FA	*Forb, annual*	6–11	–
	Forb, perennial	2FP	*Forb, perennial*	6–11	–
Forb					
2	**Sub-Dominant Forbs**			118–235	
	Forb, annual	2FA	*Forb, annual*	28–56	–
	Forb, perennial	2FP	*Forb, perennial*	28–56	–
	littleleaf pussytoes	ANMI3	*Antennaria microphylla*	6–11	–
	tufted milkvetch	ASSP6	*Astragalus spatulatus*	6–11	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	6–11	–
	basin fleabane	ERPU9	*Erigeron pulcherrimus*	6–11	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	6–11	–
	juniper biscuitroot	LOJU	*Lomatium juniperinum*	6–11	–
	rayless tansyaster	MAGR2	*Machaeranthera grindelioides*	6–11	–
	thickleaf beardtongue	PEPA6	*Penstemon pachyphyllus*	6–11	–
	rock goldenrod	PEPU7	*Petradoria pumila*	6–11	–
	desert princesplume	STPI	*Stanleya pinnata*	6–11	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	6–11	–

Animal community

Because of steep slopes this site receives very little use by livestock for grazing.

This site provides food but very little cover for wildlife. Wildlife using this site include jackrabbit, coyote, fox, and mule deer.

Hydrological functions

The soil is in hydrologic group C. The runoff curve numbers are 74 through 86 depending on the condition of the watershed.

Recreational uses

Because of steepness of slope this site has very low recreation potential.

Wood products

None

Inventory data references

Type Location: Consult the Grand County Soil Survey Report

Contributors

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Approval

Kirt Walstad, 3/05/2022

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.

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Date	04/02/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are common. Their expression may be less defined where coarse fragments (i.e., gravels and/or channers) dominate the soil surface. Rill occurrence may increase slightly on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Rills should be <1 inches deep,

somewhat long (8 to 16 feet) and somewhat widely spaced (8-12 feet). An increase in rill development may be observed immediately following major thunderstorm or spring runoff events.

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2. **Presence of water flow patterns:** Sinuous flow patterns are common and wind around perennial plants and surface rock. Evidence of flow patterns is expected to increase somewhat as slopes approach 80%. Water flow patterns are long (20 to 30 feet), somewhat narrow (1 to 2 feet wide), and spaced widely (5 to 10 yards) and more closely spaced(3 to 6 yards) on slopes nearing 70 to 80%.

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals will form at the base of plants that occur on the edge of water flow patterns, 2 to 4% of plants show minor exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 2 inches in diameter) in water flow patterns. These debris dams may accumulate smaller litter (leaves, grass and forb stems) and sediment.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20–25%. (Soil surface is typically covered by 0-60% surface fragments). Most bare ground is associated with water flow patterns, rills, and gullies. Bare ground spaces not associated with flow patterns should not be greater than 1 to 2 feet in diameter.

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5. **Number of gullies and erosion associated with gullies:** A few gullies may occur. Any gullies preaent may extend down the length of the site until they reach a stream or other area where water and sediment is deverted or accumulates. Gullies show slightly more indication of erosion as slopes approach 80%, or where the site occurs adjacent to watershed areas with concentrated flow patterns.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None to very minor. Perennial shrubs along with surface coarse fragments on this site help break the wind and help reduce the potential for wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** Because of the sites very steep slopes, some litter redistribution downslope caused by water movement is normal. Some litter removal may occur in flow channels with deposition occurring within 3 to 5 feet at points of obstruction. The majority of litter still accumulates at the base of plants. Some grass leaves, stems and small woody twigs may accumulate in soil depressions adjacent to plants. Woody stems are likely to move 1 to 2 feet. A slight increase in litter movement is expected following runoff resulting from heavy spring runoff or thunderstorms.

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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):** This site should have an erosion rating of 4 or 5 under the plant canopies, and a rating of 3 to 4 in the interspaces. The average should be a 4. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Molen, 50-80% slopes) Soil surface A horizon is typically 0 to 3 inches deep. Structure is weak thin platy parting to weak fine granular and weak thin platy. Color is pale brown (10YR 6/3). Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Good spatial distribution of well developed biological soil crusts (where present) intercept raindrops, reducing splash erosion and providing areas of increased surface detention to store water, allowing additional time for infiltration.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Sandstone bedrock occurs at about 31 to 35 inches.

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: Non-sprouting shrubs (shadscale, broom snakeweed > cool season perennial grasses (Salina wildrye, Indian ricegrass) >> warm season rhizomatous grasses (James galleta).

    Sub-dominant: Sprouting shrubs (green rabbitbrush) > cool season perennial grasses (bluebunch wheatgrass, muttongrass) = > forbs (grassy rock goldenrod) > biological soil crusts (where present).

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state. Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover. Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Factors contributing to temporal variability include insects and other pathogens (mistletoe), drought, extreme precipitation events, etc. Factors contributing to spatial variability include slope, amount of rock fragments, aspect, etc. Following a recent disturbance such as fire, drought or insects, that may remove the woody vegetation, forbs and perennial grasses (herbaceous species) may become more dominate in the community. These conditions may reflect a different functional community phase within the reference state.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent on shrubs, or grasses. There may be partial mortality on individual bunchgrasses and shrubs during drought periods, and complete mortality of individual plants during severe drought periods.

14. **Average percent litter cover (%) and depth (in):** Cover should be composed mostly of fine litter. Depth should vary from a 1 leaf thickness in the interspaces, to up to 1/2” under herbaceous canopies, and up to 1” under shrub canopies. Litter cover may increase to 30% on some years due to increased production of plants.

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 450 - 500#/acre on an average year, but could range from 300 to 600#/acre during periods of prolonged drought or above average precipitation.

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: Few invasive species are capable of dominating this site. When invasion does occur, cheatgrass, alyssum, and mustard species are the most likely species to invade.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is present during average and above average growing years.
