USDA Natural Resources
Conservation Service

Ecological site R034BY109UT
Desert Loamy Clay (Shadscale)

Last updated: 3/05/2022
Accessed: 05/07/2024

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.

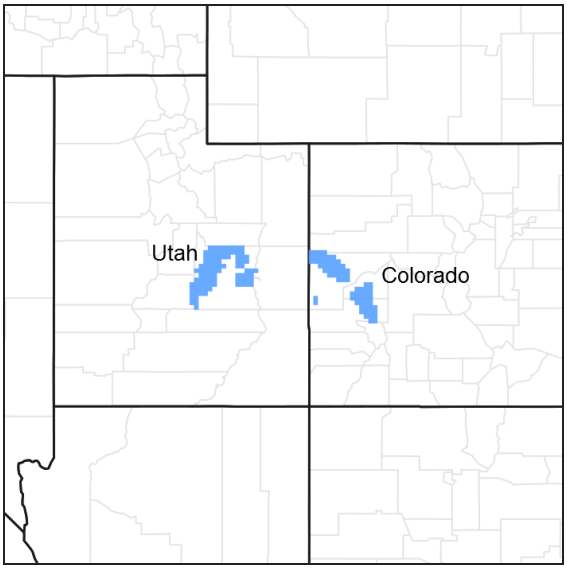


Figure 1. Mapped extent

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.

MLRA notes

Major Land Resource Area (MLRA): 034B–Warm Central Desertic Basins and Plateaus

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

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

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

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

Ecological site concept

The soils of this site formed mostly in colluvium and/or slope alluvium over residuum from sedimentary rock. Surface soils are very cobbly clay loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, and make up less than 35 percent of the soil volume. These soils are shallow to moderately deep, well drained, and have moderately slow to moderate permeability. pH is moderately to strongly alkaline. Available water-holding capacity ranges from 1 to 2 inches of water in the upper 60 inches of soil. The soil moisture regime is typic aridic and the soil temperature regime is mesic. Precipitation ranges from 5-8 inches annually.

Associated sites

R034BY106UT	**Desert Loam (Shadscale)** Desert Loam (Shadscale)
R034BY117UT	**Desert Shallow Clay (Mat Saltbush)** Desert Shallow Clay (Mat saltbush)

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia*
Herbaceous	(1) *Pleuraphis jamesii*

Physiographic features

This site occurs on hillslopes and benches. Slopes are mostly 3 to 20 percent. Elevations range from 5,300 to 6,100 feet on all aspects.

Table 2. Representative physiographic features

Landforms	(1) Hillslope (2) Structural bench
Runoff class	High
Flooding frequency	None
Ponding frequency	None
Elevation	1,615–1,859 m

Slope	3–20%
Ponding depth	Not specified
Water table depth	Not specified

Climatic features

Average annual soil loss in potential is approximately 0.3 ton per acre per year. Average annual precipitation is 5 to 8 inches. Approximately 65 percent occurs as rain from March through September. On the average, November through February are the driest months and July through October are the wettest months.

Table 3. Representative climatic features

Frost-free period (characteristic range)	
Freeze-free period (characteristic range)	110-140 days
Precipitation total (characteristic range)	127-203 mm

Influencing water features

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

Soil features

The soils of this site formed mostly in colluvium and/or slope alluvium over residuum from sedimentary rock. Surface soils are very cobbly clay loam to loam in texture. Rock fragments may be present on the soil surface and throughout the profile, and make up less than 35 percent of the soil volume. These soils are shallow to moderately deep, well drained, and have moderately slow to moderate permeability. pH is moderately to strongly alkaline. Available water-holding capacity ranges from 1 to 2 inches of water in the upper 60 inches of soil. The soil moisture regime is typic aridic and the soil temperature regime is mesic. Precipitation ranges from 5-8 inches annually.

Modal Soil: Persayo L CBV-CL — loamy, mixed, calcareous, mesic, shallow Typic Torriorthents

Table 4. Representative soil features

Parent material	(1) Colluvium–sedimentary rock (2) Slope alluvium–sedimentary rock (3) Residuum–sedimentary rock
Surface texture	(1) Loam (2) Very cobbly clay loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately slow to moderate
Depth to restrictive layer	25–102 cm
Soil depth	25–102 cm
Surface fragment cover <=3"	0–10%
Surface fragment cover >3"	0–3%
Available water capacity (Depth not specified)	3.81–12.7 cm
Calcium carbonate equivalent (Depth not specified)	5–10%
Electrical conductivity (Depth not specified)	0–8 mmhos/cm

Sodium adsorption ratio (Depth not specified)	0–2
Soil reaction (1:1 water) (Depth not specified)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	8–10%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

State 1: Reference State
The Reference State 1.0 is a representative of the natural range of variability under pristine conditions. The Reference State has two general community phases: a shrub-grass dominate phase and a shrub dominant phase. 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 response to long term drought or herbivory. Wet years will increase grass production, while drought years will reduce production. Shrub production will also increase during wet years; however, extreme growing season wet periods has been shown to cause shadscale death.

Community Phase 1.1: Shadscale saltbush, Garnder's saltbush Indian ricegrass
This community is dominated by shadscale, Garnder's saltbush, galleta and Indian ricegrass. Squirreltail and scarlet globemallow are minor components along with bud sagebrush.

Community phase changes are primarily a function of chronic drought. Drought will favor shrubs over perennial bunchgrasses. However, long-term drought will result in an overall decline in plant community production, regardless of functional group. Extreme growing season wet periods may also reduce the shadscale component. Fire is very infrequent to non-existent.

The dominant aspect of the plant community is shadscale. The composition by air dry weight is approximately 35 percent perennial grasses, 15 percent forbs, and 50 percent shrubs.

Community Phase Pathway 1.1a
Long-term drought, extreme wet periods and/or herbivory. Drought will favor shrubs over perennial bunchgrasses. Extreme wet periods will reduce the shadscale component.

Community Phase 1.2: Shadscale
Shrubs such as shadscale and bud sagebrush increase in the community. Perennial bunchgrasses decrease with drought and may become a minor component.

Community Phase Pathway 1.2a
Release from drought and/or herbivory would allow the vegetation to increase and bare ground would eventually decrease. Extreme growing season wet period may reduce shadscale.

Transition T1A
Trigger: This transition is caused by the introduction of non-native annual plants, such as halogeton, mustards 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. with the addition of a shadscale and sprouting shrub dominated

community phase. 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: Shadscale saltbush, Garnder's saltbush Indian ricegrass
This community is compositionally similar to the Reference State Community Phase 1.1 with the presence of non-native species in trace amounts. This community is dominated by shadscale, Garnder's saltbush, galleta and Indian ricegrass. Squirreltail and scarlet globemallow and bud sagebrush are also important species on this site. Community phase changes are primarily a function of chronic drought or extreme wet periods. Fire is infrequent and patchy due to low fuel loads.

Community Phase Pathway 2.1a
Inappropriate growing season grazing favors unpalatable shrubs over bunchgrasses, and bud sagebrush. Long term drought will also decrease the perennial bunchgrasses in the understory.

Community Phase 2.2: Shadscale, other shrubs
Shadscale and rabbitbrush increase while Indian ricegrass and bud sagebrush decline. Bare ground increases along with annual weeds. Prolonged drought may lead to an overall decline in the plant community. Galleta grass may increase. Wet periods will decrease the shadscale component.

Community Phase Pathway 2.2a
Release from drought and/or appropriate grazing management that facilitates an increase in perennial grasses, and bud sagebrush. Extreme growing season wet period may reduce shadscale.

Community Phase Pathway 2.2b
Long term drought and/or inappropriate grazing will significantly reduce perennial grasses, bud sagebrush in favor of shadscale and rabbitbrush.

Community Phase 2.3: Shadscale, other shrubs, annual non-natives
Shadscale and rabbitbrush dominates the overstory and perennial bunchgrasses, and bud sagebrush are reduced, either from competition with shrubs or from inappropriate grazing, chronic drought or both. Galleta may increase. Annual non-native species may be stable or increasing due to a lack of completion with perennial bunchgrasses. Bare ground may be significant. This community is at risk of crossing a threshold to either State 3.0 (shrub) or State 4.0 (annual).

Transition T2A
Trigger: Long-term inappropriate grazing and/or long-term drought will decrease or eliminate deep rooted perennial bunchgrasses and favor shrub growth and establishment.

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: Fire and/or soil disturbing treatments such as drill seeding and plowing. An unusually wet spring may facilitate the increased germination and production of cheatgrass leading to its dominance within the community.

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 has one community phase that is characterized by shadscale, bud sagebrush or a sprouting shrub overstory with very little to no understory. The site has crossed a biotic threshold and site processes are being controlled by shrubs. Shrub cover exceeds the site concept and may be decadent, reflecting stand maturity and lack of seedling establishment due to competition with mature plants. The shrub overstory dominates site resources such that soil water, nutrient capture, nutrient cycling and soil organic matter are temporally and spatially redistributed. Bare ground has increased.

Community Phase 3.1: Shadscale, other shrubs, annual non-natives
Decadent shadscale and bud sagebrush dominate the overstory. Rabbitbrush and/or other sprouting shrubs may be a significant component or dominant shrub. Deep-rooted perennial bunchgrasses may be present in trace amounts or absent from the community. Annual nonnative species increase. Bare ground is significant.

Transition T3A
Trigger: Fire and/or soil disturbing treatments such as drill seeding and plowing.

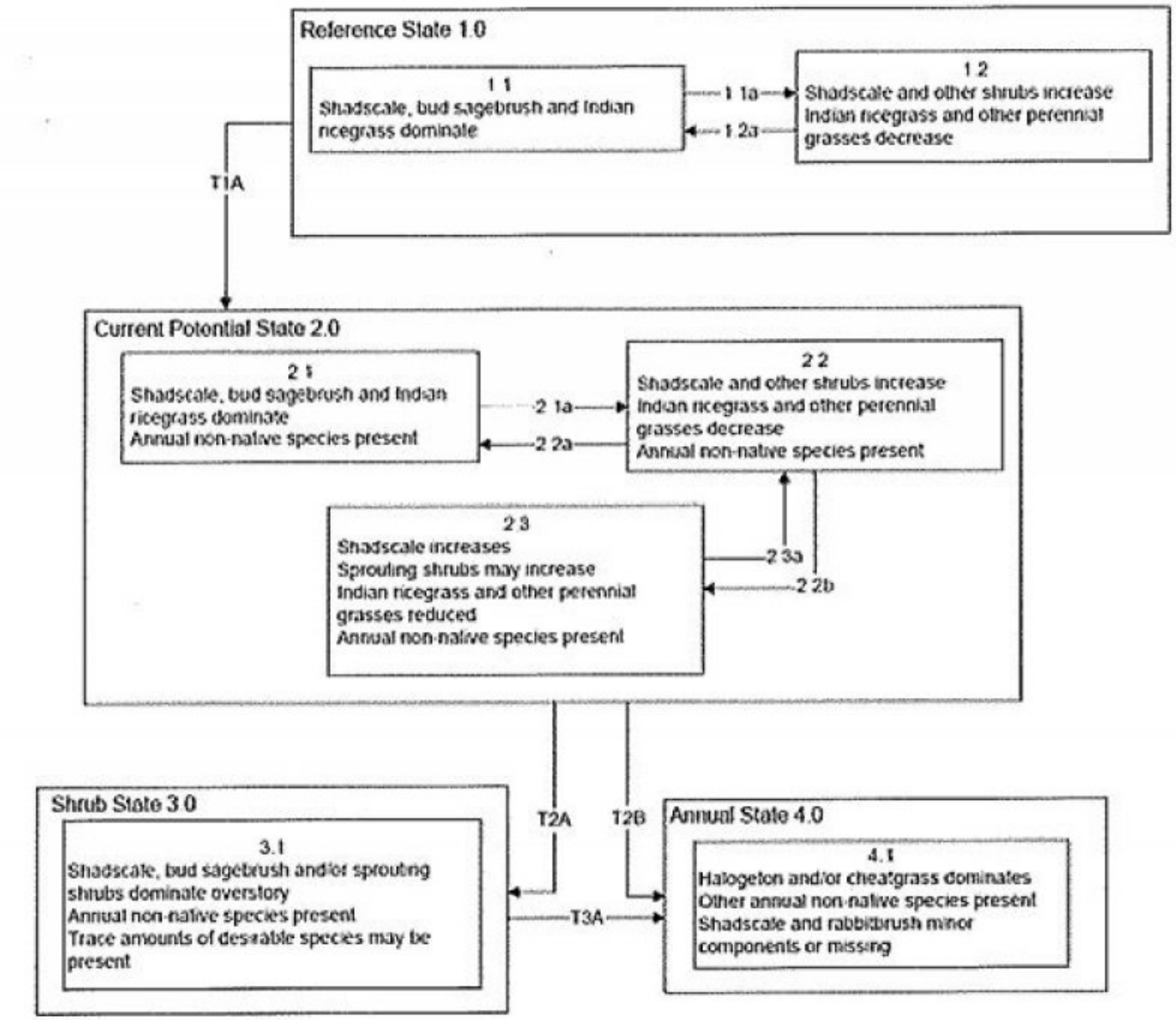
Slow variables: Increased production and cover of non-native annual species.

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 has one community phase. In this state, a biotic threshold has been crossed and state dynamics are driven by the dominance and persistence of the annual plant community which is perpetuated by a shortened fire return interval. The herbaceous understory is dominated by annual non-native species such as cheatgrass and halogeton. Bare ground may be abundant. Resiliency has declined and further degradation from fire facilitates a cheatgrass and sprouting shrub plant community. The fire return interval has shortened due to the dominance of cheatgrass in the understory and is a driver in site dynamics.

Community Phase 4.1: Halogeton, cheatgrass
This community is dominated by annual non-native species. Halogeton most commonly invades these sites. Trace amounts of shadscale 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 from wind and soil temperature are driving factors in site function.

State and transition model



State 1
Reference State

Community 1.1
Reference Plant Community

The dominant aspect of the plant community is scadscale. The composition by air-dry weight is approximately 35 percent perennial grasses, 15 percent forbs, and 50 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	71	155	211
Grass/Grasslike	48	108	147
Forb	21	46	63
Total	**140**	**309**	**421**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	29-31%
Grass/grasslike foliar cover	14-16%
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	–	29-31%	14-16%	–
>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**			111–168	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	84–118	–
	Gardner's saltbush	ATGA	*Atriplex gardneri*	17–34	–
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	10–17	–
3	**Sub-Dominant Shrubs**			37–94	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	17–34	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	3–10	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	3–10	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	3–10	–
	green molly	BAAM4	*Bassia americana*	3–10	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	3–10	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	3–10	–
Grass/Grasslike					
0	**Dominant Grasses**			77–118	
	James' galleta	PLJA	*Pleuraphis jamesii*	34–50	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	34–50	–
	squirreltail	ELEL5	*Elymus elymoides*	10–17	–
1	**Sub-Dominant Grasses**			30–64	
	Grass, annual	2GA	*Grass, annual*	10–17	–
	Grass, perennial	2GP	*Grass, perennial*	10–17	–
	blue grama	BOGR2	*Bouteloua gracilis*	3–10	–
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	3–10	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–10	–
Forb					
0	**Dominant Forbs**			10–17	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	10–17	–
2	**Sub-Dominant Forbs**			44–104	
	Forb, annual	2FA	*Forb, annual*	10–17	–
	Forb, perennial	2FP	*Forb, perennial*	10–17	–
	Holboell's rockcress	ARHO2	*Arabis holboellii*	3–10	–
	yellow milkvetch	ASFL	*Astragalus flavus*	3–10	–
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	3–10	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	3–10	–
	mountain pepperweed	LEMO2	*Lepidium montanum*	3–10	–
	woolly plantain	PLPA2	*Plantago patagonica*	3–10	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	3–10	–

Animal community

This site provides proper grazing for sheep and cattle during fall, winter and spring.

This site provides food and limited cover for wildlife. Wildlife using this site include lizard, snake, mice, sparrow, hawk, jackrabbit, and coyote.

Hydrological functions

The soil is in hydrologic group D. The runoff curve numbers are 80 through 89 depending on the condition of the watershed.

Recreational uses

This site may have aesthetic values. Recreation values are hiking and hunting.

Wood products

None

Contributors

George Cook

Approval

Kirt Walstad, 3/05/2022

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

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Date	06/01/2012
Approved by	Kirt Walstad
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Rills are somewhat common. They may be more pronounced on steeper slopes and/or on areas located below exposed bedrock, or other water shedding areas where increased runoff may occur. Rills present should be < 2 inches deep, fairly long (> 15 feet) and somewhat widely spaced (8-10 feet). On steeper slopes, rills may be 20 to 25+ feet long and spaced 6 to 8 feet apart. The expression of rills may be less defined where coarse fragments (i.e., gravels and/or channers) dominate the soil surface.

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2. **Presence of water flow patterns:** Water flow patterns are somewhat common throughout the site. They often form sinuous flow patterns that wind around perennial plants and surface rock. Evidence of flow patterns is expected to

increase somewhat with slopes greater than 15%. Water flow patterns are long (15-20 feet), narrow (1 to 2 feet wide), and spaced widely (10-20 yards) on gentle slopes (<15%) and more closely (<10 yards) on steeper slopes (>15%).

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3. **Number and height of erosional pedestals or terracettes:** Small pedestals may form at the base of plants that occur on the edge of water flow patterns, but should not show any exposed roots. Terracettes are fairly common, forming behind debris dams of small to medium sized litter (up to 1 inch) 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):** 45–50%. (Soil surface is typically covered by up to 35% surface fragments). Most bare ground is associated with water flow patterns, rills, and gullies. Bare ground spaces should not be greater than 2 to 3 feet and may be connected. Poorly developed biological soil crusts that are interpreted as functioning as bare ground should be recorded as bare ground.

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5. **Number of gullies and erosion associated with gullies:** Rare on slopes < 15%. A few widely scattered gullies will be expected to occur on steeper slopes and on areas below exposed bedrock. There they do occur, their length often extends from the exposed bedrock to where the gully reaches a stream or other area where water and sediment accumulate. Gullies may show slightly more indication of erosion as slope increases, or as the site occurs adjacent to steep sites/watershed with concentrated flow patterns.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind generated soil movement. Wind caused blowouts and deposition are not expected to be present.

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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. Some litter removal may occur in flow channels with deposition occurring within 2 to 3 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 4 feet) with increases in slopes > 15% 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 plant canopies and a rating of 2 or 3 in the interspaces. The average should be a 3 or 4. Surface texture is silty clay loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Persayo) Soil surface horizon is typically 0 to 4 inches deep. Texture is a silty clay loam, structure is moderate fine granular. Color is a yellish brown (2.5YR 6/3). An ochric horizon extends 4 inches into the soil profile. 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 is expected to break raindrop impact and splash erosion reducing splash erosion but not eliminating it. Spatial distribution of vascular plants slows runoff somewhat by obstructing surface flows and help create sinuous flow patterns that dissipate energy and allow time for some infiltration. Natural erosion would be expected in most storms and spring runoff.

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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. Shale or siltstone bedrock occurs at about 14 to 24 inches.

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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 shrubs (shadscale, bud sagebrush) > Cool season perennial bunchgrasses (bottlebrush squirreltail, Indian ricegrass) > Rhizomatous grasses (James galleta) >Perennial forbs (scarlet globemallow) > Biological soil crusts.

    Sub-dominant: Sprouting shrubs (winterfat, green rabbitbrush) > Perennial bunchgrasses (Salina wildrye, Sand dropseed) > Perennial forbs (Shockley wild buckwheat).

    Other: 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: 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 shrubs during severe drought.

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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 10 to 20%. Depth should vary from none to a 1 leaf thickness in the interspaces and from 1/4 - 1/2 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 250 to 300 pounds per acre on an average year. Production could vary from 100 to 400 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, halogeton, kochia, common sunflower, and annual mustards.

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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 should be present during average and above average growing years.
