USDA Natural Resources
Conservation Service

Ecological site R035XY203UT
Semidesert Bouldery Fan (Blackbrush)

Accessed: 05/18/2024

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.

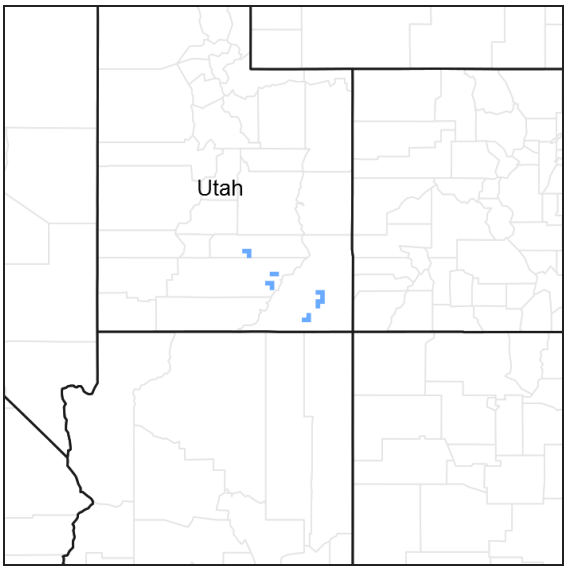


Figure 1. Mapped extent

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.

Classification relationships

Modal Soil: Stormitt BYX-L — loamy skeletal, cabonatic, mesic Ustollic Calciorthids

Associated sites

R035XY133UT	**Desert Shallow Sandy Loam (Blackbrush)**
R035XY243UT	**Semidesert Stony Loam (Blackbrush)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima*
Herbaceous	(1) *Hilaria jamesii*

Physiographic features

This site occurs on bouldery alluvial fans. Slopes are mostly 5 to 25 percent. Elevations range from 5,500 feet to 6,000 feet on all aspects

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan
Elevation	1,676–1,829 m
Slope	4–30%

Climatic features

Average annual precipitation is 9 to 12 inches. Approximately 77 percent occurs as rain from March through October. On the average, February, May, and June are the driest months and August, September, and October are the wettest months. The mean annual air temperature is 9 to 11 degrees celsius. Soil temperatures are in the mesic regime with mean annual soil temperatures ranging from 11 to 13 degrees celsius. The average freeze-free period is 130 to 160 days. Precipitation is extremely variable from month to month and from year to year. Much of the summer precipitation occurs as convection thunderstorms. In average years, plants begin growth around March 1 and end growth around October 15.

Table 3. Representative climatic features

Frost-free period (average)	0 days
Freeze-free period (average)	160 days
Precipitation total (average)	305 mm

Influencing water features

Soil features

Characteristic soils in this site are very deep and well drained. They formed in colluvium derived mainly from diorite and sandstone. The soils are extreamly bouldery on the surface and have from 35 to 50 percent rock fragments throughout the soil profile. The water supplying capacity is 4 to 6 inches.Average annual soil loss in potential is approximately less than 0.1 tons/acre.

Table 4. Representative soil features

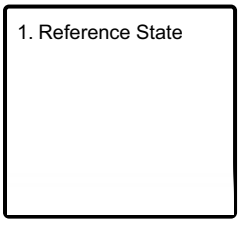
Surface texture	(1) Extremely bouldery
Drainage class	Well drained
Soil depth	152 cm

Ecological dynamics

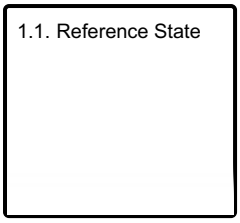
As ecological condition deteriorates due to overgrazing, bush muhly and black grama decrease while galleta, broom snakeweed, blackbrush, and Utah juniper increase. Fire does not appear to be an important factor in this site. Cheatgrass and annual weeds are most likely to invade this site.

State and transition model

Ecosystem states



State 1 submodel, plant communities



State 1
Reference State

Community 1.1
Reference State

The dominant aspect of the plant community is blackbrush and grass among large boulders. The composition by air-dry weight is approximately 50 percent perennial grasses, 5 percent forbs and 45 percent shrubs. Only scattered pinyon and juniper trees may occur in the potential natural plant community.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	155	239	323
Shrub/Vine	139	214	290
Forb	16	24	33
Total	**310**	**477**	**646**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	29-31%
Grass/grasslike foliar cover	29-31%
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%	–
>0.6 <= 1.4	–	29-31%	–	–
>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**			102–202	
	blackbrush	CORA	*Coleogyne ramosissima*	50–101	–
	mormon tea	EPVI	*Ephedra viridis*	26–50	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	26–50	–
3	**Sub-Dominant Shrubs**			198–359	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	26–50	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	16–50	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	16–26	–
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	16–26	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	16–26	–
	spiny hopsage	GRSP	*Grayia spinosa*	16–26	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	16–26	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	16–26	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	16–26	–
	Mexican cliffrose	PUME	*Purshia mexicana*	16–26	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	16–26	–
	littleleaf horsebrush	TEGL	*Tetradymia glabrata*	16–26	–
Grass/Grasslike					
0	**Dominant Grasses**			138–253	
	bush muhly	MUPO2	*Muhlenbergia porteri*	26–50	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	26–50	–
	black grama	BOER4	*Bouteloua eriopoda*	26–50	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	10–26	–
1	**Sub-Dominant Grasses**			48–99	
	Grass, annual	2GA	*Grass, annual*	16–26	–
	Grass, perennial	2GP	*Grass, perennial*	16–26	–

	blue grama	BOGR2	*Bouteloua gracilis*	6–16	–
	needle and thread	HECO26	*Hesperostipa comata*	6–16	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	6–16	–
2	**Sub-Dominant Forbs**			108–258	
	Forb, annual	2FA	*Forb, annual*	26–50	–
	Forb, perennial	2FP	*Forb, perennial*	26–50	–
	woolly locoweed	ASMO7	*Astragalus mollissimus*	6–16	–
	Esteve's pincushion	CHST	*Chaenactis stevioides*	6–16	–
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	6–16	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	6–16	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	6–16	–
	James' buckwheat	ERJA	*Eriogonum jamesii*	6–16	–
	manybranched ipomopsis	IPPO2	*Ipomopsis polycladon*	6–16	–
	desert pepperweed	LEFR2	*Lepidium fremontii*	6–16	–
	skyblue phacelia	PHCO	*Phacelia coerulea*	6–16	–

Animal community

--Livestock and Wildlife Grazing--

This site provides fair grazing conditions for livestock due to the high tannins, and low available nutrition in blackbrush. However is has relatively high importance for winter livestock grazing due to the preferable climate. For goats, the grazing value is increased (fair to good). For any class of livestock used, the carrying capacity is always low. This site often lacks natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. Reseeding and/or restoration are difficult due to the extreme temperatures and variability in time and amount of precipitation. This site may occur in mule deer ranges; however, in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily shrubs, with the majority of canopy cover being attributed to blackbrush; sub dominants include green mormontea and fourwing saltbush. These shrubs provide fair winter browse for cattle and sheep, as well as fair year round browse for goats and mule deer. When present, galleta provides poor/fair year round grazing conditions for horses, cattle, and sheep. Forb composition and annual production depends primarily on precipitation amounts and thus is challenging to use in livestock grazing management decisions. However, forb composition should be monitored for species diversity, as well as poisonous or injurious plant communities which may be detrimental to livestock if grazed. Before making specific grazing management recommendations, an onsite evaluation must be made.

--References--

Relative Forage Preference of Plants for Grazing Use by Season: Plants commonly found in Major Land Resource Area D35 --The Colorado Plateau. 2007

Stubbendieck, J., S. L. Hatch, and C. H. Butterfield. 1997. North American range plants. Lincoln, NE: University of Nebraska Press. 501p.

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

West, N. E. 1983. Colorado plateau-Mohavian blackbrush semi-desert. In: West, Neil E., ed. Temperate deserts and semi-deserts. New York: Elsevier Scientific Publishing Company: 399-411. (Goodall, David W., ed. in chief; Ecosystems of the world; vol. 5). [2508]

Hydrological functions

The soil is in hydrologic group b. The runoff curve numbers are 61 through 79 depending on the condition of the watershed.

Recreational uses

Recreation values are hiking and hunting.

Wood products

Only scattered stands of pinyon and juniper trees may occur in the potential natural plant community.

Other information

--Poisonous/Toxic Plant Communities--

Toxic plants associated with this site include woolly locoweed and broom snakeweed. Woolly locoweed is toxic to all classes of livestock and wildlife. This plant is palatable and has similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is available. Locoweed contains swainsonine (indolizdine alkaloid) and is poisonous at all stages of growth. Poisoning will become evident after 2-3 weeks of continuous grazing and is associated with 4 major symptoms: 1) neurological damage, 2) emaciation, 3) reproductive failure and abortion, and 4) congestive heart failure linked with “high mountain disease”. Broom snakeweed contains steroids, terpenoids, saponins, and flavones that can cause abortions or reproductive failure in sheep and cattle, however cattle are most susceptible. These toxins are most abundant during active growth and leafing stage. Cattle and sheep generally will only graze broom snakeweed when other forage is unavailable, typically in winter when toxicity levels are at their lowest.

Potentially toxic plants associated with this site include four-wing saltbush and buckwheat species, which may accumulate selenium, but only when growing on selenium enriched soils. These plants, when consumed will cause alkali disease or chronic selenosis, which affects all classes of livestock (excluding goats). Typically, animals consuming 5-50 ppm selenium will develop chronic selenosis and animals consuming greater than 50 ppm selenium will develop acute selenosis. Clinical signs include lameness, soughing of the hoof, hair loss, blindness, and aimless wondering.

Russian thistle is an invasive toxic plant, causing nitrate and to a lesser extent oxalate poisoning, which affects all classes of livestock. The buildup of nitrates in these plants is highly dependent upon environmental factors, such as after a rain storm during a drought, cool/cloudy days, and soils high in nitrogen and low in sulfur and phosphorus, all which cause increased nitrate accumulation. Nitrate collects in the stems and can persist throughout the growing season. Clinical signs of nitrate poisoning include drowsiness, weakness, muscular tremors, increased heart and respiratory rates, staggering gait, and death. Conversely, oxalate poisoning causes kidney failure; clinical signs include muscle tremors, tetany, weakness, and depression. Poisoning generally occurs when livestock consume and are not accustomed to grazing oxalate-containing plants. Animals with prior exposure to oxalates have increased numbers of oxalate-degrading rumen microflora and thus are able to degrade the toxin before clinical poisoning can occur.

--Invasive Plant Communities--

Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible. At this time, in most of the Colorado Plateau area, cheatgrass is not known to invade blackbrush associations as it does in areas of southwest Utah and the Mojave.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Many semi-desert communities in the Colorado Plateau may have evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

The fire regime for blackbrush is not well understood due to few species in the association that show fire scars and can be aged. Research has noted that a burned blackbrush site in Arizona has recovered, and in Nevada, fire in blackbrush communities has increased forage diversity. In these areas, a fire return interval has been suggested at 35-100 years. However, communities in southeastern Utah do not show evidence of burning within that time frame. This ecological site is comprised of dense to scattered low stature blackbrush plants with bare interspaces to patchy occurrence of grasses, which is unlikely to carry a fire unless under high winds, high temperature, and low humidity. Blackbrush is a non-sprouter and is slow to re-establish on burned sites. Studies indicate that blackbrush sites do not recover well in Utah. So currently burning is not a recommended brush management tool. Because of the apical dominance trait, removal through grazing or mechanical treatment will increase sprouting/new growth. If at sometime there are species that can be used successfully to re-vegetate the community, then mechanical treatment could be used. Of caution, blackbrush is thought to be very flammable due to the dense spacing of the brush and the tinder-like nature, and resinous foliage. So, if annual grasses or forbs dominate the area after disturbance, re-vegetating efforts could be hampered due to several factors including an increase in fire frequency.

--References--

Knight, A. P. and R. G. Walter. 2001. A guide to plant poisoning of animals in North America. Jackson, WY: Teton NewMedia. 367p.

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

Contributors

George Cook

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	09/11/2008
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 rare. Due to the bouldery characteristic of this site, traditional rill identification is hampered. However, the overall stony surface is expected to be resistant to rill formation and accelerated erosion in general.

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2. **Presence of water flow patterns:** Some flow patterns wind around large exposed boulders and perennial plant bases. They are short and stable and there is minor evidence of deposition. On gently sloping (< 6 % slopes) locations within the site, water flow patterns are infrequent and usually less than 3 feet. Longer water flow patterns may be found on steeper slopes.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes are very few. They may naturally occur where the water flows around the gravel, rock or boulders. Pedestals and terracettes are associated with water flow patterns. Interspaces between well developed biological soil crusts may resemble pedestals but they are actually a characteristic of the crust formation.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10 – 25% bare ground. This site has 30-80% of the surface covered with large rock fragments. Ground cover is based on the first raindrop impact, and bare ground is the opposite of ground cover. Well developed biological crusts should not be recorded as bare ground. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground.

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5. **Number of gullies and erosion associated with gullies:** None. Gully formation is prevented by numerous large boulders on the surface.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Site is protected from wind erosion by numerous large boulders on the surface.

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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. Very minor fine litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction. The majority of litter accumulates at the base of plants and rocks. Some grass leaves and small twigs (grass stems) may accumulate in soil depressions adjacent to plants. Woody stems not likely to move.

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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 throughout the site using the soil stability test kit. Surface texture is gravelly 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):** Soil surface is typically 3 inches deep. Structure is typically very fine granular. Color is typically reddish brown (5YR5/3). The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants and well developed biological soil crusts will break raindrop impact and splash erosion. Spatial distribution of vascular plants and well developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Interspaces between plants and well developed biological soil crusts (where present) may serve as water flow patterns during episodic runoff events, with natural erosion expected in severe storms. When perennial grasses decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. Naturally occurring soil horizons may be harder than the surface because of an accumulation of clay or calcium carbonate and should not be considered as compaction layers.

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 (blackbrush) >= warm season grasses (Galleta, Black grama, Bush muhly) Note: Be cognizant that production and presence of black grama, bush muhly and to a certain degree, blue grama grasses are often subdued during times of drought or low precipitation years. They may still be present but not obvious due to this adaptive characteristic.

    Sub-dominant: sprouting shrubs (Mormontea) > Perennial bunch grasses (Desert needlegrass) > native perennial and annual forbs > Biological soil crusts

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Siberian Wheatgrass, Forage kochia etc.)
    Biological soil crust is variable in it’s 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: Temporal variability is caused by very rare fires, droughts, insects or other pathogens, etc. and spatial variability is caused by slope, aspect and topography.
    Following a recent disturbance such as drought or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions could 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):** 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) droughts, up to 20% of the blackbrush stems may die. Some mortality of bunchgrass and other shrubs may occur during very severe (long term) droughts. There may be partial mortality of individual bunchgrasses and other shrubs during less severe droughts. Because woody stems may persist for many years, blackbrush will normally have dead stems within the plant canopy. Blackbrush will drop it’s leaves when water stressed.

14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) Depth should be 1 leaf thickness in the interspaces and up to 1/8” under canopies. Litter cover may increase up to 20% immediately following leaf drop. Litter redistribution following natural extreme runoff events can reduce litter cover by concentrating it in low lying areas. Litter cover may increase to 3-6% following seasons with above average production with a high production of biomass.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 400 - 450 #/acre on an average 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:** Cheatgrass and introduced annual forbs are most likely to invade this site.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years. Blackbrush reproduction is naturally very episodic and no young plants may be apparent.
