

Ecological site R035XY234UT Semidesert Shallow Shale (Utah Juniper-Pinyon)

Accessed: 05/03/2024

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.

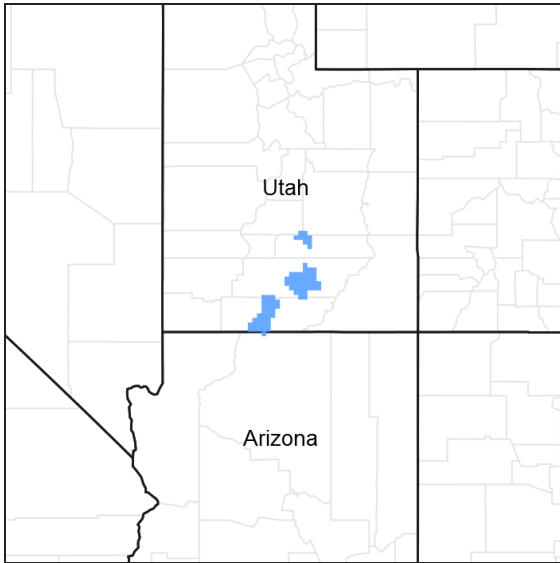


Figure 1. Mapped extent

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.

Ecological site concept

Site Concept: This site occurs in the semidesert zone of the Colorado and Green River Plateaus region (MLRA35) in Southern Utah. It is found on escarpments, hillsides, and structural benches at elevations between 5200 and 8000 feet. Soils are shallow to sedimentary rock and formed in residuum and colluvium derived from sandstone, limestone, siltstone and/or shale. Rock fragments are very abundant on the surface, but may not necessarily be in the subsoil. The soil moisture regime is ustic aridic and the soil temperature regime is mesic. Utah juniper is the dominant plant, and two-needle pinyon can also be abundant. This site does not burn regularly, and has not yet been documented to harbor invasive species.

Associated sites

R035XY209UT	Semidesert Loam (Wyoming Big Sagebrush)
R035XY212UT	Semidesert Sand (Fourwing Saltbush)
R035XY221UT	Semidesert Shallow Loam (Utah Juniper-Pinyon)
R035XY227UT	Semidesert Shallow Sand (Utah Juniper-Pinyon)
R035XY240UT	Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)

Similar sites

R035XY221UT	Semidesert Shallow Loam (Utah Juniper-Pinyon)
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Table 1. Dominant plant species

Tree	(1) <i>Juniperus osteosperma</i> (2) <i>Pinus edulis</i>
Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on structural benches, hillslopes and escarpments. Slopes can range from 2-60%. Elevations are generally 5200-8000 ft.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Hill (3) Escarpment
Flooding frequency	None
Ponding frequency	None
Elevation	1,585–2,438 m
Slope	2–60%

Climatic features

The climate is characterized by hot summers and cool to cold winters. Large fluctuations in daily temperatures are common. Average annual precipitation ranges from 9-13 inches. Much of the summer precipitation occurs as convection thunder storms from July to October. On the average February, May, and June are the driest months and August, September, and October are the wettest months. The soil moisture regime is ustic aridic and the soil temperature regime is mesic. In average years, plants begin growth around March 10 and end growth around October 10.

Table 3. Representative climatic features

Frost-free period (average)	149 days
Freeze-free period (average)	173 days
Precipitation total (average)	330 mm

Influencing water features

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

Soil features

The soil is 4 to 20 inches deep over sedimentary rock. It formed in residuum and colluvium derived from sandstone, siltstone, limestone and shale. The soil is often in complex with rock outcrop. Rock fragments are abundant on the surface, though not always present in the subsoil. Soil textures are usually loamy skeletal (high rock fragments) but range from very channery clay loams to extremely channery sandy loams. Water-holding capacity ranges from 0.5 to 1.5 inches of water in the entire profile. The soil moisture regime is ustic aridic and the soil temperature regime is mesic.

This site has been used in the following soils surveys and has been correlated to the following components:

UT642 – Kane County Area– Simel

UT685 - Capitol Reef National Park - Remorris, Simel, Hillburn, Nonip.

UT686 – Escalante Grande Staircase National Monument – Hillburn; Nonip; Simel

Table 4. Representative soil features

Parent material	(1) Residuum–shale (2) Colluvium–siltstone
Surface texture	(1) Extremely channery loam (2) Very channery silt loam (3) Extremely bouldery loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderate
Soil depth	10–51 cm
Surface fragment cover <=3"	20–50%
Surface fragment cover >3"	0–30%
Available water capacity (0-101.6cm)	1.27–3.81 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)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–57%
Subsurface fragment volume >3" (Depth not specified)	0–30%

Ecological dynamics

This site's plant species composition is generally dominated by Utah juniper and twoneedle pinyon.

Drought and insects appear to be the main driving factors in many of the Pinyon/Juniper communities of Utah. Betancourt et al. (1993), noted that Pinyon and Juniper woodlands in the southwest appear to be more susceptible to large die offs during droughts than in other locations. As severe droughts persist, the Pinyon trees, being more susceptible to drought and insects, seem to die out, while the Utah juniper trees survive. Large die offs of pinyons due to insects and drought have not been recorded for this ecological site. However, given the tendency for pinyons to be susceptible to insect and drought kill, managers should be aware of the possibility.

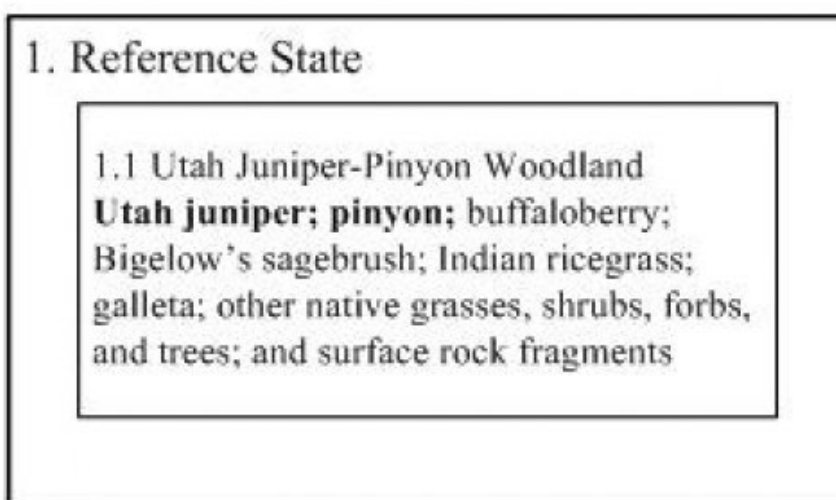
There is no evidence to indicate that this site historically maintained a short burn frequency. Until further research indicates that fire played a role in the ecosystem processes of this site, the state and transition model will not include fire as a disturbance mechanism in the reference state. However, due to modern disturbances such as brush treatments, invasive species, and OHV use, the resilience of the plant communities may be at risk. Disturbances that reduce the presence of perennial grasses result in an opportunity for invasive annuals to enter into the system and may produce a fuel load for fire to become an ecological driver.

As vegetation communities respond to changes in management or natural occurrences, thresholds can be crossed, which usually means that a return to the previous state may not be possible without major energy inputs. The amount of energy input needed to affect vegetative shifts depends on the present biotic and abiotic features and the desired results. The following diagram does not necessarily depict all the transition and states that this site may

exhibit, but it does show some of the most common plant communities that can occur on the site and the transition pathways among the communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable. As more data is collected, some of these plant communities will be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as the “desired plant community. The main purpose for including any description of a plant community here is to capture the current knowledge and experience at the time of this revision.

State and transition model

R035XY234UT Semidesert Shallow Shale (Utah Juniper-Pinyon)



State 1

Reference State

This state includes the biotic communities that become established on the ecological site if all successional sequences are completed under the natural disturbance regimes. The reference state is generally dominated by twoneedle pinyon and Utah juniper, however depending on disturbance history, native grasses, forbs, or other shrubs may occupy significant composition in the plant community. Typically, in the reference state this site is self sustainable; however once invasive plants establish, return to this community may not be possible. Reference State: Twoneedle pinyon and Utah juniper woodland Indicators: A community dominated by twoneedle pinyon and Utah juniper, where shrubs, and native perennial grasses and forb production is variable. Feedbacks: Disturbances that may allow for the establishment of invasive species. At-risk Community Phase: this community is at risk when native plants are stressed and nutrients become available for invasive plants to establish.

Community 1.1

Reference State

UTMs: Datum NAD83; Zone 12; Easting 479425; Northing 4235434
 Photo by Jake Owens (2010)
 Photo point located in Capitol Reef National Park. This location is in community phase 1.1.



Figure 4. Phase 1.1

This community phase is characterized by a Utah juniper and twoneedle pinyon upper canopy. In the lower canopy, commonly seen grasses include Indian ricegrass and galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Bare ground is approximately 40% and surface cover attributed to rock is approximately 6%.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	213	224	258
Shrub/Vine	22	34	45
Grass/Grasslike	6	17	34
Forb	6	11	17
Total	247	286	354

Table 6. Ground cover

Tree foliar cover	6-12%
Shrub/vine/liana foliar cover	2-8%
Grass/grasslike foliar cover	2-10%
Forb foliar cover	0-4%
Non-vascular plants	0%
Biological crusts	0-10%
Litter	5-24%
Surface fragments >0.25" and <=3"	10-50%
Surface fragments >3"	0-30%
Bedrock	4-20%
Water	0%
Bare ground	30-50%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-2%
>0.15 <= 0.3	–	2-10%	0-5%	0-2%
>0.3 <= 0.6	–	0-5%	0-5%	0-2%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	0-6%	–	–	–
>4 <= 12	3-8%	–	–	–
>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 (%)
Tree					
0	Dominant Trees			213–258	
	Utah juniper	JUOS	<i>Juniperus osteosperma</i>	163–224	4–8
	twoneedle pinyon	PIED	<i>Pinus edulis</i>	48–101	2–4
Grass/Grasslike					
0	Dominant Grasses			6–34	
	James' galleta	PLJA	<i>Pleuraphis jamesii</i>	6–29	1–3
	Indian ricegrass	ACHY	<i>Achnatherum hymenoides</i>	0–11	0–2
	squirreltail	ELEL5	<i>Elymus elymoides</i>	0–6	0–2
1	Sub-Dominant Grasses			0–22	
	Grass, perennial	2GP	<i>Grass, perennial</i>	0–17	–
	Grass, annual	2GA	<i>Grass, annual</i>	0–11	–
	desert needlegrass	ACSP12	<i>Achnatherum speciosum</i>	0–9	–
	purple threeawn	ARPU9	<i>Aristida purpurea</i>	0–9	–
	blue grama	BOGR2	<i>Bouteloua gracilis</i>	0–9	–
	slim spikerush	ELEL2	<i>Eleocharis elongata</i>	0–9	–
	needle and thread	HECOC8	<i>Hesperostipa comata ssp. comata</i>	0–9	–
	sand dropseed	SPCR	<i>Sporobolus cryptandrus</i>	0–9	–
Forb					
2	Sub-Dominant Forbs			6–17	
	Forb, perennial	2FP	<i>Forb, perennial</i>	0–17	0–5
	Forb, annual	2FA	<i>Forb, annual</i>	0–15	0–5
	desert princesplume	STPI	<i>Stanleya pinnata</i>	0–11	0–5
	rock goldenrod	PEPU7	<i>Petrorhiza pumila</i>	0–6	0–5
	stemless four-nerve daisy	TEACA2	<i>Tetraneuris acaulis var. acaulis</i>	0–6	0–2
	Wright's bird's beak	COWR2	<i>Cordylanthus wrightii</i>	0–6	0–2
	Brenda's yellow cryptantha	CRFL5	<i>Cryptantha flava</i>	0–6	0–2

	gooseberryleaf globemallow	SPGR2	<i>Sphaeralcea grossulariifolia</i>	0-6	0-2
	beardtongue	PENST	<i>Penstemon</i>	0-2	0-2
	white sagebrush	ARLU	<i>Artemisia ludoviciana</i>	0-2	0-2
	freckled milkvetch	ASLE8	<i>Astragalus lentiginosus</i>	0-2	0-2
	Utah penstemon	PEUT	<i>Penstemon utahensis</i>	0-2	0-2
	greenstem paperflower	PSSP	<i>Psilostrophe sparsiflora</i>	0-2	0-2
Shrub/Vine					
3	Shrubs			22-45	
	Bigelow sage	ARBI3	<i>Artemisia bigelovii</i>	0-22	0-4
	Fremont's bushmallow	MAFR2	<i>Malacothamnus fremontii</i>	0-17	0-5
	crispleaf buckwheat	ERCO14	<i>Eriogonum corymbosum</i>	0-17	0-4
	roundleaf buffaloberry	SHRO	<i>Shepherdia rotundifolia</i>	0-17	0-4
	Mexican cliffrose	PUME	<i>Purshia mexicana</i>	0-15	0-6
	Shrub (>.5m)	2SHRUB	<i>Shrub (>.5m)</i>	7-15	-
	yellow rabbitbrush	CHVI8	<i>Chrysothamnus viscidiflorus</i>	0-11	0-5
	Torrey's jointfir	EPTO	<i>Ephedra torreyana</i>	0-11	0-5
	buckwheat	ERIOG	<i>Eriogonum</i>	0-11	0-5
	black sagebrush	ARNO4	<i>Artemisia nova</i>	0-9	0-4
	fourwing saltbush	ATCA2	<i>Atriplex canescens</i>	0-6	0-2
	shadscale saltbush	ATCO	<i>Atriplex confertifolia</i>	0-6	0-2
	Cutler's jointfir	EPCU	<i>Ephedra cutleri</i>	0-6	0-2
	rubber rabbitbrush	ERNAN5	<i>Ericameria nauseosa ssp. nauseosa var. nauseosa</i>	0-6	0-2
	broom snakeweed	GUSA2	<i>Gutierrezia sarothrae</i>	0-6	0-2
	plains pricklypear	OPPO	<i>Opuntia polyacantha</i>	0-6	0-2
	narrowleaf yucca	YUAN2	<i>Yucca angustissima</i>	0-2	0-2

Animal community

--Livestock and Wildlife Grazing--

This site provides fair grazing conditions for livestock during spring, summer, and fall when in good ecological condition due to accessibility and nutritious forage. However, this site often lacks natural perennial water sources, which can influence the suitability for 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. The suitability for reseeding and/or restoration is poor due to the shallow soil characteristics of the site.

The plant community is primarily two-needle pinyon and Utah juniper with an understory of shrubs which provide browse for cattle, sheep, and goats. Cattle will typically only use mormontea in the late fall and winter when nutrient needs cannot be met by palatable shrubs and dormant grasses alone. Rabbitbrush is rarely used as forage by livestock species. The presence of grasses, including Indian ricegrass and galleta, provide grazing habitat for all classes of livestock. Utah juniper and pinyon pine provide good cover for livestock. 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

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Hydrological functions

Runoff and Soil Loss

The following runoff and soil loss data was generated using the Rangeland Hydrology and Erosion Model Web Tool (See citation below).

Hydrology and erosion are approximately the same for all of the soil texture groups on which this ecological site occurs. Slope ranges from 2-60 percent on this site. Slope does not affect the runoff on this site, but does have an impact on soil loss. Average runoff is typically about 1.15 inches per year, but may be as high as 2.7 inches in a single 100-year storm event. Soil loss ranges from 0.2 (about 2% slope) to 0.44 (about 25% slope) tons per acre on an average year, and from 0.7 (about 2% slope) to 1.5 (about 25% slope) tons per acre during a 100-year storm event. Long-term soil loss is not a concern on this site, but rather the rare storm events (i.e. 25, 50 or 100 year storms) result in significant soil loss that are more likely to impact the soil resource. Average rainfall ranges from 8-12 inches per year, but a single 100-year storm event can generate 3.8 inches of precipitation in a 24-hour period. Individual tree shrub plants spaced far apart, but are uniformly distributed, resulting in some tortuosity which slows down overland flow and promotes on-site infiltration. The grasses and forbs in the shrub interspaces have a minimal impact on water flow patterns due to low production. Heavy grazing does not significantly alter the hydrology since this site is not typically affected by livestock. Interspaces are often protected by biological soil crusts, rock fragments, or a weak physical soil crust. Soil physical crusts and weak biological crusts (light cyanobacteria) are the most susceptible to water erosion.

Soil Group

The soils associated with this ecological site are generally in Hydrologic Soil Group D due to the shallow depth (NRCS National Engineering Handbook). Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water.

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Recreational uses

Recreation activities include aesthetic value and opportunities for camping, hiking and hunting. The more open canopy, gentle slopes, and proximity of this site to the canyon walls, makes this site popular for hiking trails. The tall trees and opens understory creates camp sites that provide shade and protection from the wind. Trees provide screening values for camping and picnicking. In addition, during certain years, this site provides good opportunities for pinyon nut collection.

Wood products

This site is a good site for gathering fence posts or firewood.

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. Locoweed 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 (indolizidine 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 will typically only graze broom snakeweed when other forage is unavailable and generally in winter when toxicity levels are at their lowest. (Knight and Walter, 2001)

--References--

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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.

Author(s)/participant(s)	Robert Stager (BLM), F.E. Busby (USU), Dana Truman (NRCS), Paul Curtis (BLM), Shane A. Green (NRCS), revision 10/08 by S. Green and R. Beckstrand
Contact for lead author	shane.green@ut.usda.gov
Date	10/18/2008
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

- 1. Number and extent of rills:** Rill development is constrained on this site due to the extremely high component of surface rock fragments. None to very rare rills are expected.

- 2. Presence of water flow patterns:** Water flow patterns are subtle and difficult to interpret due to the extremely high component of surface rock fragments. They may occur in the interspaces between rock fragments.

- 3. Number and height of erosional pedestals or terracettes:** Pedestals are rare, on steeper slopes plants may appear to have slight pedestaling on the down slope side, but there should be no exposed roots.
Terracettes are few, occurring in water flow patterns behind debris dams of small to medium sized litter. These debris dams may accumulate smaller litter (leaves, grass and forb stems).

- 4. Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 30-50 %. (Soil surface is often covered 50 to 75 sometimes as high as 90% percent surface fragments). Ground cover is based on first raindrop impact, and bare ground is the opposite of ground cover. Ground cover + bare ground = 100%.

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5. **Number of gullies and erosion associated with gullies:** None. Gully formation is impaired due to the shallow soils and extremely high component of surface rock fragments.
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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. Surface rock reduces the potential for wind erosion.
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7. **Amount of litter movement (describe size and distance expected to travel):** On gentle slopes (< 10 %) most litter accumulates at base of plants or behind terracettes. Woody stems from trees not moved unless present in water flow pattern, rill, or gullies on steeper slopes.
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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 an erosion rating of 4 or 5 under the plant canopies, and a rating of 3 to 4 in the interspaces. The average should be a 4. 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 horizon is typically 1 to 2 inches deep. Structure is typically weak medium platy to weak fine granular. Color is typically light yellowish brownish (10YR6/4) to light reddish brown (5YR6\4) to red (2.5YR4/8). 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:** Spatial distribution of plants and well developed biological soil crusts (were present) intercept raindrops reducing splash erosion and provide areas of surface detention to store water allowing additional time for 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, although bedrock is found within 20 inches of soil surface. Some sites have a weak medium platy structure. These should not be considered to be compaction layers.
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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 (Desert holly, Broom snakeweed, Cliffrose) > Trees (Juniper > Pinyon) > Sprouting shrubs (Mormontea, rabbitbrush) Warm season grassess (Galleta) > Cool season grasses (Indian ricegrass).
- Sub-dominant: Forbs (Brenda's yellow cryptantha) > 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. Crested wheatgrass and Russian wildrye etc.)
- Additional: Temporal variability is caused by drought, erosion events, and very infrequent fire. Spatial variability is

caused by slope, aspect, and rock fragments. Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover. Following a recent disturbance such as fire or drought that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. These conditions reflect a functional community phase within the reference state. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Community is made up of young, mid, and old aged juniper and a smaller percentage of pinyon trees (about 1/5th of the trees are expected to be pinion). Several standing dead trees may be present on the site and approximately 30 % of the trees can show evidence of decadence (i.e. dead branches). In drought tree mortality may increase, especially the pinyon trees.
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14. **Average percent litter cover (%) and depth (in):** Litter cover (including litter beneath plant canopies) varies from 5 to 24%
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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 235-315 #/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:** Few invasives are capable of dominating this site. Cheatgrass, and annual mustards may invade the community.
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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.
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