Ecological site R035XY206UT
Semidesert Gravelly Loam (Utah Juniper-Pinyon)

Accessed: 06/19/2026

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.

MLRA notes

Major Land Resource Area (MLRA): 035X–Colorado Plateau

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, structural benches and alluvial fans at elevations between 4700 and 7500 feet. Average annual precipitation ranges from 9 to 14 inches, with much of the summer precipitation coming as convective thunderstorms from July to October. Soils loamy skeletal with an average of 15-35% rock fragments, by volume, in the profile. The soil temperature and moisture regimes are mesic and ustic aridic (torric) respectively. Utah juniper is the dominant plant, and two-needle pinyon can also be abundant. This site does not burn regularly, and the establishment of non-native species has not yet been documented. Cheatgrass is the most likely invasive species to establish on this site.

Classification relationships

Modal Soil: Strych, Dry, CBV FSL — loamy-skeletal, mixed, mesic Ustollic Calciorthids

Similar sites

R035XY240UT	**Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)** This site may also be steep with 15-35% rock fragments, but soils are less than 20 inches. Plant community composition is similar.
R035XY246UT	**Semidesert Stony Loam (Utah Juniper-Pinyon)** This site has similar soils, but with greater thatn 35% rock fragments (volume) in the soil. Grass production makes up a larger component of the plant community, and total production is often higher.
R035XY221UT	**Semidesert Shallow Loam (Utah Juniper-Pinyon)** This site has similar community composition and soil textures, but soils are less than 20 inches deep.
R035XY263UT	**Semidesert Very Steep Stony Loam (Two-Needle Pinyon, Utah Juniper)** This site is only found on slopes greater than 50%, and with rock fragments greater than 35% (volume) in the profile. Plant community composition is similar.

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma* (2) *Pinus edulis*

Shrub	Not specified
Herbaceous	Not specified

Physiographic features

This site occurs on alluvial fans and on steep hillsides associated with structural benches and escarpments. Slopes range from 10-80% and elevations are 4700 to 7500 feet.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Escarpment (3) Alluvial fan
Flooding frequency	None
Ponding frequency	None
Elevation	1,430 – 2,290 m
Slope	10 – 80 %

Climatic features

The climate of this site is characterized by hot summers and cool winters. Average annual precipitation ranges from 9 to 14 inches with about 45% of the precipitation coming as convective thunderstorms from July to October. On average years, plants begin growth around March 1 and end growth around October 31. Large fluctuations in daily temperature are common, and precipitation varies greatly from month to month and from year to year. Junie is typically the driest month during the growing season.

This section was developed using modeled (PRISM) climate data for soil map units correlated to this site.

Table 3 Representative climatic features

Frost-free period (average)	150 days
Freeze-free period (average)	180 days
Precipitation total (average)	360 mm

Influencing water features

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

Soil features

The characteristic soils of this site are loamy skeletal with an average of 15-35% rock fragments, by volume, in the profile. They formed in mixed alluvium or colluvium derived mainly from sandstone and shale parent materials. These soils are well drained and have surface textures ranging from loams to sandy loams. The soil moisture regime is ustic aridic and the soil temperature regime is mesic. Available water holding capacity is 3.4 to 6.5 inches of water in the upper 40 inches of soil.

This ecological site has been used in the following soil surveys and is correlated to the following soils:

UT633 - Canyonlands Area - Strych, Ustollic calciorthids;
UT638 - San Juan County - Bodot;
UT685 - Capitol Reef - Begay family
UT686 - Escalante Grand Staircase - Chilton

Table 4. Representative soil features

Parent material	(1) Colluvium – sandstone and shale (2) Slope alluvium – diorite
Surface texture	(1) Very cobbly loam (2) Gravelly fine sandy loam (3) Very bouldery sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Slow to moderately rapid
Soil depth	50 cm
Surface fragment cover <=3"	10 – 20 %
Surface fragment cover >3"	0 – 50 %
Available water capacity (0-101.6cm)	8.64 – 16.51 cm
Calcium carbonate equivalent (0-101.6cm)	0 – 20 %
Electrical conductivity (0-101.6cm)	Not specified

Sodium adsorption ratio (0-101.6cm)	Not specified
Soil reaction (1:1 water) (0-101.6cm)	7.4 – 10
Subsurface fragment volume <=3" (Depth not specified)	0 – 30 %
Subsurface fragment volume >3" (Depth not specified)	0 – 20 %

Ecological dynamics

This site developed under Colorado Plateau climatic conditions and included natural influences of herbivory, and climate; however due to the remote location, broken topography, steep slopes (10-80%), and lack of perennial water sources this area rarely served as habitat for large herds of native herbivores. This site's plant species composition is generally dominated by Utah juniper and two-needle pinyon.

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. However, to this point invasive species have not been documented on this site.

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 pinions to be susceptible to insect and drought kill, managers should be aware of the possibility.

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

Figure 3. State-and-Transition Model

Additional community tables

Table 5. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production ()	Foliar Cover (%)
Tree					
0	**Dominant Trees**			84-224	
	Utah juniper	JUOS	*Juniperus osteosperma*	56-168	4-8

	twoneedle pinyon	PIED	*Pinus edulis*	28-140	2-8
	blackbrush	CORA	*Coleogyne ramosissima*	62-93	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	62-93	–
	blue grama	BOGR2	*Bouteloua gracilis*	30-62	–
	needle and thread	HECO26	*Hesperostipa comata*	31-62	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	31-62	–
	fourwing saltbush	ATCA2	*Atriplex canescens*	31-62	–
	rock goldenrod	PEPU7	*Petradoria pumila*	12-31	–
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	12-31	–
Grass/Grasslike					
1	**Grasses**			45-112	
	James' galleta	PLJA	*Pleuraphis jamesii*	6-56	0-4
	blue grama	BOGR2	*Bouteloua gracilis*	0-34	0-2
	Grass, perennial	2GP	*Grass, perennial*	0-34	0-2
	Grass, annual	2GA	*Grass, annual*	0-28	0-2
	alkali sacaton	SPAI	*Sporobolus airoides*	0-28	0-2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0-22	0-2
	needle and thread	HECO26	*Hesperostipa comata*	0-11	0-1
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0-11	0-1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0-6	0-1
	squirreltail	ELEL5	*Elymus elymoides*	0-6	0-1
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0-6	0-1
	purple threeawn	ARPU9	*Aristida purpurea*	0-6	0-1
Forb					
2	**Forbs**			6-28	
	Forb, perennial	2FP	*Forb, perennial*	0-28	0-2
	Forb, annual	2FA	*Forb, annual*	0-22	0-2
	pretty buckwheat	ERBI	*Eriogonum bicolor*	0-11	0-1
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0-11	0-1
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0-11	0-1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0-6	0-1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0-6	0-1
	purple springparsley	CYPU2	*Cymopterus purpureus*	0-6	0-1
	small-leaf pussytoes	ANPA4	*Antennaria parvifolia*	0-6	0-1
	rushy milkvetch	ASLO3	*Astragalus lonchocarpus*	0-6	0-1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0-6	0-1
	sego lily	CANU3	*Calochortus nuttallii*	0-6	0-1
	Utah desertparsley	LOPA	*Lomatium parryi*	0-6	0-1
	rayless tansyaster	MAGR2	*Machaeranthera grindelioides*	0-6	0-1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0-6	0-1
	hoary groundsel	PAWE4	*Packera werneriifolia*	0-6	0-1
	Utah penstemon	PEUT	*Penstemon utahensis*	0-6	0-1
	spiny phlox	PHHO	*Phlox hoodii*	0-6	0-1
	woolly plantain	PLPA2	*Plantago patagonica*	0-6	0-1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0-6	0-1
	Pacific aster	SYCHC	*Symphyotrichum chilense var. chilense*	0-6	0-1

	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0-6	0-1
	Navajo tea	THSU	*Thelesperma subnudum*	0-6	0-1
	nodding buckwheat	ERCE2	*Eriogonum cernuum*	0-6	0-1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0-6	0-1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0-2	0-1
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0-2	0-1
Shrub/Vine					
3	**Shrubs**			28-140	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	6-67	0-4
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0-50	0-3
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0-45	0-3
	shadscale saltbush	ATCO	*Atriplex confertifolia*	6-34	0-3
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0-17	0-1
	greasewood	SAVE4	*Sarcobatus vermiculatus*	0-17	0-1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0-11	0-1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0-11	0-1
	winterfat	KRLA2	*Krascheninnikovia lanata*	0-6	0-1
	Spanish bayonet	YUHA	*Yucca harrimaniae*	0-6	0-1
	Cutler's jointfir	EPCU	*Ephedra cutleri*	0-6	0-1
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0-6	0-1
	spiny hopsage	GRSP	*Grayia spinosa*	0-6	0-1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0-6	0-1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0-6	0-1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0-6	0-1

Animal community

--Livestock and Wildlife Grazing-- This site provides fair/poor grazing conditions for livestock and wildlife due to large amounts of bare ground, and low available nutritious forge. This site also 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 habitat; however in many places the populations will be small and have little grazing impact on the site. The plant community is generally an equal mixture of grasses and shrubs/trees. Grasses, including galleta, Indian ricegrass, blue grama, and needleandthread, when in abundance, provide good grazing conditions for all classes of livestock and wildlife. Shrubs, including blackbrush, fourwing saltbush, and Torrey jointfir provide good winter browse for cattle, sheep, goats and mule deer. Utah juniper and pinyon pine present on this site provide good cover for livestock and wildlife. Mule deer and goats may utilize these trees as forage. 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.

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, camping, and hunting.

Wood products

The site index of the juniper and pinyon is 35. Production of firewood is approximately four cords per acre.

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 had 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 fourwing 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 the non-native 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. On well developed Utah juniper and pinyon pine communities soils are complete occupied by lateral roots, which inhibit an herbaceous understory as well as annual invasions. However once these sites are disturbed and pinyon-juniper communities begin to decline invasion is possible. --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 plant 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 pinyon and Utah juniper communities in the Colorado Plateau on shallow soils are unique. These sites have a natural occurring fire regime, but this is not understood very well due to the difficulty in reconstructing fire histories in these ecosystems. The difficulty results from a lack of living fire-scarred trees in this area. These trees can support stand-replacing fires, though historically, fires were likely a mixture of surface and crown fires with intensities and frequencies dependent on site productivity. Most research agrees that historic fire return intervals are at a minimum 100 years, indicating that fire may have not played an important role in community dynamics. Fires are more common when trees are stressed or dead due to drought and/or beetle infestations. Pinyon-juniper stands reestablish either by seeds dispersed from adjacent unburned patches or by unburned seeds found at the burn site. Continuous (every 20-40 years) burning of these ecological sites can result in shrub dominated communities, due to the relatively fast recovery of shrubs when compared to trees. If invasive annual grasses are allowed to establish fires may become more frequent, inhibiting the site’s ability to recover. --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.

Other references

Anderson, M. D. 2002. Pinus edulis. In: Fire Effects Information System. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). http://www.fs.fed.us/database/feis/. Accessed on September 9, 2008.

Bailey, R. G., P E. Avers, T. King,, and W. H. McNab, [EDs]. 1994. Ecoregions and subregions of the United States (map). Washington, DC: USDA Forest Service. 1:7,500,000. With supplementary table of map unit descriptions, compiled and edited by W. H. McNab and R. G. Bailey

Bentancourt, J. L., E. A. Pierson, K. A. Rvlander, J. A. Fairchild-Parks, and J. S. Dean. 1993. Influence of history and climate on New Mexico pinyon-juniper woodlands. General technical report RM. US9443188.

Floyd, M. L., D. D. Hanna, W. H. Romme. 2004. Historical and recent fire regimes in pinyon-juniper woodlands on Mesa Verde, Colorado, USA. Forest Ecology and Management. 198:269-289

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

National Engineering Handbook. US Department of Agriculture, Natural Resources Conservation Service. Available: http://www.info.usda.gov/CED/Default.cfm#National%20Engineering%20Handbook. Accessed February 25, 2008.

NRCS Grazing Lands Technology Institute. 2003. National Range and Pasture Handbook. Fort Worth, TX, USA: US Department of Agriculture, Natural Resources Conservation Service, 190-VI-NRPH.

Romme, W. H., L. Floyd-Hanna, and D. D. Hanna. 2003. Ancient pinyon-juniper forests of Mesa Verde and the West: a cautionary note for forest restoration programs. In: Proceedings of the conference on fire, fuel treatments and ecological restoration: Proper place, appropriate time, Colorado State University, April 2002. RMRS-P-29. 2003

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

Swetnam, T. W. and C. H. Baisan. 1996. Historic fire regime patterns in the Southwestern United States since AD 1700. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. US9738275.

Tausch, R. J., N. E. West, and A. A. Nabi. 1981. Tree age and dominance patterns in Great Basin pinyon-juniper woodlands. Journal of Rangeland Management. 34:259-264

Contributors

George Cook
Jamin Johanson

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), Randy Beckstrand (BLM), Dana Truman (NRCS), Paul Curtis (BLM), Shane A. Green (NRCS)
Contact for lead author	shane.green@ut.usda.gov
Date	09/11/2008
Approved by	
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** **Rills increase immediately following large storm events but should not persist more than one or two winters due to frost-heave recovery. There should be very few on slopes < 6%. On slopes >6%, rills may be 5-10 feet in length. Rills are most likely to form below adjacent exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion.**

---

2. **Presence of water flow patterns:** **Interspaces between vegetation and/or well developed biological soil crusts can serve as somewhat stable water flow patterns below run-off generating areas (exposed bedrock, areas with very shallow soils). If present, these waterflow patterns should be narrow (<1-1½') but can be very long. These waterflow patterns should be widely spaced (15-20 yrds) on low slopes (< 6%), increasing in frequency (every 10-15yrds) with slope. Otherwise, there should be none to few and short (3-6') water flow patterns on low slopes (< 6%), increasing in frequency and length (up to 5-10') with slope. Waterflow patterns should dissipate where the slope flattens.**

---

3. **Number and height of erosional pedestals or terracettes:** **Shrubs and trees that occur on the edge of water flow patterns and rills on steeper slopes (>6%) may be pedestalled, but there should be no exposed roots. Occasional terracettes may be associated with accumulation behind woody juniper litter. Well developed biological crusts may appear pedestalled, but are actually a characteristic of the crust formation.**

---

4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** **20 – 30 %. Most bare ground is associated with water flow patterns, rills, and gullies. Areas with well developed biological soil crusts should not be counted 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. Ground cover is based on first raindrop impact, and bare ground is the opposite of ground cover.**

---

5. **Number of gullies and erosion associated with gullies:** **None to rare. On areas below adjacent to sites with concentrated water flow (such as exposed bedrock), gullies may occur. Gullies may remove soil from the base of trees exposing roots.**

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** **None to very few. Trees break the wind and reduce the potential for wind erosion.**

---

7. **Amount of litter movement (describe size and distance expected to travel):** **There may be movement of fine litter outside of the stable waterflow patterns of up to 2-4'on low slopes (< 6%) and 5-10' on steeper slopes . Fine litter may be redistributed in the stable waterflow patterns following large storm events, depositing where the slope flattens or behind obstructions. Woody litter should not move from beneath the plant.**

---

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 to 6 throughout the site using the soil stability kit test. The average should be a 5. Surface texture is gravelly loam to stony fine sandy loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.**

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** **Soil surface is typically 1 to 9 inches deep. Structure is typically strong to weak fine granular to weak thin platy. Color is typically gray (5YR5/1) to brown**

(7.5YR5/2) to yellowish brown (10YR5/4). 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: Spatial distribution of perennial plants and well developed biological soil crusts (where present) intercept raindrops preventing splash erosion and provide areas of surface detention to store water allowing additional 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.**

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site): None. There may be layers of calcium carbonate or other naturally occurring hard layers found in the soil subsurface. These should not be considered to be 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: trees (juniper > pinion) >= non sprouting shrubs (blackbrush, fourwing saltbush) >= warm season perennial grasses (galleta, blue grama) = cool season perennial grasses (indian ricegrass, needle and thread). These groups are co-dominant on this site.

    Sub-dominant: forbs (globemallow, rock goldenrod) > 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, Russian wildrye, 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: Factors contributing to temporal variability include wildlife (deer) use of the palatable sub dominant shrubs and forbs, drought and insects (though these have minimal direct impacts on the dominant plants (blackbrush and juniper)). Factors contributing to spatial variability include texture, coarse fragment (rock/gravel) content, slope, aspect, and degree of topographic heterogeneity (contributing to water redistribution and concentration). Following a recent disturbance such as drought or pathogens that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. These conditions reflect a 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 trees, shrubs, or grasses. During severe (multi-year) drought up to 20% of the blackbrush stems may die. There may be partial mortality of individual bunchgrasses and other shrubs during drought. Some bunchgrass and shrub mortality may occur during severe droughts, particularly on the shallower and coarser soils associated with this site. Because woody stems may persist for many years, juniper (especially older trees) and blackbrush will normally have dead stems within the plant canopy. Blackbrush will drop its leaves when water stressed.**

---

14. **Average percent litter cover (%) and depth (in):** **Average litter cover (including under plants) can be less (as low as 5%) in low (10-15%) tree cover or more (as high as 20%) in high (15-20%) tree cover sites. Nearly all should be fine litter. Depth should be 1 leaf thickness in the interspaces, up to ¼" under shrub canopies and ¼ to 1½" under trees. Litter redistribution following natural extreme runoff events can reduce litter cover by concentrating it in low-lying areas. Litter cover may increase by 5 to 10% followings seasons with high production of annuals.**

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** **500-550 #/acre on an average year**

---

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 capable of dominating this site. Cheatgrass, Broom snakeweed, and Mustard may invade the community.**

---

17. **Perennial plant reproductive capability:** **All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years. Low green rabbitbrush sprouts vigorously following fire.**
