USDA Natural Resources
Conservation Service

Ecological site R047XB244UT
Semidesert Silt Loam (winterfat)

Last updated: 2/06/2025
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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.

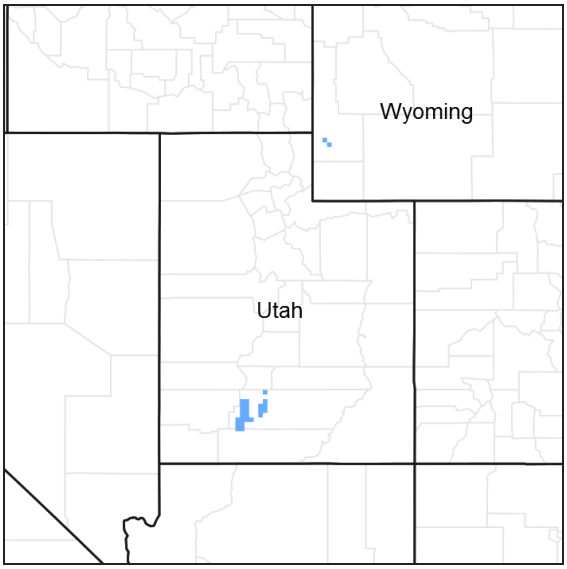

Figure 1. Mapped extent

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): 047X–Wasatch and Uinta Mountains

MLRA 47 occurs in Utah (86 percent), Wyoming (8 percent), Colorado (4 percent), and Idaho (2 percent). It encompasses approximately 23,825 square miles (61,740 square kilometers). The northern half of this area is in the Middle Rocky Mountains Province of the Rocky Mountain System. The southern half is in the High Plateaus of the Utah Section of the Colorado Plateaus Province of the Intermontane Plateaus. Parts of the western edge of this MLRA are in the Great Basin Section of the Basin and Range Province of the Intermontane Plateaus. The MLRA includes the Wasatch Mountains, which trend north and south, and the Uinta Mountains, which trend east and west. The steeply sloping, precipitous Wasatch Mountains have narrow crests and deep valleys. Active faulting and erosion are a dominant force in controlling the geomorphology of the area. The Uinta Mountains have a broad, gently arching, elongated shape. Structurally, they consist of a broadly folded anticline that has an erosion-resistant quartzite core. The Wasatch and Uinta Mountains have an elevation of 4,900 to about 13,500 feet (1,495 to 4,115 meters).

The mountains in this area are primarily fault blocks that have been tilted up. Alluvial fans at the base of the mountains are recharge zones for the basin fill aquifers. An ancient shoreline of historic Bonneville Lake is evident on the footslopes along the western edge of the area. Rocks exposed in the mountains are mostly Mesozoic and Paleozoic sediments, but Precambrian rocks are exposed in the Uinta Mountains. The Uinta Mountains are one of the few ranges in the United States that are oriented west to east. The southern Wasatch Mountains consist of

Tertiary volcanic rocks occurring as extrusive lava and intrusive crystalline rocks.

The average precipitation is from 8 to 16 inches (203 to 406 mm) in the valleys and can range up to 73 inches (1854 mm) in the mountains. In the northern and western portions of the MLRA, peak precipitation occurs in the winter months. The southern and eastern portions have a greater incidence of high-intensity summer thunderstorms; hence, a significant amount of precipitation occurs during the summer months. The average annual temperature is 30 to 50 degrees Fahrenheit (-1 to 15 C). The freeze-free period averages 140 days and ranges from 60 to 220 days, generally decreasing in length with elevation.

The dominant soil orders in this MLRA are Aridisols, Entisols, Inceptisols, and Mollisols. The lower elevations are dominated by a frigid temperature regime, while the higher elevations experience cryic temperature regimes. Mesic temperature regimes come in on the lower elevations and south facing slopes in the southern portion of this MLRA. The soil moisture regime is typically xeric in the northern part of the MLRA, but grades to ustic in the extreme eastern and southern parts. The mineralogy is generally mixed and the soils are very shallow to very deep, generally well drained, and loamy or loamy-skeletal.

LRU notes

LRU 47B
E47B is the Wasatch Mountains South MLRA. It occurs in the Loa, Panguitch, New Harmony area. Most of Zion, Bryce Canyon National Parks and Cedar Breaks National Monument are in this area. This area is composed of mountain ranges that run north and south.

Classification relationships

Modal Soil: Codley Silt Loam 1 to 2% — fine-silty, carbonatic, frigid Ustic Torriorthents

Ecological site concept

The soils in this site are deep and well drained and occur on dissected alluvial fans and valley flats. They were formed in alluvium derived primarily from igneous and sedimentary rock. Slopes are linear and long. Typically, the surface layer is a strongly alkali silt loam about 7 inches thick. Underlying layers are also strongly alkaline and range from silt loam to silty clay loam. Permeability is moderate to moderately slow and available water holding capacity is 6.7 to 7.0. Effective rooting depth is 60 inches or more. Runoff is slow and water erosion hazard is slight.

Associated sites

R047XB210UT	**Semidesert Gravelly Loam (black sagebrush)**
R047XB221UT	**Semidesert Loam (black sagebrush)**

Similar sites

R047XB220UT	**Semidesert Loam (basin big sagebrush)** These sites have similar floral and soil characteristics.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Krascheninnikovia lanata*
Herbaceous	(1) *Pascopyrum smithii*

Physiographic features

Dissected alluvial fans and valley flats.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Valley flat
Runoff class	Low
Flooding frequency	None
Ponding frequency	None
Elevation	1,981–2,195 m
Slope	2–5%

Climatic features

The climate is characterized by cold, snowy winters and cool, moist summers. Approximately 50 percent of the moisture comes during the plant growth period from April 1 through September 30. On the average April, May, and June are the driest months and July, August, and September are the wettest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	70-100 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

The soils in this site are deep and well drained and occur on dissected alluvial fans and valley flats. They were formed in alluvium derived primarily from igneous and sedimentary rock. Slopes are linear and long. Typically, the surface layer is a strongly alkali silt loam about 7 inches thick. Underlying layers are also strongly alkaline and range from silt loam to silty clay loam. Permeability is moderate to moderately slow and available water holding capacity is 6.7 to 7.0. Effective rooting depth is 60 inches or more. Runoff is slow and water erosion hazard is slight.

Table 4. Representative soil features

Parent material	(1) Alluvium–igneous and sedimentary rock
Surface texture	(1) Silt loam
Family particle size	(1) Fine-silty
Drainage class	Well drained
Permeability class	Moderately slow
Depth to restrictive layer	152 cm
Soil depth	152 cm
Available water capacity (50.8-101.6cm)	17.02–18.03 cm
Calcium carbonate equivalent (50.8-101.6cm)	15–45%

Electrical conductivity (50.8-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (50.8-101.6cm)	0
Soil reaction (1:1 water) (50.8-101.6cm)	7.9–9
Subsurface fragment volume <=3" (50.8-101.6cm)	0%
Subsurface fragment volume >3" (50.8-101.6cm)	0%

Ecological dynamics

The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. This state has two community phases, one co-dominated by shrubs and grass, and the other dominated by shrubs. State dynamics are maintained by interactions between climatic patterns and disturbance regimes. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. This site is very stable, with little variation in plant community composition. Plant community changes would be reflected in production in response to drought or abusive grazing. Wet years will increase grass production, while drought years will reduce production. Shrub production will also increase during wet years; however, recruitment of winterfat is episodic.

Community Phase 1.1: Winterfat, Indian ricegrass
This community is dominated by winterfat and Indian ricegrass. Bottlebrush squirreltail and bud sage are also important species on this site. Community phase changes are primarily a function of chronic drought. Fire is infrequent and patchy due to low fuel loads.

Community Phase Pathway 1.1a
Long term drought and/or herbivory. Fires would also decrease vegetation on these sites but would be infrequent and patchy due to low fuel loads.

Community Phase 1.2: Winterfat
Drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in the plant community, regardless of functional group.

Community Phase Pathway 1.2a
Time, lack of disturbance and recovery from drought would allow the vegetation to increase and bare ground would eventually decrease.

Transition T1A
Trigger: This transition is caused by the introduction of non-native annual plants, such as halogeton and cheatgrass.
Slow variables: Over time the annual non-native species will increase within the community.
Threshold: Any amount of introduced non-native species causes an immediate decrease in the resilience of the site. Annual non-native species cannot be easily removed from the system and have the potential to significantly alter disturbance regimes from their historic range of variation.

State 2: Current Potential State
This state is similar to the Reference State 1.0. This state has the same two general community phases. Ecological function has not changed, however the resiliency of the state has been reduced by the presence of invasive weeds. Non-natives may increase in abundance but will not become dominant within this State. These non-natives can be highly flammable and can promote fire where historically fire had been infrequent. Negative feedbacks enhance ecosystem resilience and contribute to the stability of the state. These feedbacks include the presence of all structural and functional groups, low fine fuel loads, and retention of organic matter and nutrients. Positive feedbacks decrease ecosystem resilience and stability of the state. These include the non-natives' high seed output, persistent seed bank, rapid growth rate, ability to cross pollinate, and adaptations for seed dispersal.

Community Phase 2.1: Winterfat, Indian ricegrass, annual non-natives
This community is dominated by winterfat and Indian ricegrass. Bottlebrush squirreltail and bud sage are also important species on this site. Community phase changes are primarily a function of chronic drought. Fire is infrequent and patchy due to low fuel loads. Non-native annual species are present.

Community Phase Pathway 2.1a
Long term drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in the plant community, regardless of functional group. Inappropriate grazing will favor unpalatable shrubs such as shadscale, and cause a decline in winterfat and budsage.

Community Phase 2.2: Winterfat, annual non-natives
This community is dominated by winterfat. The perennial grass component is significantly reduced. This community phase is at-risk to move to state 3 or state 4.

Community Phase Pathway 2.2a
Release from long term drought and/or growing season grazing pressure allows recovery of bunchgrasses, winterfat, and bud sagebrush.

Transition T2A
Trigger: Inappropriate, long-term grazing of perennial bunchgrasses during the growing season and long term drought will favor shrubs and initiate a transition to Community phase 3.1.
Slow variables: Long term decrease in deep-rooted perennial grass density.
Threshold: Loss of deep-rooted perennial bunchgrasses changes nutrient cycling, nutrient redistribution, and reduces soil organic matter.

Transition T2B
Trigger: Severe fire/ multiple fires, long term inappropriate grazing or soil disturbing treatments such as plowing.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Loss of deep-rooted perennial bunchgrasses and shrubs truncates, spatially and temporally, nutrient capture and cycling within the community. Increased, continuous fine fuels from annual non-native plants modify the fire regime by changing intensity, size and spatial variability of fires.

State 3: Shrub State
This state consists of one community phase. This site has crossed a biotic threshold and site processes are being controlled by shrubs. Bare ground has increased.

Community Phase 3.1: Winterfat, sickle saltbush, rabbitbrush, annual non-natives
Perennial bunchgrasses, like Indian ricegrass are reduced and the site is dominated by winterfat. Rabbitbrush and shadscale may be significant components or dominant shrubs. Annual nonnative species increase. Bare ground has increased.

Transition T3A
Trigger: Severe fire/ multiple fires, long term inappropriate grazing, or soil disturbing treatments such as plowing.
Slow variables: Increased production and cover of non-native annual species.
Threshold: Increased, continuous fine fuels modify the fire regime by changing intensity, size and spatial variability of fires. Changes in plant community composition and spatial variability of vegetation due to the loss of perennial bunchgrasses and sagebrush truncate energy capture spatially and temporally thus impacting nutrient cycling and distribution.

State 4: Annual State
This state consists of one community phase. This community is characterized by the dominance of annual non-native species such as halogeton and cheatgrass. Rabbitbrush, shadscale, sickle saltbush and other sprouting shrubs may dominate the overstory.

Community Phase 4.1: Annual non-natives
This community is dominated by annual non-native species. Trace amounts of winterfat and other shrubs may be present, but are not contributing to site function. Bare ground may be abundant, especially during low precipitation

years. Soil erosion, soil temperature and wind are driving factors in site function.

State and transition model

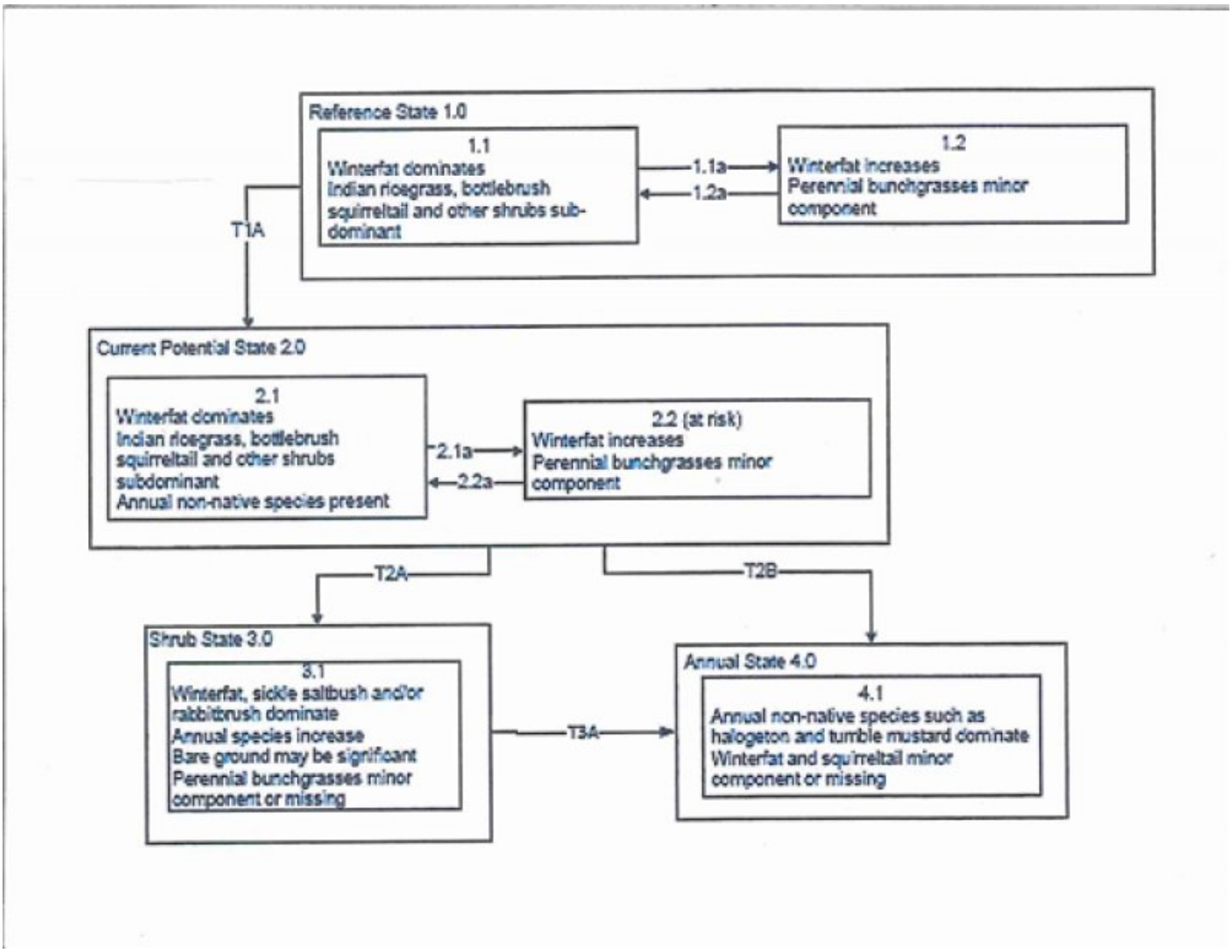

Figure 3. STM

Reference State 1.0 Community Phase Pathways
1.1a: Drought and/or excessive herbivory favors as decrease in perennial bunchgrasses. Fire was infrequent but would be patchy due to low fuel loads.
1.2a: Time and lack of disturbance and/or release from drought

Transition T1A: Introduction of non-native species such as cheatgrass and halogeton.

Current Potential State 2.0 Community Phase Pathways
2.1a: Drought and/or inappropriate grazing management
2.2a: Time and lack of disturbance and/or release from drought

Transition T2A: Inappropriate grazing management in the presence of non-native species (3.1)

Transition T2B: Catastrophic fire and/or multiple fires, inappropriate grazing management and/or soil disturbing treatments (4.1)

Transition T3A: Catastrophic fire and/or multiple fires, inappropriate grazing management and/or soil disturbing treatments (4.1)

Figure 4. Legend

State 1
Reference State

Community 1.1

Reference State

The dominant aspect of the plant community is a shrub/grass combination. The shrubs are dominated by winterfat and basin big sagebrush. The grasses are dominated by western wheatgrass and Indian ricegrass. Forbs make up a very minor component of this plant community.

Table 5. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	19-21%
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 6. 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	–	–	19-21%	–
>0.6 <= 1.4	–	19-21%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Additional community tables

Table 7. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			251–448	
	winterfat	KRLA2	*Krascheninnikovia lanata*	135–224	–
	basin big sagebrush	ARTRT	*Artemisia tridentata ssp. tridentata*	90–179	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	27–45	–
3	**Sub-Dominant Shrubs**			90–224	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	45–90	–
	prairie sagewort	ARFR4	*Artemisia frigida*	9–27	–
	pygmy sagebrush	ARPY2	*Artemisia pygmaea*	9–27	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	9–27	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	9–27	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–27	–
Grass/Grasslike					
0	**Dominant Grasses**			251–404	
	western wheatgrass	PASM	*Pascopyrum smithii*	135–224	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–135	–
	needle and thread	HECO26	*Hesperostipa comata*	27–45	–
1	**Sub-Dominant Grasses**			36–179	
	Grass, annual	2GA	*Grass, annual*	9–45	–
	Grass, perennial	2GP	*Grass, perennial*	9–45	–
	blue grama	BOGR2	*Bouteloua gracilis*	9–45	–
	squirreltail	ELEL5	*Elymus elymoides*	9–45	–
Forb					
2	**Sub-Dominant Grasses**			54–90	
	Forb, annual	2FA	*Forb, annual*	9–45	–
	Forb, perennial	2FP	*Forb, perennial*	45	–

Animal community

Good spring/fall grazing for cattle and sheep.
No cover. Good to fair forage. Mule deer and antelope.

Hydrological functions

The soils in this site are in the b hydrologic group

Recreational uses

This site has fair aesthetic appearances.

Wood products

None

Contributors

Tom Simper

Approval

Kendra Moseley, 2/06/2025

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	12/01/2012
Approved by	Kendra Moseley
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to Very Rare. Very minor rill development may be evident following significant thunderstorm or snow melt events. The presence of rills may also be more apparent where run-on from adjacent upland sites or exposed bedrock concentrate flows. Any rill development present should be less than 1 inch deep, moderately short (< 5') and spaced 8 to 10 feet apart.

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2. **Presence of water flow patterns:** A few stable overland flow patterns wind around plant bases but show no evidence of current deposition. Flow patterns are normally 15 to 20 feet long, follow natural contours, and are typically spaced at least 10 to 15 feet apart. A slight increased flow activity may be observed immediately following significant weather events such as thunderstorms or spring run-off events.

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3. **Number and height of erosional pedestals or terracettes:** None. There should be no evidence of pedestals or terracettes caused by accelerated water erosion. One to 2 inches of elevational mounding under winterfat and four-wing saltbush canopies, and within biological soil crusts, is normal for this site and is not be caused by water erosion. There are no exposed roots around perennial grasses and shrubs.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 50% - 60%. Bare ground openings should not be greater than 2 to 3 feet in diameter and should not be connected.

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5. **Number of gullies and erosion associated with gullies:** None at site level. Scattered landscape level gully channels, however, are a normal component of basin/range environments. Where landscape gullies are present, they should be stable, partially vegetated on their sides and bottoms, with no evidence of head-cutting. Some slight increase on disturbance may be evident following significant weather events or when gullies convey considerable runoff from higher elevation rocky or naturally eroding areas.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of wind generated soil movement may be present. Slight depositional mounding within perennial grass crowns, under winterfat and four-wing saltbush canopies, and within biological soil crusts is normal fof this site.

7. **Amount of litter movement (describe size and distance expected to travel):** The majority of litter accumulates in place at the base of plants canopies. Slight movement of the finest material (< 1/8 inch) may move 1 to 2 feet in the direction of prevailing winds or down slope if being transported by water. Little accumulation is observed behind obstructions.

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 a soil stability rating of 4 or 5 under plant canopies, and a 3 to 5 in the interspaces. Average should be a 4. Surface textures are typically silt loams and loams containing very few coarse fragments.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Codley) Soil surface is typically 0 to 7 inches deep. Texture is a silt loam and structure is weak thin platy parting to weak fine granular. The A-horizon color is light brown (7.5YR 6/4). Soils have an ochric epipedon that extends 7 inches into the soil profile. The A horizon is normally deeper and better developed under plant canopies.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Healthy stands of perennial grasses and shrubs, as well as the presents of biological crusts, provide for good infiltration, help break raindrop impact, and reduce runoff from storm events. Bare spaces are expected to be fairly small (< 3 feet) should be irregular in shape and usually not connected. Vegetative structure is adequate to capture snow and and allow snowmelt to occur in a controlled manner.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Soils are deep to very deep. An increase in clay content within the soil profile should not be mistaken for a compaction layer.

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 (winterfat, four-wing saltbush >> Cool Season Perennial bunchgrasses (Indian ricegrass, bottlebrush squirreltail) > Perennial forbs (scarlet globemallow).

    Sub-dominant: Cool Season Rhizomatous grasses (Western wheatgrass) > = Warm season grasses (James galleta, blue grama).

    Other: A wide variety of other grasses and both perennial and annual forbs can be expected to occur in the plant community.

    Additional: Moss and lichen communities will normally be found under plant canopies while the cyanobacteria may be found throughout the site. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species. Perennial and annual forbs can be expected to vary widely in their expression

in the plant community based upon departures from average growing conditions.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** All age classes of perennial grasses should be present during years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought or insect infestations up to 20% of the winterfat may die. There may be partial mortality of individual bunchgrasses and other shrubs during severe drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 10 to 20% but could reach 25% in above average years. Depth should be 0 to 1 leaf thickness in the interspaces and from ½ - ¾ inches under perennial plant canopies.

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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 600 to 800 pounds per acre on an average year. Production could vary from 400 to 1000 pounds per acre during drought or above-average years.

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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:** Russian thistle, annual bromes, alyssum and halogeton are most likely to invade this site.

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17. **Perennial plant reproductive capability:** All perennial plant species have the ability to reproduce in most years except drought years. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species may be present during average or above average years.
