USDA Natural Resources
Conservation Service

Ecological site R028AY320UT
Upland Shallow Hardpan (Pinyon-Utah Juniper)

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.

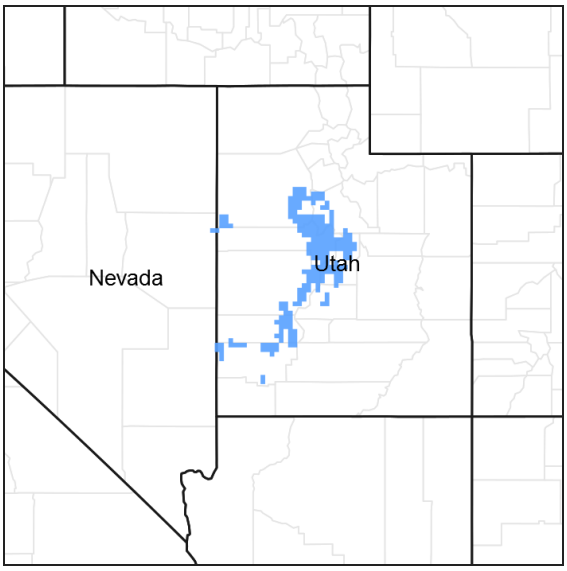

Figure 1. Mapped extent

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.

Similar sites

R028AY338UT	**Upland Stony Loam (Pinyon-Utah Juniper)**
R028AY324UT	**Upland Shallow Loam (Utah Juniper - Singleleaf Pinyon)**

Table 1. Dominant plant species

Tree	(1) *Pinus monophylla* (2) *Juniperus osteosperma*
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs most commonly on alluvial fans and fan remnants, and occaisionally on mountain slopes. It is found on all aspects and at elevations between 4,700 and 7,000 feet. Slopes are gentle ranging from 2 to 25 percent. Runoff is medium to high.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Fan remnant (3) Mountain slope
Flooding frequency	None
Ponding frequency	None
Elevation	1,433–2,134 m
Slope	2–25%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by cold, snowy winters and warm dry summers. The average annual precipitation is mostly 13 to 18 inches, but in a few instances is as high as 20 inches on south and west exposures. July, August and September are commonly the driest months while March and April are the wettest. Annual distribution is 45 percent during the plant growth period, May to October. However, this is usually not too effective in influencing plant growth since it comes as small intermittent showers which do not wet the soil very deep or as intense cloud bursts where considerable runoff occurs, especially in July and August the effective moisture for plant growth is the 55 percent that falls during the winter plant dormant period.

Table 3. Representative climatic features

Frost-free period (average)	129 days
Freeze-free period (average)	157 days
Precipitation total (average)	508 mm

Influencing water features

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

Soil features

The soils of this site are shallow and well-drained. They are typically 10 to 20 inches deep over an indurated lime or silica cemented hardpan. They formed in alluvium derived mainly from limestone, sandstone or igneous parent materials. Surface textures are gravelly or cobbly loams. Rock fragments are usually present on the soil surface. The volume of rock fragments in the soil profile ranges from 10 to 40 percent. These soils are strongly calcareous with up to 30 percent calcium carbonate. Permeability is moderate.
Available water capacity is 1.8 to 3.8 inches. The soil moisture regime is xeric and the soil temperature regime is mesic.

Soil Survey Area: Soil Components (Map units in parentheses)

Fairfield-Nephi Area (UT608): Borvant (BgD, BhD, BhF, BkE, DcD, FfD);

Iron-Washington Area (UT634): Elenore (374); Pavant (445, 446, 447); Revor (463);

Table 4. Representative soil features

Surface texture	(1) Gravelly loam (2) Cobbly loam
Family particle size	(1) Loamy
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderately slow to moderate

Soil depth	25–51 cm
Surface fragment cover <=3"	7–13%
Surface fragment cover >3"	15–16%
Available water capacity (0-101.6cm)	4.57–9.65 cm
Calcium carbonate equivalent (0-101.6cm)	5–30%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	9–26%
Subsurface fragment volume >3" (Depth not specified)	3–13%

Ecological dynamics

As ecological condition deteriorates due to overgrazing, bluebunch wheatgrass, Indian ricegrass, and bluegrass decrease, while pinyon, juniper, rabbitbrush and sagebrush increase.

When the potential natural plant community is burned, bitterbrush, big sagebrush, perennial grasses, pinyon and juniper decrease while low rabbitbrush and Sandberg bluegrass increase.

Cheatgrass and annual forbs are most likely to invade this site.

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 dominant aspect of this plant community is pinyon and juniper. The composition by air-dry weight is approximately 40 percent perennial grasses, 10 percent forbs, and 50 percent shrubs and trees.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	135	314	426
Shrub/Vine	84	196	267
Tree	84	196	267
Forb	34	78	106
Total	**337**	**784**	**1066**

Table 6. Ground cover

Tree foliar cover	15%
Shrub/vine/liana foliar cover	15-30%
Grass/grasslike foliar cover	10-25%
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	–	–	–	–
>0.3 <= 0.6	–	25-35%	20-30%	0-10%
>0.6 <= 1.4	–	–	–	–
>1.4 <= 4	10-20%	–	–	–
>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	**Primary Shrubs**			269–448	
	black sagebrush	ARNO4	*Artemisia nova*	135–179	–
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	45–90	–

	Mexican cliffrose	PUME	*Purshia mexicana*	45–90	–
	antelope bitterbrush	PUTR2	*Purshia tridentata*	45–90	–
3	**Secondary Shrubs**			27–45	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	9–27	–
	Nevada jointfir	EPNE	*Ephedra nevadensis*	9–18	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–18	–
	stemless mock goldenweed	STAC	*Stenotus acaulis*	9–18	–
	mountain snowberry	SYOR2	*Symphoricarpos oreophilus*	9–18	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	9–18	–
Grass/Grasslike					
0	**Primary Grasses**			260–404	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	90–135	–
	bluebunch wheatgrass	PSSP6	*Pseudoroegneria spicata*	90–135	–
	squirreltail	ELEL5	*Elymus elymoides*	27–45	–
	needle and thread	HECO26	*Hesperostipa comata*	27–45	–
1	**Secondary Grasses**			27–45	
	prairie Junegrass	KOMA	*Koeleria macrantha*	9–27	–
	western wheatgrass	PASM	*Pascopyrum smithii*	9–27	–
	Sandberg bluegrass	POSE	*Poa secunda*	9–27	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	9–27	–
Forb					
2	**Forbs**			90–135	
	freckled milkvetch	ASLE8	*Astragalus lentiginosus*	9–27	–
	Hooker's balsamroot	BAHO	*Balsamorhiza hookeri*	9–27	–
	tapertip hawksbeard	CRAC2	*Crepis acuminata*	9–27	–
	roundspike cryptantha	CRHU2	*Cryptantha humilis*	9–27	–
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	9–27	–
	ballhead ipomopsis	IPCOC3	*Ipomopsis congesta ssp. congesta*	9–27	–
	low beardtongue	PEHU	*Penstemon humilis*	9–27	–
	spiny phlox	PHHO	*Phlox hoodii*	9–27	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	9–27	–
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	9–27	–
Tree					
4	**Trees**			117–179	
	singleleaf pinyon	PIMO	*Pinus monophylla*	90–135	–
	Utah juniper	JUOS	*Juniperus osteosperma*	27–45	–

Animal community

his site is suited for grazing by cattle and sheep during fall, winter, and spring.

Wildlife using this site include rabbit, coyote, sage grouse, pronghorn antelope, mule deer, and elk.

This is a short list of the more common species found. Many other species are present as well and migratory birds

are present at times.

Hydrological functions

The soils are in hydrologic group D with runoff curves ranging from 80 to 89 depending on hydrologic condition.

Recreational uses

Resources that have special aesthetic and landscape values are wildflowers. Some recreation uses of this site are hiking and horseback riding.

Wood products

Firewood, Fence Posts, and Christmas Trees

Other information

Threatened and endangered species include plants and animals.

Type locality

Location 1: Box Elder County, UT	
Township/Range/Section	T14N R16W S6
General legal description	5 Miles West of Yost; Section 6, Township 14N, Range 16W

Contributors

David J. Somorville
DJS

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.

Author(s)/participant(s)	Jack Alexander, Range Specialist, Synergy Resource Solutions, Inc. Julia Kluck, Soil Scientist, Synergy Resource Solutions, Inc. Shane Green, State Range Specialist, Utah NRCS
Contact for lead author	Shane Green, Shane.Green@ut.usda.gov
Date	02/09/2010
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Some rills present. Rill development may increase following large storm events, but should begin to heal during the following growing season. Frost heaving will accelerate recovery. Rill development may increase when run inflow enters site from other sites that produce large amounts of runoff (i.e. steeper sites, slickrock, rock outcrop).

2. **Presence of water flow patterns:** Water flow patterns will be short (2-5') and meandering; interrupted by plants and exposed rocks. Some evidence of erosion or deposition associated with flow patterns. Where slopes exceed 5%, water flow patterns may be longer (5–10').

3. **Number and height of erosional pedestals or terracettes:** Plants may have small pedestals (1-3") where they are adjacent to water flow patterns, but without exposed roots. Terracettes should be few and stable. Terracettes should be small (1-3") and show little sign of active erosion. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

   Well-developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation. Some plants may appear to have a pedestal but rather than be formed by erosion, the only place litter accumulates and soil collects is at plant bases forming the appearance of a pedestal.

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 20-40% bare ground (soil with no protection from raindrop impact). Herbaceous communities are most likely to have lower values. As species composition by shrubs increases, bare ground is likely to increase. Poorly developed biological soil crust that is susceptible to raindrop splash erosion should be recorded as bare ground. Very few if any bare spaces of greater than 1 square foot.

5. **Number of gullies and erosion associated with gullies:** No gullies present.

6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of active wind-generated soil movement. Wind scoured (blowouts) and depositional areas are rarely present. If present they have muted features and are mostly stabilized with vegetation and/or biological crust. Gravel or desert pavement protects the site from wind scour.

7. **Amount of litter movement (describe size and distance expected to travel):** Most litter resides in place with some redistribution caused by water and wind movement. Very minor 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. Some leaves, stems, and small twigs may accumulate in soil depressions adjacent to plants. Woody stems are not likely to move.

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 an erosion rating of 5 or 6 under plant canopies and a rating of 4 to 5 in the interspaces with an average rating of 5 using the soil stability kit test.

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** This description is based on a combination of the 4 correlated soils for this site. This results in variation of each of these attributes. Due to the natural variability of soil attributes, it is critical to supplement this description with the soil-specific information from the published soil survey.

Soil surface horizon is typically 7 to 14 inches deep. Structure is typically moderate fine or weak medium granular. Color is typically brown (10YR 5/3) or grayish brown (10YR 5/2), dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2) moist. Mollic epipedon is common.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Vascular plants and any well-developed biological soil crusts (where present) will break raindrop impact and splash erosion. Spatial distribution of vascular plants and interspaces between well-developed biological soil crusts (where present) provide detention storage and surface roughness that slows runoff allowing time for infiltration. Crowns of trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in pinyon-juniper canopy reduces understory vegetation and increases 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. 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. A duripan (indurated layer of illuvial silica and lime) may be present

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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: black sagebrush > Indian ricegrass, bluebunch wheatgrass, singleleaf pinyon

    Sub-dominant: Wyoming big sagebrush, Mexican cliffrose, antelope bitterbrush

    Other: other grasses, other shrubs, forbs

    Additional: In the northern portion of the MLRA cool-season perennial grasses (Indian ricegrass, needle and thread) dominate. In the southernmost portion of the MLRA warm-season perennial grasses (galleta, sand dropseed) dominate. The two groups share dominance in the middle portion of the MLRA.

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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. Some bunchgrass and shrub mortality may occur during severe droughts, particularly on the shallower and coarser soils associated with this site.

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14. **Average percent litter cover (%) and depth (in):** Litter cover includes litter under plants. Most litter will be fine litter. Depth should be 1-2 leaf thickness in the interspaces and up to 1/2” under canopies. Litter cover may increase to 20-30% following years with favorable growing conditions. Excess litter may accumulate in absence of disturbance. Vegetative production may be reduced if litter cover exceeds 40%.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 700#/acre.
    Even the most stable communities exhibit a range of production values. Production will vary between communities and across the MRLA. Refer to the community descriptions in the ESD. Production will differ across the MLRA due to the naturally occurring variability in weather, soils, and aspect. The biological processes on this site are complex; therefore,

representative values are presented in a land management context.

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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 annual forbs

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually, except in drought years. Density of plants indicates that plants reproduce at level sufficient to fill available resource. Within capability of site there are no restrictions on seed or vegetative reproductive capacity.
