

Ecological site R047XA442UT Mountain Shallow Loam (low sagebrush)

Accessed: 05/03/2024

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.

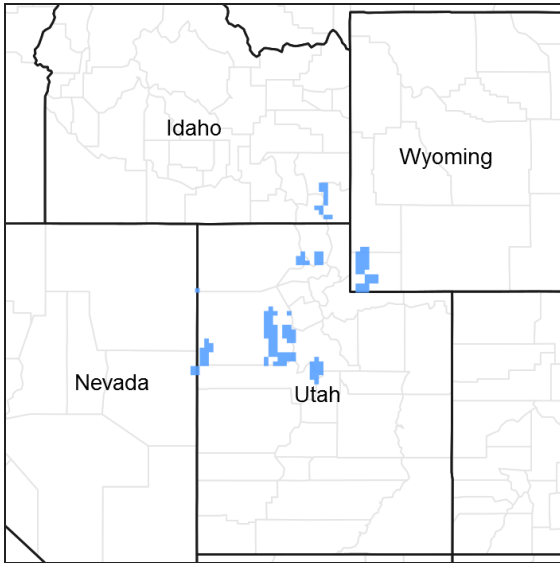


Figure 1. Mapped extent

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.

Associated sites

R047XA446UT	Mountain Shallow Loam (mountain big sagebrush) The overstory of this site is dominated by Mountain big sagebrush.
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Similar sites

R047XA476UT	Mountain Windswept Ridge (low sagebrush) This site is found only on wind-swept ridges, while the Mountain Shallow Loam (Low sagebrush) site is found on mountain slopes.
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Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia arbuscula</i>
Herbaceous	(1) <i>Pseudoroegneria spicata</i>

Physiographic features

This site occurs on moderately steep to very steep mountain slopes and is found on all aspects. The typical elevation for the site is between 6,000 and 8,500 feet, but it may occasionally be found at elevations above 10,000

feet. Flooding and ponding are not observed on the site and runoff is medium to very high.

Table 2. Representative physiographic features

Landforms	(1) Mountain slope (2) Mountain
Flooding frequency	None
Ponding frequency	None
Elevation	1,829–2,591 m
Slope	30–60%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by cold snowy winters and cool dry summers. The average annual precipitation is typically between 12 and 19 inches. Much of the precipitation comes as snow in the winter or rain in the spring. This moisture is the most dependable water supply for plant growth on the site. Lower precipitation and higher evapo-transpiration during July, August, and September tends to reduce plant growth and cause dormancy in many forbs and grasses.

Table 3. Representative climatic features

Frost-free period (average)	144 days
Freeze-free period (average)	174 days
Precipitation total (average)	483 mm

Influencing water features

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

Soil features

The soils for this site are shallow and well-drained to excessively well-drained. They formed in colluvium and residuum derived from limestone, shale, or quartzite. Bedrock is within 20 inches of the surface and gravels and cobbles are present throughout the profile. The surface layers are dark brown in color and typically constitute a mollic epipedon. Roots penetrate the soil readily above the bedrock and into rock fractures. The soil moisture regime is xeric to ustic and the soil temperature regime is frigid to cryic. Water-holding capacity ranges from 1.4 to 2.4 inches due to the shallow depth and rock fragment content of the site. Runoff may occur as the soil water-holding capacity is exceeded.

Soil Survey Area: Soil Components (Map units in parentheses)

Box Elder County, East (UT602): Foxol (FHG, FRG);

Cache Valley Area (UT603): Foxol (FOG);

Rich County (UT604): Starley (FdF, SpF);

Tooele Area (UT611): Lundy (38, 40, 51);

Table 4. Representative soil features

Surface texture	(1) Very cobbly loam (2) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate

Soil depth	25–51 cm
Surface fragment cover <=3"	16–26%
Surface fragment cover >3"	11–20%
Available water capacity (0-101.6cm)	3.56–6.1 cm
Calcium carbonate equivalent (0-101.6cm)	0–40%
Electrical conductivity (0-101.6cm)	0 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	5.6–8.4
Subsurface fragment volume <=3" (Depth not specified)	16–28%
Subsurface fragment volume >3" (Depth not specified)	19–21%

Ecological dynamics

It is impossible to determine in any quantitative detail the historic climax plant community (HCPC) 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 that illustrates 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 just 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/or 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

R047AY442UT: Mountain Shallow Loam (Low Sagebrush)

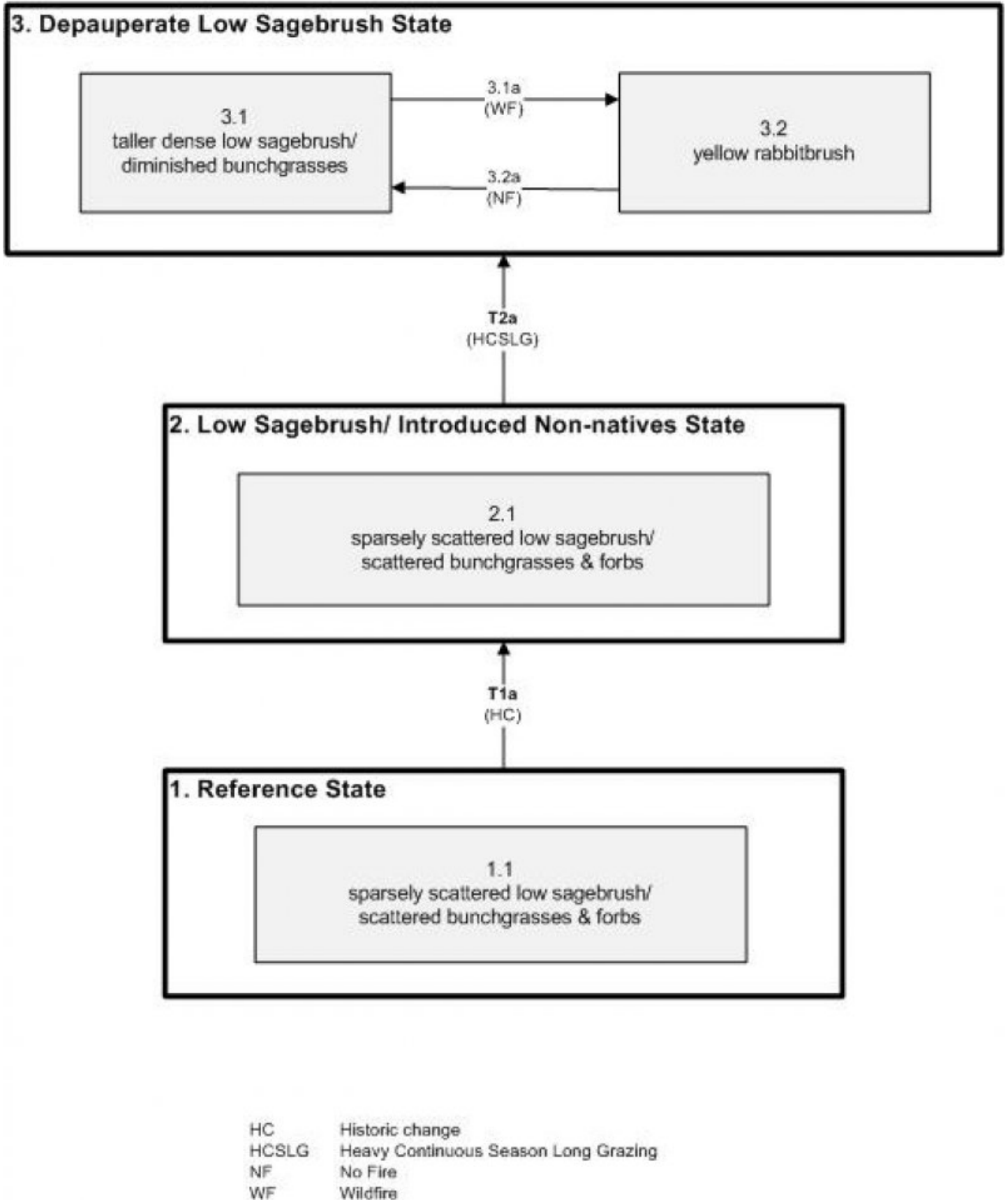


Figure 4. State and Transition Model

State 1 Reference State

Community 1.1 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 least modified plant community would have been dominated by sparsely scattered stands of low sagebrush (*Artemisia arbuscula*). The herbaceous understory would also have been relatively sparse on these shallow soils, with grass species including bluebunch wheatgrass (*Pseudoroegneria spicata*), needle-and-thread (*Hesperostipa comata*), and muttongrass (*Poa fendleriana*), and forbs including spiny phlox (*Phlox hoodii*) and Torrey's cryptantha (*Cryptantha torreyana*), and rock goldenrod (*Petrorhiza pumila*) (1.1). A more complete list of species by lifeform for the Reference State is available in accompanying tables in the "Plant Community Composition by Weight and Percentage" section of this document. These sites would have had wildfire return intervals approximately every 100 years. Community Phase 1.1: sparsely scattered low sagebrush/ scattered bunchgrasses & forbs This plant community would have been characterized by sparsely scattered stands of low sagebrush. Some mountain shrubs may also have been present, but would have been very scarce. These would have included mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain snowberry (*Symphoricarpos oreophilus*), and slender buckwheat (*Eriogonum microthecum*). The perennial herbaceous understory would have included a scattering of forbs such as spiny phlox and rock goldenrod, and grasses such as bluebunch wheatgrass and needle-and-thread. Transition T1a: from State 1 to State 2 (Reference State to Low Sagebrush/ Introduced Non-natives State) The simultaneous introduction of exotic species, both plants and animals, possible extinctions of native flora and fauna, and 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.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	303	437	572
Grass/Grasslike	177	256	334
Forb	26	37	48
Total	506	730	954

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	29-31%
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	–	–	19-21%	–
>0.6 <= 1.4	–	29-31%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2

Low Sagebrush/ Introduced Non-natives State

Community 2.1

Low Sagebrush/ Introduced Non-natives State

State 2 is identical 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. This plant community is characterized by scattered stands of low sagebrush and possibly mountain browse associates. The native perennial herbaceous understory is still intact, but a small component of non-native species will also be present. This should be considered the current potential. The soils on this site are considered self-armoring, thus stabilizing this state from the effects of erosion. The stability of this state is maintained by a reduction in ungulate use. Alternatively, this state will lose resiliency with heavy ungulate use. Community Phase 2.1: sparsely scattered low sagebrush/ scattered bunchgrasses & forbs This plant community is characterized by sparsely scattered stands of low sagebrush and possibly mountain browse associates such as mountain big sagebrush, mountain snowberry, and slender buckwheat. The perennial herbaceous understory includes a scattering of forbs such as spiny phlox and rock goldenrod, and grasses such as bluebunch wheatgrass and needle-and-thread. Transition T2a: from State 2 to State 3 (Low Sagebrush/ Introduced Non-natives State to Depauperate Low Sagebrush State) Heavy continuous season-long livestock grazing will convert the low sagebrush/ introduced non-natives state to a more depauperate condition. Key indicators of the approach to this transition are a loss of perennial grass understory, an increase in the shrub component relative to grasses, and bare ground between shrubs. The transition is triggered by sustained heavy grazing in the growing season by livestock, and by deer and elk in winter.

State 3

Depauperate Low Sagebrush State

Community 3.1

Depauperate Low Sagebrush State

Following long periods with heavy livestock grazing, and where fire has been excluded, low sagebrush will be taller and denser. This will also be the case where deer and elk use is excessive. In this state the herbaceous understory species are greatly reduced (3.1). Subsequent wildfire (3.1a) will remove the older low sagebrush which will be replaced by yellow rabbitbrush (*Chrysothamnus viscidiflorus*) (3.2). Community Phase 3.1: taller dense low sagebrush/ diminished bunchgrasses This plant community is characterized by an increase in low sagebrush both in height and density. The native perennial bunchgrasses will be substantially reduced. Community Pathway 3.1a: Wildfire will remove the older low sagebrush and replace it with yellow rabbitbrush. Community Phase 3.2: yellow rabbitbrush Wildfire will cause the plant community to change favoring more fire-tolerant species such as yellow rabbitbrush, which will remain temporarily dominant. Other introduced annuals and biennials may also appear in the understory at this time. Community Pathway 3.2a: As the time since last fire increases, low sagebrush will slowly return to the site provided there is an available seed source.

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			269–303	
	little sagebrush	ARAR8	<i>Artemisia arbuscula</i>	269–303	–
3	Sub-Dominant Shrubs			128–269	
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	101–135	–
	Saskatoon serviceberry	AMAL2	<i>Amelanchier alnifolia</i>	7–34	–
	mountain big sagebrush	ARTRV	<i>Artemisia tridentata ssp. vaseyana</i>	7–34	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	7–34	–
	mountain snowberry	SYOR2	<i>Symphoricarpos oreophilus</i>	7–34	–
Grass/Grasslike					
0	Dominant Grasses			128–202	
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	67–101	–
	squirreltail	ELEL5	<i>Elymus elymoides</i>	20–34	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	20–34	–
	muttongrass	POFE	<i>Poa fendleriana</i>	20–34	–
1	Sub-Dominant Grasses			74–135	
	Grass, annual	2GA	<i>Grass, annual</i>	20–34	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	20–34	–
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	7–13	–
	Letterman's needlegrass	ACLE9	<i>Achnatherum lettermanii</i>	7–13	–
	prairie Junegrass	KOMA	<i>Koeleria macrantha</i>	7–13	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	7–13	–
	Sandberg bluegrass	POSE	<i>Poa secunda</i>	7–13	–
Forb					
2	Sub-Dominant Forbs			128–316	
	Forb, annual	2FA	<i>Forb, annual</i>	34–67	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	34–67	–
	common yarrow	ACMI2	<i>Achillea millefolium</i>	7–20	–
	Torrey's cryptantha	CRT04	<i>Cryptantha torreyana</i>	7–20	–
	shortstem buckwheat	ERBR5	<i>Eriogonum brevicaulle</i>	7–20	–
	tailcup lupine	LUCAC3	<i>Lupinus caudatus ssp. caudatus</i>	7–20	–
	Wasatch beardtongue	PECY2	<i>Penstemon cyananthus</i>	7–20	–
	rock goldenrod	PEPU7	<i>Petradoria pumila</i>	7–20	–
	spiny phlox	PHHO	<i>Phlox hoodii</i>	7–20	–
	stemless mock goldenweed	STAC	<i>Stenotus acaulis</i>	7–20	–

Animal community

Cattle, sheep, goats, and horses may utilize this site in spring, summer, and fall.

This site also produces browse for use by deer and elk.

Hydrological functions

Soil series in this site are grouped mainly into d hydrologic group. They have high runoff potential. When the vegetation is in climax (potential), the hydrologic curves are 76 to 73 where range condition has declined from climax.

Recreational uses

This site has aesthetic value and is good for open space. It is suitable for hiking and horseback riding. Potential winter recreation activities include snowmobiling and snowshoeing.

Wood products

None

Other references

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Contributors

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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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Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** Rare to Slight. Slight rill development may occur in exposed areas, on steeper slopes (> 20%) and/or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Where rills are present, they should be fairly short (4-8 feet), < 1 inch deep and somewhat widely spaced (5-10 feet). Minor rill development may be observed on all slopes following major thunderstorm or spring runoff events but should heal during the next growing season.

- 2. Presence of water flow patterns:** Slight. Some minor evidence of water flow patterns may be found winding around perennial plant bases. They show little evidence of current erosion. They are expected to be short (3-6 feet), stable, sinuous and normally not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat on slopes > 20%.

- 3. Number and height of erosional pedestals or terracettes:** Perennial vegetation shows little evidence of erosional pedestalling (1 to 2% of individual plants). Plant roots are covered and most litter remains in place around plant crowns. Terracettes should be absent or, if present, stable. A slight increase in both pedestal and terracette development may occur with increasing slope.

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 30% - 35%. Soil surface may be covered by 20 to 70% coarse fragments. Bare ground openings should not be greater than 1 to 2 feet in diameter and should normally not be connected.

- 5. Number of gullies and erosion associated with gullies:** None to Rare 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 in 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:** None. No evidence of wind generated soil movement is present. Wind caused blowouts and deposition are not present.

- 7. Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water movement. Minor litter removal may occur in flow channels with deposition occurring within 1 to 2 feet at points of obstruction. The majority of litter accumulates at the base of plants. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move. However, some litter movement is expected (up to 6 feet) with increases in slopes >20% and/or increased runoff resulting from heavy 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 a soil stability rating of 5 or 6 under the plant canopies, and a rating of 4 to 5 in the interspaces. The average rating should be a 5. Soil surface textures are typically loams, very fine sandy loams and silt loams.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Foxol) Soil surface 0-7 inches. Texture is a gravelly loam; color is brown (7.5YR 5/3); and structure is moderate fine granular. Mollic epipedon ranges from 7 to 12 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.
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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, also protect the soil surface from splash erosion and encourage higher infiltration. Bare spaces are expected to be small and irregular in shape and usually not connected. Vegetative structure and distribution are usually adequate to capture snow and ensure that snowmelt occurs in a controlled manner, allowing maximum time for infiltration, and reducing runoff and erosion in all but the most extreme storm events. When perennial grasses and shrubs decrease due to natural events such as long-term drought, insect damage, etc., runoff is likely to increase and infiltration be reduced.
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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Fractured bedrock occurs at about 17 inches. Some soils may have natural textural variability within their profiles, including changes in clay content, these should not be mistaken for a compaction pan.
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12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**
- Dominant: Non-sprouting shrub (low sagebrush, mountain big sagebrush) > Sprouting shrubs (mountain snowberry) = > Perennial bunchgrasses (bluebunch wheatgrass, muttongrass) > Rhizomatous Grasses (western wheatgrass).
- Sub-dominant: Perennial forbs (spurred lupine).
- Other: A wide variety of other perennial grasses and both perennial and annual forbs can be expected to occur in the plant community.
- Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 60+ years. Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference. Following a disturbance such as fire, drought, rodents or insects that remove woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community for a period of time. If a disturbance has not occurred for an extended period of time, woody species may continue to increase. These conditions would reflect different functional community phases within the reference state.
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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Slight decadence in the principle shrubs could occur near the end of the fire cycle or during periods of extended drought, or insect infestations. In general, a mix of age classes should be expected with some dead and decadent plants present.

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14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1/2 to 1 inches would be considered normal. Perennial vegetation should be well distributed on the site.
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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 - 700 #/acre on an average year but could range from 500 - 800 #/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:** Cheatgrass, alyssum, mustard species.
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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. Green rabbitbrush sprouts vigorously following fire. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is expected to be present during average and above average growing years.
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