USDA Natural Resources
Conservation Service

Ecological site R028AY104UT
Desert Alkali Bench (Bud Sagebrush)

Accessed: 04/27/2024

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.

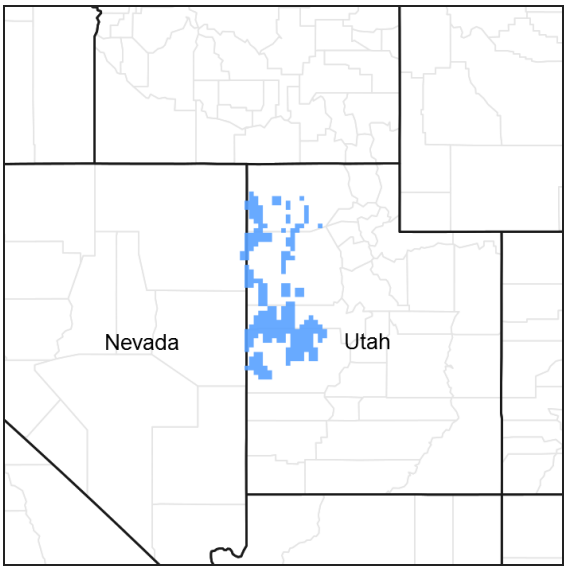

Figure 1. Mapped extent

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): 028A–Ancient Lake Bonneville

This site occurs in MLRA 28A, LRU A, the northern part of MLRA 28A. This LRU has a mesic soil temperature regime and a typic aridic soil moisture regime. Typically most precipitation occurs in the winter. Mean annual precipitation is between 4 to 8 inches. The north desert ecological zone typically has no big sagebrush (Artemisia tridentate spp.), but typically is dominated by shadscale (Atriplex confertifolia), winterfat (Krascheninnikovia lanata), saltbushes (Atriplex spp), Indian ricegrass (Achnatherum hymenoides), and bottlebrush squirreltail (Elymus elymoides). Unlike the southern LRUs, there is typically very little if any galleta (Pleuraphis jamesii) grass.

Classification relationships

MLRA 28A, LRU A, ecological zone desert.

Ecological site concept

This site occurs predominantly in the northern part of 28A. It is dominated by bud sagebrush in reference condition. It is typically found on alluvial fans and fan terraces on coarser textured soils.

Associated sites

R028AY119UT	**Desert Flat (Shadscale)**
R028AY124UT	**Desert Loam (Shadscale)**
R028AY138UT	**Desert Shallow Loam (Shadscale)**
R028AY230UT	**Semidesert Shallow Hardpan (Black Sagebrush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Picrothamnus desertorum* (2) *Atriplex confertifolia*
Herbaceous	Not specified

Physiographic features

This site occurs on benches, gently sloping outwash fans, old lake terraces, lake plains, beach bars, and plateaus. It is typically found between 4300 to 5800 feet at 2 to 8 percent slopes.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Fan remnant (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,311–1,768 m
Slope	2–8%

Climatic features

The climate is cold and snowy in the winter and warm and dry in the summer. The average annual precipitation is 5 to 8 inches. Approximately 70 percent comes as rain from March through October. On the average, June through September are the driest months and March through May are the wettest months.

Mean Annual Air Temperature: 45-50
Mean Annual Soil Temperature: 52-54

Table 3. Representative climatic features

Frost-free period (average)	76 days
Freeze-free period (average)	117 days
Precipitation total (average)	305 mm

Climate stations used

- (1) GROUSE CREEK [USC00423486], Grouse Creek, UT

Influencing water features

Water erosion hazard is slight.

Soil features

Characteristic soils in this site are over 60 inches deep and well or somewhat excessively drained.

They formed in alluvium and colluvium and lacustrine materials derived mainly from mixed by the wave action of ancient Lake Bonneville or by running water in streams or sheetflood. The surface horizon is gravelly loam to very gravelly sandy loam textures and 13 inches thick. About 60 percent of the soil surface is covered by rock fragments. These soils are moderately calcareous to very stongly calcareous, strongly alkaline or very strongly alkaline and slightly saline to strongly saline in some part of the profile. These soils are affected by sodium. Permeability is moderate to moderately rapid. Available water capacity is reduced by salinity and ranges from 2 to 5 inches. Runoff is slow, and the hazard of water erosion is slight.

The available water capacity is 1.2 to 3.8 inches. Natural geologic erosions in potential is approximately 0.5 tons/acre/year.

Table 4. Representative soil features

Parent material	(1) Alluvium–limestone and sandstone
Surface texture	(1) Gravelly loam (2) Very gravelly sandy loam (3) Gravelly silt loam
Drainage class	Somewhat excessively drained to well drained
Permeability class	Slow to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	0–38%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	3.05–9.65 cm
Calcium carbonate equivalent (0-101.6cm)	1–40%
Electrical conductivity (0-101.6cm)	0–16 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–30
Soil reaction (1:1 water) (0-101.6cm)	7.9–11
Subsurface fragment volume <=3" (Depth not specified)	0–35%
Subsurface fragment volume >3" (Depth not specified)	0–3%

Ecological dynamics

As ecological condition deteriorates due to overgrazing, galleta, squirreltail, and Indian ricegrass decrease while snakeweed, horsebrush, and rabbitbrush increase.

When the potential natural plant community is burned, Indian ricegrass and galleta decrease while low rabbitbrush, horsebrush, and cheatgrass increase.

Annual forbs and annual grasses are most likely to invade this site.

This site is similar in soils and vegetation composition to 028AY016NV. The STM developed by Nevada (Stringham et al. 2015) is used for the Utah ESD.

State and transition model

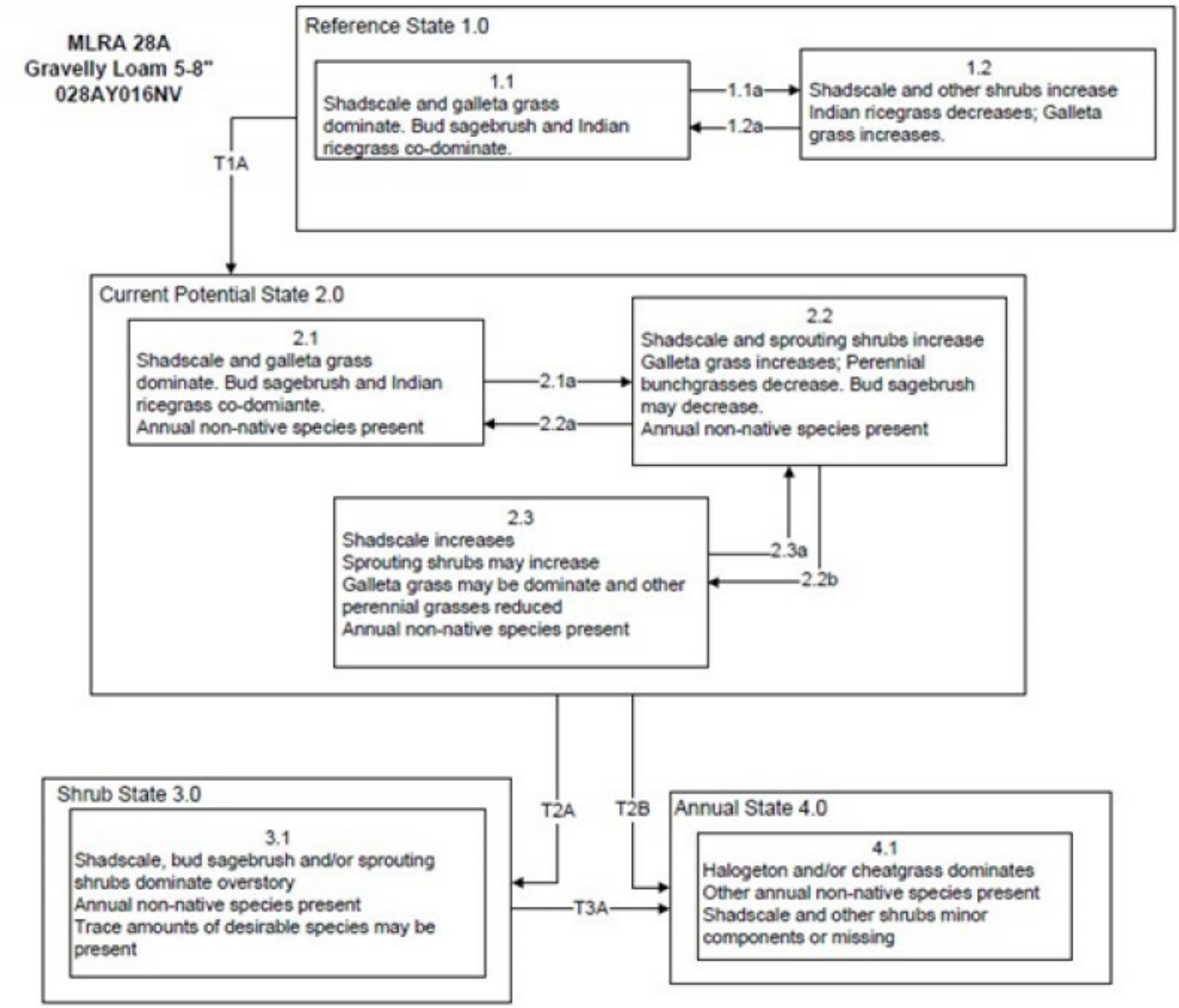

Figure 6. R028AA104UT STM

Reference State 1.0 Community Phase Pathways
1.1a: Prolonged drought and/or herbivory
1.2a: Release from drought and/or herbivory

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

Current Potential State 2.0 Community Phase Pathways
2.1a: Prolonged drought and/or inappropriate grazing management
2.2a: Release from drought and/or appropriate grazing management that allows for an increase in bud sagebrush, winterfat and perennial grasses. Extreme growing season moisture may reduce shadscale.
2.2b: Inappropriate grazing and/or drought
2.3a: Release from drought and/or inappropriate grazing management allows for an increase in bud sagebrush and perennial grasses. Extreme growing season moisture may reduce shadscale.

Transition T2A: Long-term inappropriate grazing management and/or long-term chronic drought.

Transition T2B: Soil disturbing treatments (drill seeding, roller chopper, Lawson aerator etc.), fire, and/or unusually wet spring.

Transition T3A: Soil disturbing treatments (drill seeding, roller chopper, Lawson aerator etc.), fire, and/or unusually wet spring.

Figure 7. R028AA104UT STM Legend

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 1.1
Bud sagebrush, shadscale, perennial grass

The dominant aspect of the plant community is bud sagebrush and shadscale. The composition by air dry weight is approximately 30 percent perennial grasses, 10 percent forbs, and 60 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	34	135	168
Grass/Grasslike	17	67	84
Forb	6	22	28
Total	**57**	**224**	**280**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	5-15%
Forb foliar cover	3-5%
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	–	25-35%	10-20%	0-10%
>0.3 <= 0.6	–	–	–	–
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Figure 9. Plant community growth curve (percent production by month). UT1041, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	25	50	10	0	0	5	5	0	0

Community 1.2
Bud sagebrush, shadscale

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

Pathway 1.1a
Community 1.1 to 1.2

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

Pathway 1.2a
Community 1.2 to 1.1

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.

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 2.1
Bud sagebrush, shadscale, perennial grasses, non-native annuals

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 and Galleta grass. Indian ricegrass,

bud sagebrush and Nevada ephedra 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 2.2
Bud sagebrush, shadscale, non-native annuals

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 2.3
Shrub dominated, non-native annuals (At Risk)

Shadscale and rabbitbrush dominates the overstory and perennial bunchgrasses, winterfat 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).

Pathway 2.1a
Community 2.1 to 2.2

Inappropriate growing season grazing favors unpalatable shrubs over bunchgrasses, winterfat and bud sagebrush. Prolonged drought will also decrease the perennial bunchgrasses in the understory.

Pathway 2.2a
Community 2.2 to 2.1

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

Pathway 2.2b
Community 2.2 to 2.3

Chronic drought and/or inappropriate grazing will significantly reduce perennial grasses, winterfat and bud sagebrush in favor of shadscale and rabbitbrush.

Pathway 2.3a
Community 2.3 to 2.2

Release from drought and/or inappropriate grazing allows for bud sagebrush, winterfat and perennial grasses to increase. Extreme growing season wet period may reduce shadscale.

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. Bareground has increased.

Community 3.1
Bud sagebrush, shadscale, non-native annuals

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 non-native species increase. Bare ground is significant.

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 4.1
Non-native annuals

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.

Transition T1A
State 1 to 2

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.

Transition T2A
State 2 to 3

Trigger: Long-term inappropriate grazing and/or long-term chronic 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
State 2 to 4

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.

Transition T3A
State 3 to 4

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.

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	**Primary Shrubs**			143–171	
	bud sagebrush	PIDE4	*Picrothamnus desertorum*	112–127	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	15–28	–
	green molly	BAAM4	*Bassia americana*	9	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	9	–
3	**Secondary Shrubs**			9–15	
	spiny hopsage	GRSP	*Grayia spinosa*	3–9	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	3–9	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	3–9	–
	shortspine horsebrush	TESP2	*Tetradymia spinosa*	3–9	–
Grass/Grasslike					
0	**Primary Grasses**			59–143	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	43–56	–
	squirreltail	ELEL5	*Elymus elymoides*	43–56	–
	James' galleta	PLJA	*Pleuraphis jamesii*	43–56	–
1	**Seconary Grasses**			15–28	
	King's eyelashgrass	BLKI	*Blepharidachne kingii*	3–9	–
	Sandberg bluegrass	POSE	*Poa secunda*	3–9	–
	alkali sacaton	SPAI	*Sporobolus airoides*	3–9	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	3–9	–
Forb					
0	**Primary Forbs**			9–15	
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	9–15	–
2	**Seconary Forbs**			15–28	
	Holboell's rockcress	ARHO2	*Arabis holboellii*	3–9	–
	western tansymustard	DEPI	*Descurainia pinnata*	3–9	–
	shaggy fleabane	ERPU2	*Erigeron pumilus*	3–9	–
	whitestem blazingstar	MEAL6	*Mentzelia albicaulis*	3–9	–

Animal community

--Threatened and Endangered Species--
This section will be populated as more information becomes available.

--Wildlife Interpretation--

This ecological site, in its reference state, produced large amounts of nutritious forage that was utilized by native herbivores including deer and antelope who lived here along their associated predators. Although much of this site is presently different from the reference state, it is still very important as wildlife habitat. Other wildlife commonly observed using this site include rabbit, coyote, badger, fox, and various waterfowl species.

--Grazing Interpretations--
This site provides good spring, fall, and winter grazing conditions for domestic livestock due to its accessibility and

its supply of nutritious forage. When this site is stressed, cheatgrass, Russian thistle and halogeton are likely to invade.

Hydrological functions

The soils are in hydrologic group B. The hydrologic curve number is 61 when the vegetation is in good condition.

Recreational uses

Resources that have special aesthetic and lancscape value are wildflowers. Some recreation uses of this sight are hiking and hunting.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
General legal description	Box Elder West Soil Survey – Terrace Mountain Pigeon Mountain Lyon Mountain Warm Springs Soil Survey Pit - No. 6-4 Pit No. 23-1 Location Ferguson Desert

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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Date	01/05/2009
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Minor rill development may be evident in the reference community following significant storm or snow melt events. The appearance of rills may be more apparent on steeper slopes or where run-on from adjacent upland sites or exposed bedrock concentrate flows. Any rill development will be short (< 3’) and widely spaced (6’ – 8’). Evidence of rills will disappear in the months following major weather events. Potential rill development may be masked by large concentrations (70% - 80% or greater) of coarse fragments on the soil surface.

2. **Presence of water flow patterns:** Evidence of water flow is not apparent in the reference community except slight flow activity may be observed following significant weather events. Surface coarse fragments and biological soil crusts typically protect surface soils from accelerated erosion in the reference state. Any flow patterns present are normally <10 feet long, follow natural contours, and are typically spaced 15 to 20 feet apart. There are no exposed roots around perennial grass clumps and surface coarse fragments show little sign of movement or redistribution.

3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes caused by accelerated water erosion are not evident in the reference community. 1 – 3 inches of elevational mounding in James galleta clumps, Bud sage canopies and cryptogamic crusts are normal and may not be water erosion caused.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Bare ground ranges from 5% - 15% in the reference community. Ground cover (the inverse of bare ground) typically includes: coarse fragments – 50% to 70%; plant canopy – 10% to 20%; litter – 10% to 15%, and biologicsl soil crusts – 2% to 5%. Bud sage is deciduous and may appear to increase bare ground percentages following leaf drop.

5. **Number of gullies and erosion associated with gullies:** Developed gully channels are a normal component of desert environments. Gullies will typically have stable, partially vegetated sides and bottoms with no evidence of recent head-cutting. Some evidence of disturbance may be evident following significant weather events or when gullies convey 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 in reference communities. Slight depositional mounding in perennial grass clumps, Bud sage canopies and biological soil crusts is a normal characteristic of this site.

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place within or under plant canopies. Some movement of the finest material (< 1/8”) may move (1’ – 2’) 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 3 to 4. Surface textures are typically sandy loams containing 50 to 75% coarse fragments. Where surface soil is lost, increased clay and silt percentages are common in the remaining soil material.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 3 or 4 inches deep and structure varies from thin to thick platy. The A-horizon color varies from 10YR 6/2 to 10YR 7/2. It 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: The presence of rhizomatous grasses such as James galleta or Alkali sacaton combined with healthy perennial bunchgrass and Bud sage in the reference community provides for the best infiltration and least runoff from storm events and snow melt. As perennial vegetation decreases and bare ground increases, runoff increases and soil loss is accelerated. Coarse fragments can increase as a percentage of total cover sealing the soil surface and slowing infiltration.

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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. Soils are mostly very deep, but a few may have bedrock at 25 – 30 inches. Increases in clay or silt content in subsoil layers should not be mistaken for compaction.

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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: Dominant: Non-sprouting shrubs (e.g. Bud sage and Shadscale) 40 – 60%, >> warm season perennial grasses (e.g. James galleta, Alkali sacaton, dropseeds) 10 – 20%, > cool season grasses (e.g. Bottlebrush squirreltail and Indian ricegrass) 5 – 10%.

    Sub-dominant: Sub-dominant: Mixed shrubs (e.g. Nevada jointfir and Winterfat) 1-5% > Cool season grasses (e.g. Sandberg and Nevada bluegrasses) 1-3%.

    Other: Others: Shrubs (e.g. Shortspine horsebrush and Spiny hopsage) 1-3%, perennial forbs (e.g. Scarlet globemallow and Holboell rockcress) 3-5%, biological soil crusts (e.g. lichens, mosses, cyanobacteria).

    Additional: Moss and lichen communities will normally be found under plant canopies while the cyanobacteria will be found throughout the site.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Reference community populations should remain relatively stable during average or above average precipitation years. During extreme drought years Bud sage may die and cool season perennial grasses may appear stressed with little production. Broom snakeweed may temporarily increase in percent composition during years with favorable growing conditions for this plant.

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14. **Average percent litter cover (%) and depth (in):** Litter cover ranges from 10 to 15% with a spike when Bud Sage drops its leaves. Depth varies from ¼ - 1/2 inch with depth increasing near plant canopies.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 150 – 250 pounds on a typical year.

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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:** Broom snakeweed, Redstem storksbill and Halogeton are likely to increase in or invade this site.

17. **Perennial plant reproductive capability:** All perennial plant species have the ability to reproduce in most years except drought years. During drought years new seedlings may be missing and principle shrubs may experience early and prolonged leaf drop.