Ecological site R034BY248UT
Semidesert Very Steep Loam (Shadscale)

Last updated: 9/09/2023
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General information

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

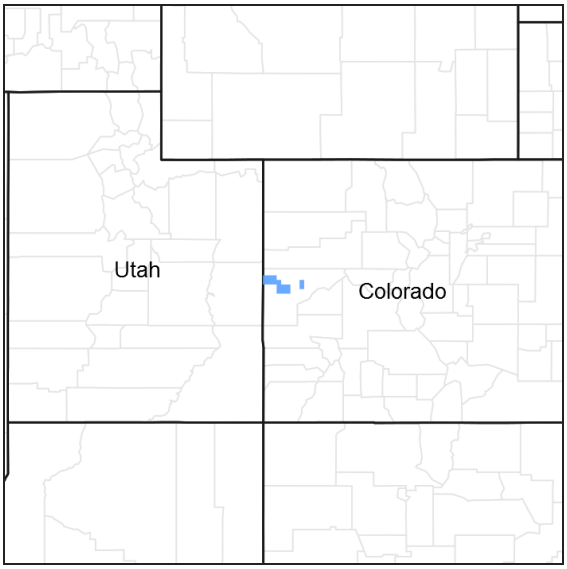


Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

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

Characteristic soils in this site are 10 to 60 inches deep over shale and sandstone and well-drained. They formed in colluvium and residuum derived mainly from shale and sandstone parent materials. The soils commonly have a channery clay loam surface. The underlying material is silty clay loam, which overlies soft weathered shale. Hard shale is at depths of 20 to 40 inches. Permeability is moderately slow. Water supplying capacity is 1.1 to 7.9 inches and depends to a large extent on the depth to soft weathered shale. Effective rooting depth is generally 20 to 60 inches but may range to 10 inches. Runoff is very high and the hazard of water erosion is very high. Average annual soil loss in potential is approximately 2 tons/acre. The soil moisture regime is ustic aridic and the soil temperature regime is mesic.

Associated sites

R034BY251UT	**Semidesert Very Steep Loam (Wyoming big sagebrush)** Semidesert Very Steep Loam (Wyoming big sagebrush)

Similar sites

R034BY251UT	**Semidesert Very Steep Loam (Wyoming big sagebrush)**

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 or eroded pediments. Slopes are mostly 25 to 65 percent. Elevations range from 4,700 to 5,400 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Canyon (2) Escarpment (3) Pediment
Runoff class	Very high
Flooding frequency	None
Ponding frequency	None

Elevation	1,433–1,646 m
Slope	25–65%
Ponding depth	Not specified
Water table depth	Not specified
Aspect	Aspect is not a significant factor

Climatic features

Average annual precipitation is 8 to 12 inches. Approximately 35 percent 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. The climate of this ecosystem is semidesert with about 45 to 50 percent of the precipitation occurring during the plant growth period, March through October. Due to the steepness of slope and the slow water infiltration rate associated with this site, a substantial amount of water leaves the site as runoff. The intense nature of most rain storms which occur during the wetter summer months also reduces water infiltration and reduces water available for plant growth. In average years, plants begin growth around March 1 and end growth around October 30.

Table 3. Representative climatic features

Frost-free period (characteristic range)	140-180 days
Freeze-free period (characteristic range)	
Precipitation total (characteristic range)	203-305 mm

Influencing water features

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

Wetland description

N/A

Soil features

Characteristic soils in this site are 10 to 60 inches deep over shale and sandstone and well-drained. They formed in colluvium and residuum derived mainly from shale and sandstone parent materials. The soils commonly have a channery clay loam surface. The underlying material is silty clay loam, which overlies soft weathered shale. Hard shale is at depths of 20 to 40 inches. Permeability is moderately slow. Water supplying capacity is 1.1 to 7.9 inches and depends to a large extent on the depth to soft weathered shale. Effective rooting depth is generally 20 to 60 inches but may range to 10 inches. Runoff is very high and the hazard of water erosion is very high. Average annual soil loss in potential is approximately 2 tons per acre. The soil moisture regime is ustic aridic and the soil temperature regime is mesic.

Table 4. Representative soil features

Parent material	(1) Colluvium–shale (2) Residuum–shale
Surface texture	(1) Clay loam (2) Very parachannery clay loam
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	25–152 cm
Soil depth	25–152 cm

Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0%
Available water capacity (Depth not specified)	2.79–20.07 cm
Calcium carbonate equivalent (Depth not specified)	5–10%
Electrical conductivity (Depth not specified)	0–2 mmhos/cm
Soil reaction (1:1 water) (Depth not specified)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

State 1: Reference State

The reference state represents the historic plant communities and ecological dynamics of the desert loam, shadscale site. This state includes the biotic communities that become established on the ecological site if all successional sequences are completed under current climatic conditions; natural disturbances are inherent in its development. This state is dominated by warm season perennial grasses and shadscale. The primary disturbance mechanism is climate fluctuations. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. When natural disturbances occur, the rate of recovery is relatively rapid due to niches being filled with highly adapted native vegetation.

Reference State: Community phases disturbed by climate fluctuations and insect herbivory.

Indicators: A site dominated by shadscale with galleta. Indian ricegrass and sand dropseed may or may not be present.

Feedbacks: Extended periods of above average precipitation resulting in an increase in the native perennial plant vigor. Insect herbivory that reduces shrub vigor and allows grass production to increase.

At-risk Community Phase: All communities are at risk when nutrients are available for invasive plants to establish. Plant community 1.2 is especially at risk due to limited production and cover of understory grasses.

Trigger: Introduction of invasive plants to fill available niches.

Community Phase 1.1: Shrubland with Grasses
This plant community phase is dominated by shadscale, Torrey mormontea, and perennial grasses. Grasses may include but are not limited to, Indian ricegrass and galleta. Galleta is typically the dominant perennial grass species in this plant community phase. Other perennial grasses may or may not be present. Other perennial shrubs, and forbs may be present and cover is variable. Bare ground is 2 to 19 percent and biological crusts are 0 to 30 percent. Surface rock fragments (0 to 35 percent) can be very prevalent.

Community Phase Pathway 1.1a
This pathway occurs when climatic events, such as drought disfavor the establishment and persistence of perennial grasses.

Community Phase 1.2: Shrubland
This plant community phase is dominated by shadscale and Torrey mormontea, where warm and cool season perennial grasses are minimally present. Grasses may include but are not limited to, Indian ricegrass and galleta. Galleta is typically the dominant perennial grass species in this plant community phase. Other perennial grasses,

shrubs, and forbs may or may not be present and cover is variable. Bare ground is 2 to 19 percent and biological crusts are 0 to 30 percent. Surface rock fragments 0 to 35 percent.

Community Phase Pathway 1.2a
This pathway occurs when climatic events, such as years with normal to above average precipitation favor the establishment of perennial grasses.
Transition T1a
This transition occurs as invasive species become established in the plant community. Common invasive species include cheatgrass, halogeton, and Russian thistle. Disturbances that may accelerate this transition include improper livestock grazing and extended drought. Invasive species such as cheatgrass have also been known to invade intact perennial plant community where no disturbance has occurred.

State 2: Current Potential State
This state is similar to state one, however there are invasive species established in the understory—cheatgrass and halogeton being the most common. The primary disturbance mechanism is climate fluctuations; however livestock grazing may influence the ecological dynamics of the site.

Current Potential State: Plant communities disturbed by fluctuating climatic conditions insect herbivory, and livestock grazing.

Indicators: A site dominated by shadscale and galleta, where Indian ricegrass and sand dropseed may or may not be present. Invasive species are present.

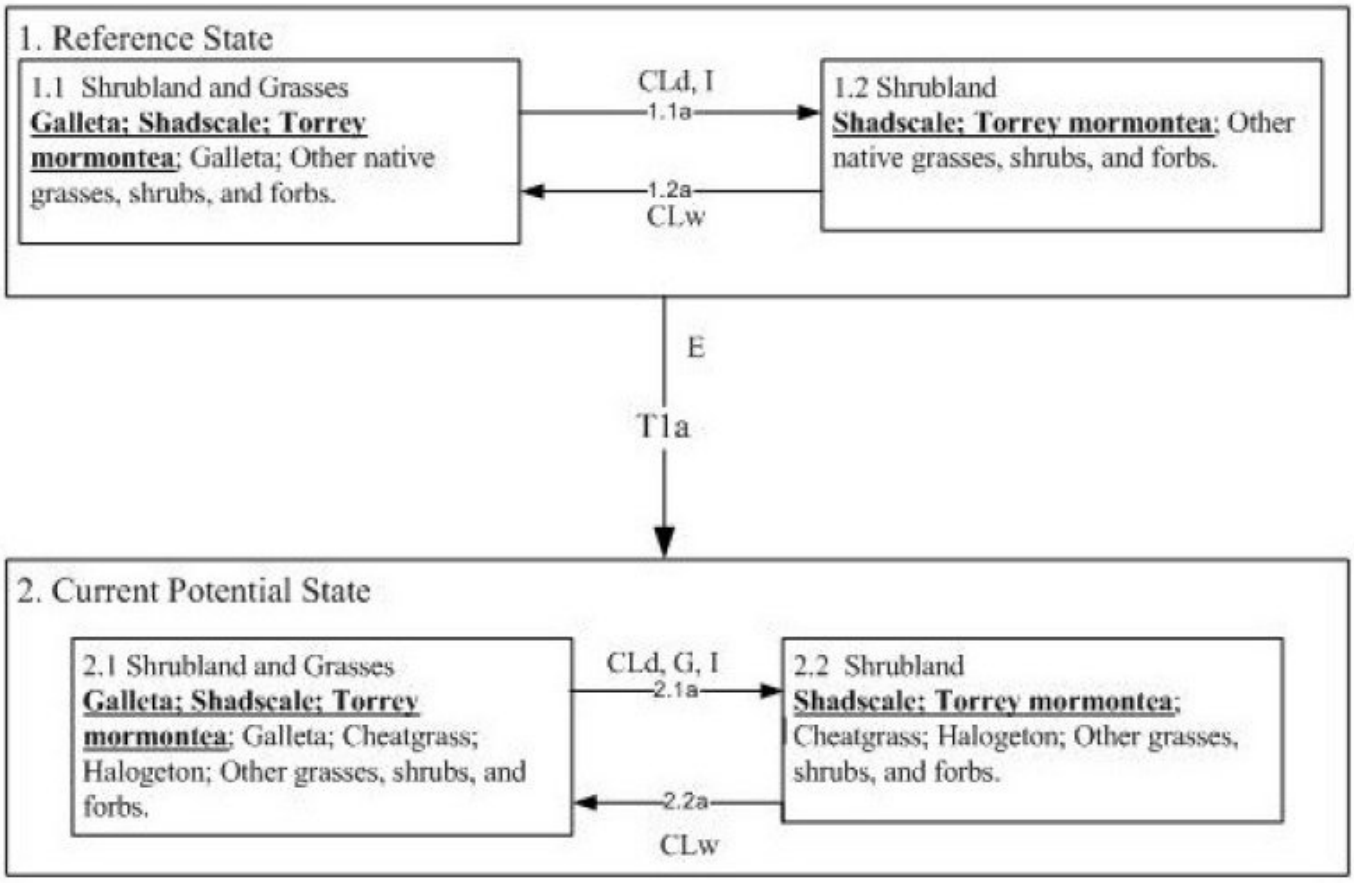
Feedbacks: Fluctuations in climate allow for the maintenance of both shrubs and perennial grasses.

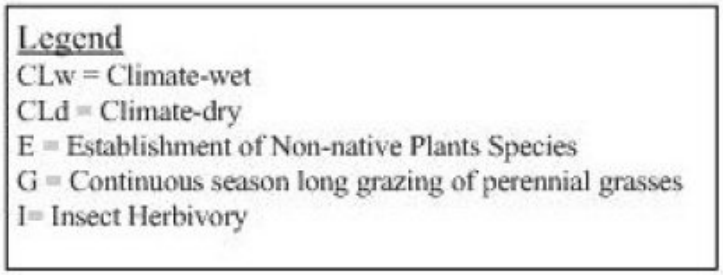
Community Phase 2.1: Shrubland with grasses
This plant community phase is dominated by shadscale, Torrey mormontea, and perennial grasses. Grasses may include but are not limited to, Indian ricegrass and galleta. Galleta is typically the dominant perennial grass species in this plant community phase. Other perennial or invasive grasses, shrubs, and forbs my or may not be present and cover is variable. This plant community is very similar to plant community 1.1 in production and cover. The main difference is that invasive species are present in this phase. Bare ground is 2 to 19 percent and biological crusts are 0 to 30 percent. Surface rock fragments (0 to 35 percent) can be very prevalent.

Community Phase Pathway 2.1a
This pathway occurs when events, such as drought or continuous season long grazing of perennial grasses, disfavor the persistence of perennial grasses.
Community Phase 2.2: Shrubland
This plant community phase is dominated by shadscale and Torrey mormontea, where warm and cool season perennial grasses are minimally present. Grasses may include but are not limited to, Indian ricegrass and galleta. Galleta is typically the dominant perennial grass species in this plant community phase. Other perennial or invasive grasses, shrubs, and forbs my or may not be present and cover is variable. This plant community is very similar to plant community 1.2 in production and cover. The main difference is that invasive species are present in this phase. Bare ground is 2 to 19 percent and biological crusts are 0 to 30 percent. Surface rock fragments (0 to 35 percent) can be very prevalent.

Community Phase Pathway 2.2a
This pathway occurs when events, such as years with normal to above average precipitation favor the establishment of perennial grasses, and when grazing regimes are used that promote the establishment and persistence of perennial grasses.

State and transition model





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	108	139	169
Shrub/Vine	68	89	108
Forb	20	26	31
Total	**196**	**254**	**308**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	14-16%
Grass/grasslike foliar cover	19-31%
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%	29-31%	–
>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**			46–85	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	28–43	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	15–28	–
	valley saltbush	ATCU	*Atriplex cuneata*	3–15	–
3	**Sub-Dominant Shrubs**			53–87	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	9–15	–
	littleleaf brickellbush	BRMI	*Brickellia microphylla*	3–6	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–6	–
	mormon tea	EPVI	*Ephedra viridis*	3–6	–
	pretty buckwheat	ERBI	*Eriogonum bicolor*	3–6	–
	slender buckwheat	ERMI4	*Eriogonum microthecum*	3–6	–
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	3–6	–

	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	3–6	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	3–6	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	3–6	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	3–6	–
	Mexican cliffrose	PUME	*Purshia mexicana*	3–6	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	3–6	–
Grass/Grasslike					
0	**Dominant Grasses**			140–155	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	140–155	–
2	**Sub-Dominant Grasses**			25–47	
	Grass, annual	2GA	*Grass, annual*	9–15	–
	Grass, perennial	2GP	*Grass, perennial*	9–15	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	3–9	–
Forb					
2	**Sub-Dominant Forbs**			90–152	
	Forb, annual	2FA	*Forb, annual*	28–43	–
	Forb, perennial	2FP	*Forb, perennial*	28–43	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	3–9	–
	sego lily	CANU3	*Calochortus nuttallii*	3–9	–
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	3–9	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	3–9	–
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	3–9	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	3–9	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	3–9	–
	juniper biscuitroot	LOJU	*Lomatium juniperinum*	3–9	–
	desert princesplume	STPI	*Stanleya pinnata*	3–9	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	3–9	–

Animal community

This site receives very little grazing from livestock because of steep slopes. This site produces food but limited cover for wildlife. Wildlife using this site include jackrabbit, snake, hawk, and coyote.

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 slopes this site has limited potential for recreation.

Wood products

None

Inventory data references

The reference state was determined by study of rangeland relic areas, areas protected from excessive disturbance and outside influences, such as grazing and recreation. Literature reviews, trends in plant community dynamics, and historical accounts are also considered.

Other references

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Contributors

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Approval

Kirt Walstad, 9/09/2023

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.

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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 0-25% 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. Perennial shrubs along with any 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.

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 5 or 6 under the plant canopies, and a rating of 4 to 5 in the interspaces. The average should be a 5. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Montwel 50-80% slopes) Soil surface A horizon is typically 0 to 2 inches deep. Structure is weak very fine, fine, and medium subangular blocky. Color is strong brown (7.5YR 5/4). 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. Fractured Shale occurs at about 36 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 (cushion wild buckwheat) > 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 3/4” under shrub canopies. Litter cover may increase to 25% on some years due to increased production of plants.

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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 200 - 250#/acre on an average year, but could range from 150 to 300#/acre during periods of prolonged drought or above average precipitation.

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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:** 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.
