USDA Natural Resources
Conservation Service

Ecological site R025XY316UT
Upland Shallow Loam (Black Sagebrush)

Accessed: 04/20/2024

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): 025X–Owyhee High Plateau

Refer to the meeting on D25 MLRA S&TM response groups on 02/20/2013. This site may be a part of response group #3 Shallow Clay Loam 10-14. Use this S&TM as a basis.

Associated sites

R025XY320UT	**Upland Stony Clay (Low Sagebrush)**
R025XY322UT	**Upland Juniper Savanna (Utah Juniper)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Artemisia nova*
Herbaceous	Not specified

Physiographic features

This site can be found on hillslopes and ridges between slopes of 15 to 30%, although the sites can be found on gentle slopes of 5% up to steep slopes of 60%. It can occur at elevations between 5,200 to 7,000 feet. Flooding and ponding do not occur on this site.

Table 2. Representative physiographic features

Landforms	(1) Hill (2) Ridge
Flooding frequency	None
Ponding frequency	None
Elevation	5,200–7,000 ft
Slope	15–30%

Climatic features

The climate is cold and snowy in the winter and dry in the summer. The average annual precipitation is 12 to 17 inches. Approximately 55 percent occurs as rain from May through September. On the average July, August, and September are the driest months and March through May are the wettest. In average years, grasses begin growth around May 1 and end growth around October 1.

Mean Annual Air Temperature: 41-44
Mean Annual Soil Temperature: 43-47

Table 3. Representative climatic features

Frost-free period (average)	0 days
Freeze-free period (average)	120 days
Precipitation total (average)	17 in

Influencing water features

Soil features

The soils on this site were formed in alluvium and colluvium derived from limestone, chert and quartzite. The soil is well drained with moderate permeability in the upper 10 inches of soil. The soil is also shallow with bedrock less than 20 inches beneath the soil surface. A lithic bedrock or duripan layer is found between 10 and 20 inches below the soil surface. The soil texture at the surface is very gravelly loam, gravelly loam, and extremely gravelly loam. Surface and subsurface rock fragments between 2 mm and 3 inches are 28 to 47% and 34 to 42% by cover and volume, respectively. Surface and subsurface rocks over 3 inches in diameter less than 5% by cover and volume. Available water capacity is between 1.2 and 2.1 in the upper 40 inches of soil. The soil pH is between 7.4 and 8.4. The soil temperature regime is frigid.

Soils associated with this site:
Box Elder Co. UT601: Rodrof (13, 72) Sonlet (13, 48, 56, 85)

Table 4. Representative soil features

Surface texture	(1) Very gravelly loam (2) Gravelly loam (3) Extremely gravelly loam
Drainage class	Well drained
Permeability class	Moderate
Soil depth	10–20 in

Surface fragment cover <=3"	28–47%
Surface fragment cover >3"	0–5%
Available water capacity (0-40in)	1.2–2.1 in
Calcium carbonate equivalent (0-40in)	1–15%
Electrical conductivity (0-40in)	0–2 mmhos/cm
Sodium adsorption ratio (0-40in)	0
Soil reaction (1:1 water) (0-40in)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	34–42%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

As this site deteriorates due to grazing pressure bluebunch wheatgrass and Thurber needlegrass decrease while black sagebrush and low rabbitbrush increase. When the potential natural plant community is burned, black sagebrush and wild buckwheat decrease while low rabbitbrush and lupine increase.

State and transition model

Ecosystem states

1. Reference State

State 1 submodel, plant communities

1.1. Reference State

State 1
Reference State

Community 1.1
Reference State

The general view of this site is black sagebrush and bluebunch wheatgrass. The composition by air-dry weight is approximately 5 percent perennial grasses, 10 percent forbs, and 40 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Lb/Acre)	Representative Value (Lb/Acre)	High (Lb/Acre)
Shrub/Vine	80	180	320
Forb	20	45	70
Grass/Grasslike	10	23	35
Total	**110**	**248**	**425**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	25-35%
Grass/grasslike foliar cover	25-35%
Forb foliar cover	5-15%
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	–	–	–	5-10%
>1 <= 2	–	15-30%	15-30%	–
>2 <= 4.5	–	–	–	–
>4.5 <= 13	–	–	–	–
>13 <= 40	–	–	–	–
>40 <= 80	–	–	–	–
>80 <= 120	–	–	–	–
>120	–	–	–	–

Figure 3. Plant community growth curve (percent production by month). UT3161, PNC. Excellent Condition.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	5	15	40	20	10	5	5	0	0	0

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	**Primary Shrub**			125–150	
	black sagebrush	ARNO4	*Artemisia nova*	125–150	–
3	**Secondary Shrubs**			25–50	
	Saskatoon serviceberry	AMAL2	*Amelanchier alnifolia*	15–25	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	15–25	–
	spiny hopsage	GRSP	*Grayia spinosa*	15–25	–
	winterfat	KRLA2	*Krascheninnikovia lanata*	15–25	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	15–25	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	15–25	–
Grass/Grasslike					
0	**Primary Grasses**			155–225	
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	75–100	–
	Thurber's needlegrass	ACTH7	*Achnatherum thurberianum*	50–75	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	15–25	–
1	**Secondary Grasses**			25–50	
	squirreltail	ELEL5	*Elymus elymoides*	15–25	–
	Idaho fescue	FEID	*Festuca idahoensis*	15–25	–
	western wheatgrass	PASM	*Pascopyrum smithii*	15–25	–
	Sandberg bluegrass	POSE	*Poa secunda*	15–25	–
Forb					
2	**Forbs**			15–25	
	Torrey's milkvetch	ASCA9	*Astragalus calycosus*	15–25	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	15–25	–
	shortstem buckwheat	ERBR5	*Eriogonum brevicaule*	15–25	–
	tailcup lupine	LUCAC3	*Lupinus caudatus ssp. caudatus*	15–25	–
	spiny phlox	PHHO	*Phlox hoodii*	15–25	–

Animal community

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

Wildlife using this site include blacktail jackrabbit, coyote, sage grouse, and mule deer, and elk.

Hydrological functions

The soil series is in hydrologic group D. The runoff curve number is 80 when the vegetation is in good condition.

Recreational uses

Hiking and Hunting.

Wood products

None

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T9N R16W S19
General legal description	Type Location: 2100 ft E 2500 ft S of NW Corner Section 19, Township 9N, Range 16W General Legal Description: SW slope of Bovine Mountain in western Box Elder county, Utah

Contributors

GBB

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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Contact for lead author	shane.green@ut.usda.gov
Date	12/15/2011
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 rills present. Some very minor rill development may occur on steeper slopes 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 (<8 feet long) and somewhat widely spaced (6-8 feet). Minor rill development may be observed following major thunderstorm or spring runoff events but should heal during the next growing season.

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2. **Presence of water flow patterns:** 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 (4-8 feet), stable, sinuous and not connected. There may be very minor evidence of deposition. Evidence of water flow may increase somewhat with slope.

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3. **Number and height of erosional pedestals or terracettes:** 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.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5-15% bare ground. Soil surface is typically covered by approximately 30 to 60% coarse fragments. Bare ground spaces should not be greater than 2 to 3 feet in diameter.

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5. **Number of gullies and erosion associated with gullies:** None to very few gullies present on site. 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 present. Wind caused blowouts and deposition are not 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. 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 >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 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 very gravelly loam.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** (Rodrof) Soil surface 0-2 inches. Texture is an extremely gravelly loam; color is dark brown (10YR5/3); and structure is weak thin platy parting to weak very fine granular. Mollic epipedon ranges to 10 inches. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Perennial vegetation produces sufficient cover and spatial arrangement to intercept most raindrops and reduce raindrop splash erosion. Litter on soil surface and cryptogamic crusting, where present, also protects soil from splash erosion and encourages a higher rate of infiltration. 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. An indurated duripan which occurs at approximately 19 inches which is not 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: Perennial bunchgrasses (bluebunch wheatgrass, Thurber needlegrass) > Non-Sprouting shrubs (black sagebrush, antelope bitterbrush).

    Sub-dominant: Other perennial bunchgrasses (Indian ricegrass, bottlebrush squirreltail) >> Rhizomatous grasses (western wheatgrass) > Sprouting shrubs (green rabbitbrush, winterfat) >> Perennial forbs (longleaf hawksbeard).

    Other: A wide variety of other perennial grasses and both perennial and annual forbs can be expected to occur in the plant community.

    Additional: Natural disturbance regimes include fire, drought, and insects. Assumed fire cycle of 30 to 40+ 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 (e.g. Crested wheatgrass, Smooth brome, intermediate wheatgrass, Siberian Wheatgrass etc.)
    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.

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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 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.

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14. **Average percent litter cover (%) and depth (in):** Litter cover will be heavier under plants. Most litter will be herbaceous and depths of 1/4 to 1/2 inch would be considered normal. Perennial vegetation should be well distributed on the site.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** Annual production in air-dry herbage should be approximately 400 - 500#/acre on an average year, but could range from 200 to 700#/acre during periods of prolonged drought or above average precipitation.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Cheatgrass, Russian thistle, Utah juniper, and non-native invasive annual forbs such a

alyssum.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce in all years, except in extreme drought years. Green rabbitbrush sprouts vigorously following fire. There are no restrictions on either seed or vegetative reproduction. Some seedling recruitment of major species is present during average and above average growing years.