

Ecological site R047XA302UT Upland Clay (low sagebrush)

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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.

Classification relationships

Modal Soil: Ant Flat CL, 8-15% – fine, montmorillonitic, frigid Calcic Argixerolls

Associated sites

R047XA430UT	Mountain Loam (mountain big sagebrush)
R047XA308UT	Upland Loam (basin big sagebrush)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) <i>Artemisia arbuscula ssp. arbuscula</i>
Herbaceous	(1) <i>Poa nevadensis</i>

Physiographic features

This site occurs on piedmont slopes and fan terraces. The slopes are mostly 8 to 15 percent and elevations are 6,000 to 7,500 feet.

Table 2. Representative physiographic features

Landforms	(1) Pediment (2) Fan
Flooding frequency	None
Ponding frequency	None
Elevation	6,000–7,500 ft
Slope	8–15%
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 14 to 16 inches. The effective moisture for plant growth is the 55 to 80 percent that falls during the fall, winter, and spring. Summer precipitation is minimal and many herbaceous species become dormant by July.

Table 3. Representative climatic features

Frost-free period (average)	110 days
Freeze-free period (average)	100 days
Precipitation total (average)	16 in

Influencing water features

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

Soil features

The soils are deep over bedrock and well drained. The parent materials are sandstone and quartzite. The surface horizon has a clay loam texture about 8 inches thick. A layer of carbonate accumulation may be present at a depth of about 18 inches. The volume of rock fragments on the soil surface and throughout the soil profile is less than ten percent. Permeability is slow due to the clay texture. Available water capacity is about 6.6 to 7.8 inches.

Table 4. Representative soil features

Surface texture	(1) Clay loam
Drainage class	Well drained
Permeability class	Slow
Soil depth	60 in
Surface fragment cover <=3"	0%
Surface fragment cover >3"	11%
Available water capacity (0-40in)	6.6–7.8 in
Electrical conductivity (0-40in)	0 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	6.6–7.3
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	9%

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

existed just prior to European settlement.

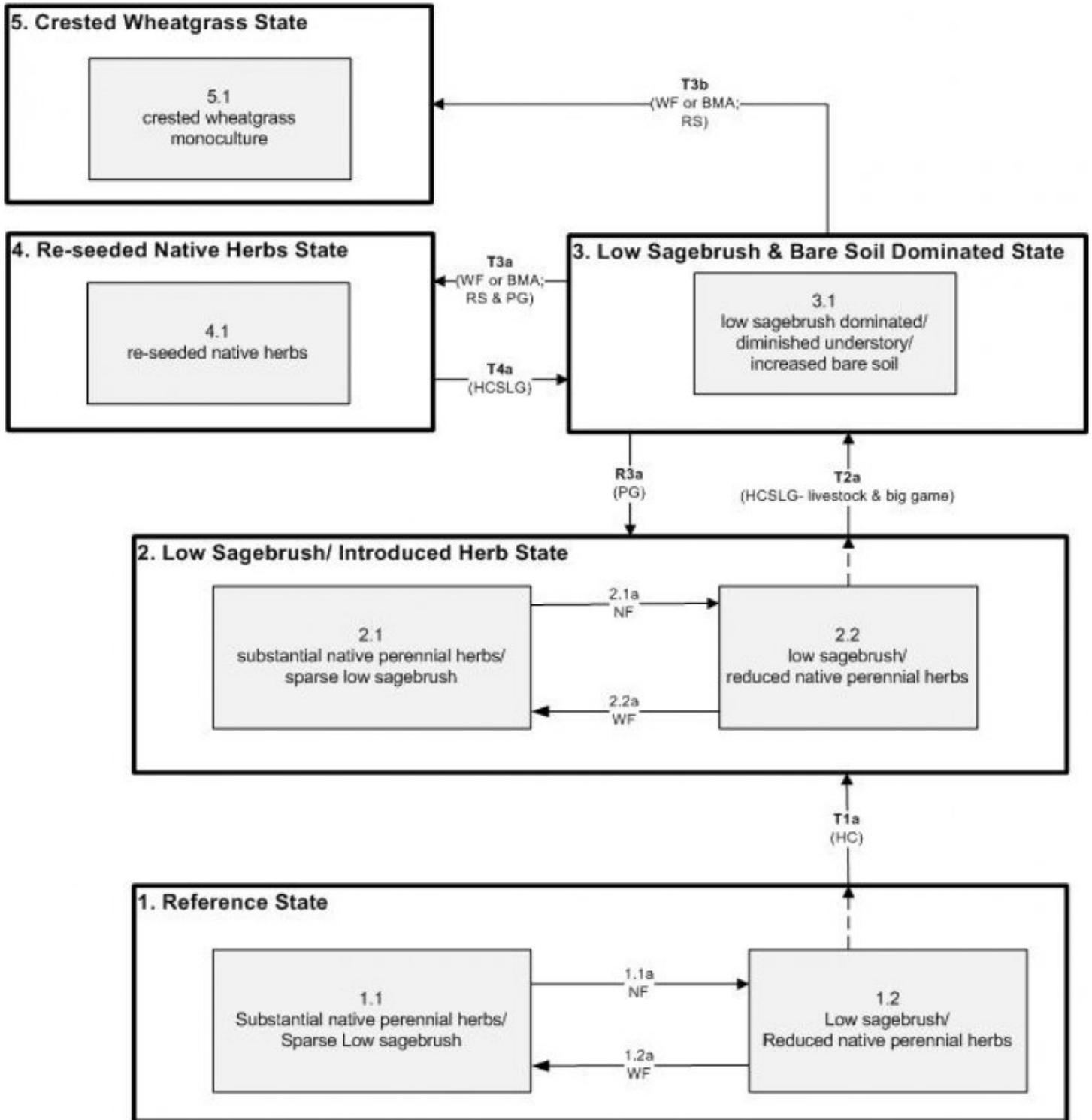
The major successional pathways within states, (“community pathways”) are indicated by arrows between phases. “Transitions” are indicated by arrows between states. The drivers of these changes are indicated in codes decipherable by referring to the legend at the bottom of the page and by reading the 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

R047AY302UT: Upland Clay (Low Sagebrush)



- BMA Brush Management (all methods)
- HC Historic Change
- HCSLG Heavy Continuous Season Long Grazing
- NF No fire
- PG Prescribed Grazing
- RS Re-seed
- WF Wildfire

Figure 1. 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. Under natural disturbance regimes the Reference State for this site would have been characterized by low sagebrush (*Artemisia arbuscula* ssp. *arbuscula*, in northern Utah and western Wyoming *A. arbuscula* ssp. *thermopola* may have also been present), and associated native perennial forbs and grasses. The relative abundance of native perennial herbs would have been greatest and low sagebrush relatively reduced (1.1) following a recent wildfire event (1.2a). Alternatively, in the absence of fire (1.1a), low sagebrush would have re-established and the native perennial understory would have become somewhat reduced (1.2). This clayey soil tended to be particularly susceptible to accelerated erosion (e.g. anthropogenic disturbances). A more complete list of species by lifeform for the Reference State is available in the accompanying tables in the "Plant Community Composition by Weight and Percentage" section of this document.

Community Phase 1.1: substantial native perennial herbs/ sparse low sagebrush This plant community would have had a substantial native perennial herb component and relatively sparse cover of low sagebrush. The primary bunchgrasses present would have included bluebunch wheatgrass (*Pseudoroegneria spicata*), slender wheatgrass (*Elymus trachycaulus*), and squirreltail (*Elymus elymoides*). Forbs would have included shortstem buckwheat (*Eriogonum brevicaulis*), Holboell's rockcress (*Arabis holboellii*), and western stoneseed (*Lithospermum ruderale*).

Community Pathway 1.1a In the absence of fire, this plant community would have responded with an increase in low sagebrush and a reduction in native perennial herbs. Community Phase 1.2: low sagebrush/ reduced native perennial herbs This plant community would have had an increase in low sagebrush with an understory somewhat reduced in native perennial herbs compared to that of phase 1.1. This phase would have occurred after a long fire-free interval. Community Pathway 1.2a Wildfire would have reduced or temporarily removed low sagebrush, allowing the native perennial forbs and grasses to increase. T1a: Transition from State 1 to State 2 (Reference State to Low Sagebrush/ Introduced Herb State) The simultaneous introduction of exotic species, both plants and animals, and possible extinctions of native flora and fauna, along with climate change, has caused State 1 to transition to State 2. Reversal of such historic changes (i.e. a return pathway) back to State 1 is not practical.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Grass/Grasslike	303	413	495
Shrub/Vine	220	300	360
Forb	28	38	45
Total	551	751	900

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	44-46%
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 (Ft)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.5	–	–	–	–
>0.5 <= 1	–	–	–	4-6%
>1 <= 2	–	44-46%	19-21%	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

State 2

Low Sagebrush/ Introduced Herb State

Community 2.1

Low Sagebrush/ Introduced Herb State

State 2 is very similar to State 1 in form and function, with the exception of the presence of non-native plants and animals, possible extinctions of native species, and a different climate. State 2 is a description of the ecological site shortly following Euro-American settlement. This State can be regarded as the current potential. As with State 1, a shift will be seen in the relative abundance of low sagebrush versus perennial herbs depending upon the length of time elapsed since the last fire. Following a recent fire event (2.2a) the site will increase in forbs (both perennial and non-native annuals) and decrease in low sagebrush (2.1). With a lack of fire (2.1a) the site will favor low sagebrush over the perennial native herbs. A small component of non-native species such as cheatgrass (*Bromus tectorum*) and Russian thistle (*Salsola* spp.) is also likely to be present. The resiliency of this State is maintained by a healthy, productive, and diverse plant community that can provide native seed sources and promotes soil stability, water infiltration, and soil moisture retention. The resiliency of this state will be negatively impacted by heavy growing season livestock grazing. Shortly following fire, livestock grazing should be deferred. Mechanical, herbicidal, and prescribed burning treatments are not recommended because of low biological and economic response and susceptibility to accelerated soil erosion. This site should be reseeded with native perennial herbs quickly after fire or mechanical disturbances. Community Phase 2.1: substantial native perennial herbs/ sparse low sagebrush This plant community is characterized by a reduction in low sagebrush and an increased perennial native herb understory that develops following a recent fire event. Non-native annual and biennial species such as cheatgrass and Russian thistle will also increase following fire. Community Pathway 2.1a Following extended periods without fire, low sagebrush will increase relative to the native perennial herbs. Community Phase 2.2: low sagebrush/ reduced native perennial herbs This plant community is characterized by an increase in low sagebrush and a decrease in the perennial native herb understory that develops in the absence of fire. Community Pathway 2.2a A recent fire event will temporarily remove or reduce the low sagebrush component and allow perennial native herbs increase substantially. Non-native annual and biennial species such as cheatgrass and Russian thistle will also increase following fire. T2a: Transition from State 2 to State 3 (Low Sagebrush/ Introduced Herb State to Low Sagebrush & Bare Soil Dominated State) The Low Sagebrush/ Introduced Herbs State transition to the Low Sagebrush & Bare Soil Dominated State is triggered when the site is exposed to heavy continuous season-long grazing by livestock and big game (elk). The approach to this transition is indicated by a loss of herbs and litter, and an increase in bare soil. The transition is triggered by intense growing season livestock grazing.

State 3

Low Sagebrush & Bare Soil Dominated State

Community 3.1

Low Sagebrush & Bare Soil Dominated State

This State is characterized by a dominance of low sagebrush with an understory much diminished in herb

abundance and species richness. This State will also have a lot of bare soil exposure. This State is the result of heavy continuous season-long grazing by livestock and big game. The stability or continued degradation of this State is a result of the lack of a healthy, productive and diverse herb component capable of providing native seed source, soil stabilization, and soil moisture retention. This State will slowly degrade due to accelerated soil erosion, and may eventually become badlands. As with State 2, mechanical, herbicidal, and prescribed burning treatments are not recommended because of low biological and economic response and susceptibility to accelerated soil erosion. This site should be reseeded with native perennial herbs quickly after fire or mechanical disturbances.

Community Phase 3.1: low sagebrush-dominated/ diminished understory/ increased bare soil This plant community is characterized by the dominance of low sagebrush and an understory that may be greatly diminished in species richness and abundance. There will also be quite a bit of bare soil exposure. T3a: Transition from State 3 to State 4 (Low Sagebrush & Bare Soil Dominated State to Re-seeded Native Herbs State) The Low Sagebrush & Bare Soil Dominated State may be converted to the Re-seeded Native Herbs State by using a combination of reseeding and prescribed grazing following brush removal. Reseed with native perennial herbs shortly following wildfire or brush removal and gently trample the seed in with animals, preferably sheep, by moving them briefly through the site with tight herding. Sheep are preferable because they move tightly together. Sufficient time for grass establishment must be allowed before the site is again grazed. T3b: Transition from State 3 to State 5 (Low Sagebrush & Bare Soil Dominated State to Crested Wheatgrass State) The Low Sagebrush & Bare Soil Dominated State may be converted to the Crested Wheatgrass State by first removing the shrub component through fire or other form of brush management (e.g. chemicals), followed by reseeding with a species such as crested wheatgrass (*Agropyron cristatum*) and/or western wheatgrass (*Pascopyrum smithii*) to enhance forage production and to control soil erosion. Re-seeding should take place quickly after any sagebrush-removing event to prevent further soil erosion.

R3a: Restoration Pathway from State 3 to State 2 (Low Sagebrush & Bare Soil Dominated State to Low Sagebrush/ Introduced Herb State) Reducing livestock grazing, particularly during the growing season of the herbs, will allow the native perennial herbs to re-establish a balance with the early sagebrush.

State 4

Re-seeded Native Herbs State

Community 4.1

Re-seeded Native Herbs State

This State exists where native grasses and forbs such as western wheatgrass, bluebunch wheatgrass, and longleaf phlox (*Phlox longifolia*) have been seeded and trampled in by livestock following wildfire or brush removal. These seedings (4.1) will be re-invaded by sagebrush at a rate dependent upon levels of grazing use and drought. The resilience of this State is maintained by moderate levels of livestock grazing, but continued heavy livestock grazing will negatively impact the resiliency of this State. Community Phase 4.1: re-seeded native herbs This phase is dominated by native grasses and forbs that have been seeded into the site. T4a: Transition from State 4 to State 3 (Re-seeded Native Herbs State to Low Sagebrush & Bare Soil Dominated State) Heavy growing season livestock grazing will reduce the herbs and allow sagebrush to re-establish at the site.

State 5

Crested Wheatgrass State

Community 5.1

Crested Wheatgrass State

This State exists where re-seeding with a particular grass species such as crested wheatgrass has taken place, creating a near-monoculture of that species to increase forage production and/or control soil erosion. These seedings (5.1) will be re-invaded by sagebrush at a rate dependent upon levels of grazing use and drought. The resilience of this State is maintained by moderate levels of livestock grazing, but continued heavy livestock grazing will negatively impact the resiliency of this State. Community Phase 5.1: crested wheatgrass monoculture This phase is dominated by crested wheatgrass or another exotic seeded species.

Additional community tables

Table 8. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Lb/Acre)	Foliar Cover (%)
Shrub/Vine					
0	Dominant Shrubs			200–280	
	little sagebrush	ARARA	<i>Artemisia arbuscula ssp. arbuscula</i>	200–280	–
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	24–40	–
	yellow rabbitbrush	CHVIV4	<i>Chrysothamnus viscidiflorus ssp. viscidiflorus var. viscidiflorus</i>	8–16	–
	slender buckwheat	ERMI4	<i>Eriogonum microthecum</i>	8–16	–
Grass/Grasslike					
0	Dominant Grasses			320–480	
	squirreltail	ELEL5	<i>Elymus elymoides</i>	80–120	–
	slender wheatgrass	ELTR7	<i>Elymus trachycaulus</i>	80–120	–
	needle and thread	HECO26	<i>Hesperostipa comata</i>	40–80	–
1	Sub-Dominant Grasses			96–160	
	Grass, annual	2GA	<i>Grass, annual</i>	24–40	–
	Grass, perennial	2GP	<i>Grass, perennial</i>	24–40	–
	western wheatgrass	PASM	<i>Pascopyrum smithii</i>	24–40	–
	bluebunch wheatgrass	PSSP6	<i>Pseudoroegneria spicata</i>	24–40	–
2	Sub-Dominant Forbs			128–304	
	Forb, annual	2FA	<i>Forb, annual</i>	40–80	–
	Forb, perennial	2FP	<i>Forb, perennial</i>	40–80	–
	nodding onion	ALCE2	<i>Allium cernuum</i>	8–24	–
	Holboell's rockcress	ARHO2	<i>Arabis holboellii</i>	8–24	–
	western stoneseed	LIRU4	<i>Lithospermum ruderae</i>	8–24	–
	longleaf phlox	PHLO2	<i>Phlox longifolia</i>	8–24	–
	scarlet globemallow	SPCO	<i>Sphaeralcea coccinea</i>	8–24	–

Animal community

This site has grazing value for cattle, sheep, and horses in spring, summer, and fall.

This site is fair habitat at least part of the year for songbirds, quail, rabbits and small mammals, coyotes, deer and antelope.

Recreational uses

This site is valued for open space. It is not suitable for camping due to the low stature of the plant community. However, it may be adjacent to recreation areas and is suitable for hiking, horseback riding and wildlife viewing. Winter recreation activities include snowmobiling and snowshoeing.

Wood products

None

Other references

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

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

Contributors

Unknown

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	10/17/2012
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** None to very few. Some very minor rill development may occur on steeper slopes (>10%) or on areas located below exposed bedrock or other water shedding areas where increased runoff may occur. Any rills present should be <1 inch deep, fairly short (<6 feet long) and somewhat widely spaced (8-10 feet). Minor rill development may be observed following major thunderstorm or spring runoff events, but they should heal during the next growing season.

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

- 3. Number and height of erosional pedestals or terracettes:** None to Slight. Perennial vegetation shows little evidence of erosional pedestalling (2 to 3% of individual plants). Plant roots are covered and 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):** 25-30% bare ground. Soil surface is typically covered by <10% coarse fragments. Bare ground spaces

should not be greater than 2 to 3 feet in diameter and should not be connected.

5. **Number of gullies and erosion associated with gullies:** None to Very Few. A few gullies may be present in landscape settings where they transport runoff from areas of greater water flow such as exposed bedrock. These gullies will be limited to slopes exceeding 20% slope and adjacent to sites where this runoff accumulation occurs. Any gullies present should show little sign of accelerated erosion and should be stabilized with perennial vegetation.
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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. No evidence of wind generated soil movement is expected.
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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 >10% and/or increased runoff resulting from heavy 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 a soil stability rating of 4 or 5 under the plant canopies, and a rating of 3 to 4 in the interspaces. The average rating should be a 4. Soil surface texture is typically a clay loam.
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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Ant Flat clay loam) Soil surface 0-7 inches. Texture is a loam or clay loam; color is very dark brown (7.5YR2/2); structure is weak fine granular. Mollic epipedon ranges 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:** The clay loam surface texture and clay within the soil profile provide a runoff surface that will normally reduce infiltration in all but gentle storms and slow snowmelt. 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 protects soil from splash erosion and encourages a higher rate of infiltration. Good plant spatial distribution should slow runoff, allowing additional time for infiltration. Bare spaces are expected to be small and irregular in shape and are usually not connected. Vegetative structure is 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 including drought, insect damage, etc., which reduce ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration 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. This site has a well developed argillic horizon beginning at 11 inches that should not be mistaken for a compaction layer.
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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: Sprouting shrubs (low sagebrush, green rabbitbrush), > Perennial bunchgrasses (Nevada bluegrass, bottlebrush squirreltail).

Sub-dominant: Other perennial bunchgrasses (bluebunch wheatgrass, needle-and-thread >> Rhizomatous grasses (slender wheatgrass) > Shrubs (slender wild buckwheat) >> Perennial forbs (scarlet globemallow).

Other: Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 50 to 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 state. 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 a 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):** All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued during periods of extended drought. 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.

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 3/4 inch would be considered normal. Perennial vegetation should be well distributed on the site.

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 700 - 800#/acre on an average year, but could range from 500 to 950#/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:** Cheatgrass, halogeton, Russian thistle, Utah juniper, alyssum, & mustard species.

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 present during average and above average growing years.

