USDA Natural Resources Conservation Service

Ecological site R035XY246UT
Semidesert Stony Loam (Utah Juniper-Pinyon)

Accessed: 05/20/2025

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.

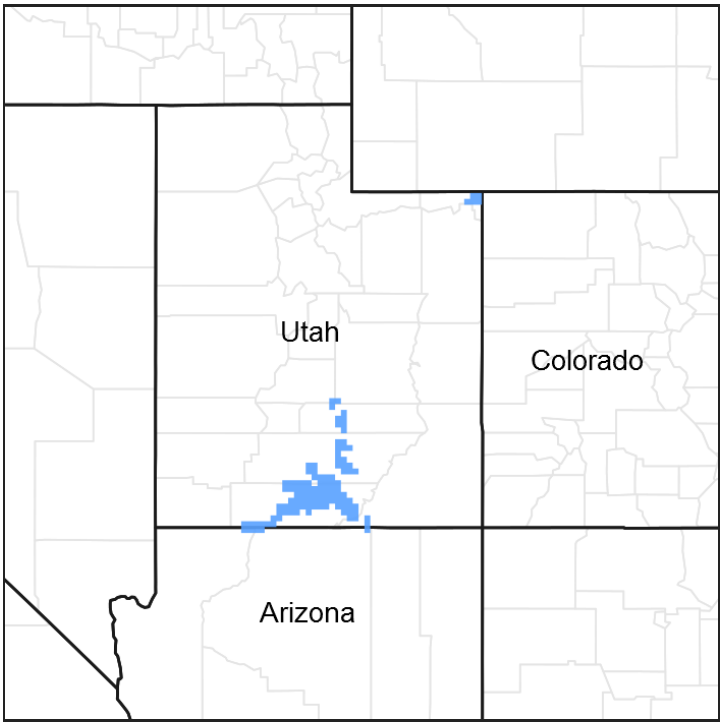


Figure 1. Mapped extent

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): 035X–Colorado Plateau

Site Concept: This site occurs in the semidesert zone of the Colorado and Green River Plateaus region (MLRA 35) in southern Utah. It is found on landslides, remnant stream terraces, dissected pediments, and escarpments at elevations between 5600 and 6500

feet. Average annual precipitation ranges from 9 to 14 inches, with about 45% coming as convective thunderstorms from July through October. Soils are deep loams or sandy loams, and usually have a cobbly or bouldery surface with over 50% rock fragments throughout the profile. Utah juniper dominates the overstory, while blue grama, needleand thread, and other perennial grasses are abundant and dominate the understory. Perennial grasses can be lost as Utah juniper and two-needle pinyon increase. This may be accelerated by improper livestock grazing practices and may lead to accelerated soil loss.

Associated sites

R035XY206UT	**Semidesert Gravelly Loam (Utah Juniper-Pinyon)**
R035XY209UT	**Semidesert Loam (Wyoming Big Sagebrush)**
R035XY221UT	**Semidesert Shallow Loam (Utah Juniper-Pinyon)**
R035XY238UT	**Semidesert Shallow Hardpan (Utah Juniper-Pinyon)**
R035XY239UT	**Semidesert Shallow Clay (Shadscale-Utah Juniper)**
R035XY240UT	**Semidesert Steep Shallow Loam (Utah Juniper-Two-Needle Pinyon)**
R035XY242UT	**Semidesert Gravelly Loam (Shadscale)**
R035XY321UT	**Upland Stony Loam (Pinyon-Utah Juniper)**

Similar sites

R035XC329AZ	**Loamy Upland 10-14" p.z. Gravelly**

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma* (2) *Pinus edulis*
Shrub	Not specified
Herbaceous	(1) *Bouteloua gracilis* (2) *Hesperostipa comata*

Physiographic features

This site occurs on many landforms, including: landslides, remnant stream terraces, dissected pediments, and escarpments. Elevations are typically 5600 to 6500 feet, but are sometimes as low as 4200 or as high as 7200 feet. Slopes range from 15-60% and runoff is medium to high.

Table 2. Representative physiographic features

Landforms	(1) Landslide (2) Escarpment (3) Pediment
Flooding frequency	None
Ponding frequency	None
Elevation	1,707–1,981 m
Slope	15–60%

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% coming as convective thunderstorms from July through October. June is typically the driest month during the growing season. Large fluctuations in daily temperature are common, and precipitation can vary greatly from month to month and from year to year. On average, plants begin growth around March 1 and stop growth around October 31.

This section was developed using modeled climate data (PRISM) 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)	356 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 deep and usually have a cobbly or bouldery surface and over 50% rock fragments throughout the profile. They are formed frmo colluvium and slope alluvium (sometimes alluvium), derived from sandstone and basalt. Textures of the fine fraction range from loams to sandy loams and are well-drained with moderate to rapid permeability. The soil moisture regime is ustic aridic and the soil temperature regime is mesic. Available water-holding capacity ranges from 2.4 to 4.2 inches of water in the upper 40 inches of soil.

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

UT623 - Emery Area - Strych;
UT636 - Panguitch - Catahoula, Clapper;
UT642 - Kane County - Strych;
UT643 - San Juan County - Anasazi;
UT685 - Capitol Reef - Strych, Clapper, Polychrome;
UT686 - Escalante Grand Staircase - Clapper, Strych, Catahoula, Polychrome;
UT689 - Glenn Canyon - Jaconita family;

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone (2) Slope alluvium–basalt
Surface texture	(1) Very bouldery sandy loam (2) Very stony sandy loam (3) Extremely bouldery fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to rapid
Soil depth	86 cm
Surface fragment cover <=3"	5–20%
Surface fragment cover >3"	15–65%
Available water capacity (0-101.6cm)	6.1–10.67 cm
Calcium carbonate equivalent (0-101.6cm)	1–15%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	5–30%
Subsurface fragment volume >3" (Depth not specified)	10–50%

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

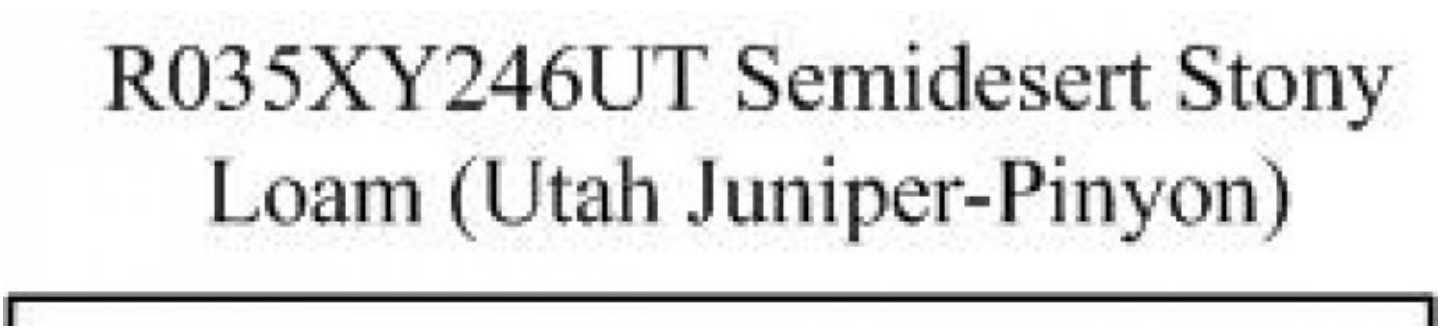
topography, steep slopes (15-60%), and lack of perennial water sources this area rarely served as habitat for large herds of native herbivores. This site's plant species composition is generally dominated by Utah juniper and perennial grasses.

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 pinyons 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



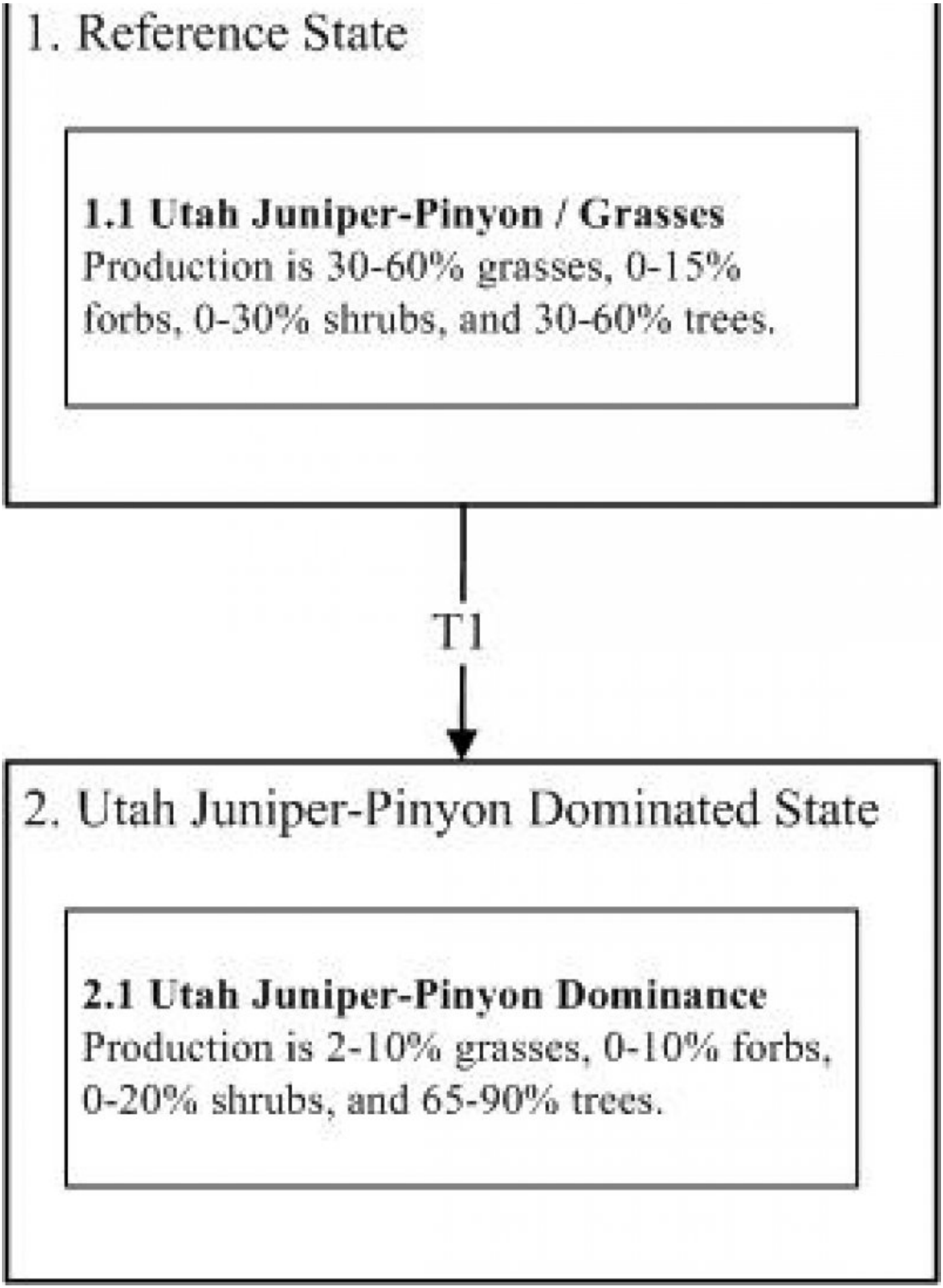


Figure 4. State-and-Transition Model

State 1
Reference State

The reference plant community is dominated by diverse perennial grasses and Utah juniper. Two-needle pinyon is also abundant, and diverse shrubs and forbs can make up a significant portion of the community in some areas. The reference state is highly resistant to erosion due to high grass cover and high rock fragments on the soil surface. Areas with fewer rock fragments and coarser soil textures may be less resillient following disturbance that removes perennial grasses, such as improper livestock grazing. Non-native invasive species have not been documented on this site, but cheatgrass is likely capable of establishing.

Community 1.1
Utah Juniper-Pinyon / Grasses

NAD83 0469529 E. 4258410 N. Photo by Jamin Johanson, October 15, 2011.

Figure 5. Phase 1.1

The reference plant community is dominated by diverse perennial grasses and Utah juniper. Two-needle pinyon is also abundant, and diverse shrubs and forbs can make up a significant portion of the community in some areas. Composition by air-dry weight is 30-60% grasses, 0-15% forbs, 0-30% shrubs, and 30-60% trees. This phase is resistant to soil erosion as well as invasion by non-native species.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	224	336
Tree	112	168	224
Shrub/Vine	6	56	112
Forb	6	28	56
Total	**236**	**476**	**728**

Table 6. Ground cover

Tree foliar cover	5-15%
Shrub/vine/liana foliar cover	2-10%
Grass/grasslike foliar cover	5-15%
Forb foliar cover	1-5%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	5-15%
Surface fragments >0.25" and <=3"	5-20%
Surface fragments >3"	15-65%
Bedrock	0%
Water	0%
Bare ground	10-30%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-2%	0-2%	0-2%
>0.15 <= 0.3	–	0-5%	0-5%	0-5%
>0.3 <= 0.6	–	0-5%	5-10%	0-5%
>0.6 <= 1.4	0-5%	0-2%	0-5%	–
>1.4 <= 4	5-15%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Utah Juniper-Pinyon Dominated State

This state results when perennial grasses are lost from the system and trees increase and dominate. Soil erosion becomes a hazard, and non-native invasive species, particularly cheatgrass, may be more likely to establish in this state. However, non-native species have not been documented on this ecological site.

Community 2.1
Utah Juniper-Pinyon Dominance

R035XY246UT—Semidesert Stony Loam (Utah Juniper-Pinyon) community 2.1—Utah Juniper-Pinyon

Figure 7. Phase 2.1

This phase is dominated by Utah juniper and two-needle pinyon. Perennial grasses are greatly reduced, and forbs and shrubs may also be reduced. Soil erosion may result from the lack of herbaceous cover. Composition by air-dry weight is 2-10% grasses, 0-10% forbs, 0-20% shrubs, and 65-90% trees. This phase may be more susceptible to invasion by non-native invasive species, though none have been documented on this site.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Tree	168	280	392
Shrub/Vine	–	39	84
Grass/Grasslike	11	28	56
Forb	–	6	28
Total	**179**	**353**	**560**

Table 9. Ground cover

Tree foliar cover	15-30%
Shrub/vine/liana foliar cover	0-10%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-2%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	5-20%
Surface fragments >0.25" and <=3"	5-20%
Surface fragments >3"	15-65%
Bedrock	0%
Water	0%
Bare ground	5-25%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-2%	0-2%	0-2%
>0.15 <= 0.3	–	0-5%	0-2%	0-2%
>0.3 <= 0.6	–	0-5%	0-2%	0-2%
>0.6 <= 1.4	0-5%	0-2%	–	–
>1.4 <= 4	10-20%	–	–	–
>4 <= 12	0-5%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Transition T1
State 1 to 2

This transition occurs when perennial grasses are reduced by improper livestock grazing (heavy stocking rates, continuous season-long grazing, etc.) followed by an increase in Utah juniper and pinyon (West et al. 1998). The resulting state is unable to regain perennial grasses without significant management inputs.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			112–224	
	Utah juniper	JUOS	*Juniperus osteosperma*	84–168	5–10
	twoneedle pinyon	PIED	*Pinus edulis*	28–84	2–5
Grass/Grasslike					
0	**Dominant Grasses**			112–280	
	James' galleta	PLJA	*Pleuraphis jamesii*	11–168	1–10
	blue grama	BOGR2	*Bouteloua gracilis*	22–168	2–10
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–112	0–7
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	6–84	1–5
	black grama	BOER4	*Bouteloua eriopoda*	0–84	0–4
1	**Sub-Dominant Grasses**			0–84	
	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–45	0–3
	Grass, perennial	2GP	*Grass, perennial*	0–34	0–2
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–11	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–11	0–1
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	0–11	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–1
	foxtail barley	HOJU	*Hordeum jubatum*	0–6	0–1
Forb					
2	**Forbs**			6–56	
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–28	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–2
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–11	0–1
	buckwheat	ERIOG	*Eriogonum*	0–11	0–1
	beardtongue	PENST	*Penstemon*	0–11	0–1
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–11	0–1

	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–11	0–1
	Forb, annual	2FA	*Forb, annual*	0–11	0–1
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–6	0–1
	low greenthread	THCA11	*Thelesperma caespitosum*	0–6	0–1
	Navajo tea	THSU	*Thelesperma subnudum*	0–6	0–1
	shaggy fleabane	ERPU2	*Erigeron pumilus*	0–6	0–1
	plains flax	LIPU4	*Linum puberulum*	0–6	0–1
	Colorado four o'clock	MIMU	*Mirabilis multiflora*	0–6	0–1
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–6	0–1
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–6	0–1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0–6	0–1
	Navajo fleabane	ERCOC3	*Erigeron concinnus var. concinnus*	0–6	0–1
Shrub/Vine					
3	**Shrubs**			6–112	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	0–2
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–22	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–22	0–1
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–22	0–1
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–22	0–1
	antelope bitterbrush	PUTR2	*Purshia tridentata*	3–12	–
	Spanish bayonet	YUHA	*Yucca harrimaniae*	0–11	0–1
	mormon tea	EPVI	*Ephedra viridis*	0–11	0–1
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0–11	0–1
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–11	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	blackbrush	CORA	*Coleogyne ramosissima*	0–6	0–1

	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	0–1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–6	0–1

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			168–392	
	Utah juniper	JUOS	*Juniperus osteosperma*	140–336	8–15
	blue grama	BOGR2	*Bouteloua gracilis*	22–168	2–10
	James' galleta	PLJA	*Pleuraphis jamesii*	11–168	1–10
	twoneedle pinyon	PIED	*Pinus edulis*	28–168	2–8
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–112	0–7
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	6–84	1–5
	black grama	BOER4	*Bouteloua eriopoda*	0–84	0–4
	Wyoming big sagebrush	ARTRW8	*Artemisia tridentata ssp. wyomingensis*	15–59	–
	mormon tea	EPVI	*Ephedra viridis*	15–59	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	15–59	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	9–20	–
Grass/Grasslike					
1	**Grasses**			11–56	
	James' galleta	PLJA	*Pleuraphis jamesii*	2–45	1–3
	blue grama	BOGR2	*Bouteloua gracilis*	2–22	1–2
	erect spiderling	BOER	*Boerhavia erecta*	0–17	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–17	0–1
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–17	0–1
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–11	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–11	0–1

	saline wildrye	LESAS	*Leymus salinus ssp. salinus*	0–11	0–1
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	0–11	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–6	0–1
	foxtail barley	HOJU	*Hordeum jubatum*	0–6	0–1
Forb					
2	**Forbs**			0–28	
	Forb, annual	2FA	*Forb, annual*	0–11	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–11	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–11	0–1
	buckwheat	ERIOG	*Eriogonum*	0–11	0–1
	beardtongue	PENST	*Penstemon*	0–11	0–1
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–11	0–1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–11	0–1
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–6	0–1
	low greenthread	THCA11	*Thelesperma caespitosum*	0–6	0–1
	Navajo tea	THSU	*Thelesperma subnudum*	0–6	0–1
	shaggy fleabane	ERPU2	*Erigeron pumilus*	0–6	0–1
	plains flax	LIPU4	*Linum puberulum*	0–6	0–1
	Colorado four o'clock	MIMU	*Mirabilis multiflora*	0–6	0–1
	Esteve's pincushion	CHST	*Chaenactis stevioides*	0–6	0–1
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–6	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–6	0–1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0–6	0–1
	Navajo fleabane	ERCOC3	*Erigeron concinnus var. concinnus*	0–6	0–1
Shrub/Vine					
3	**Shrubs**			0–84	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–50	0–3

	buffaloberry				
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–34	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–22	0–1
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–22	0–1
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–22	0–1
	antelope bitterbrush	PUTR2	*Purshia tridentata*	3–12	–
	mormon tea	EPVI	*Ephedra viridis*	0–11	0–1
	rubber rabbitbrush	ERNAN5	*Ericameria nauseosa ssp. nauseosa var. nauseosa*	0–11	0–1
	singleleaf ash	FRAN2	*Fraxinus anomala*	0–11	0–1
	Spanish bayonet	YUHA	*Yucca harrimaniae*	0–11	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–11	0–1
	blackbrush	CORA	*Coleogyne ramosissima*	0–6	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–6	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	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, desert bighorn sheep, and elk 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. Grasses, including galleta, Indian ricegrass, and needleandthread, when in abundance, provide good grazing conditions for all classes of livestock and wildlife. Shrubs, including roundleaf buffaloberry, Wyoming big sagebrush, green mormontea, and broom snakeweed provide good winter browse for cattle, sheep, goats, bighorn sheep, elk, and

mule deer. Utah juniper and pinyon pine provide good cover for livestock and wildlife; however most animals will not utilize these trees unless other forage is no longer available. 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.

Recreational uses

This site is used for hiking.

Wood products

The site index for this site is 40. The wood products from this site are used for firewood and fenceposts.

Other products

The hydrologic group is B.

Other information

--Poisonous/Toxic Plant Communities--

The toxic plant associated with this site includes broom snakeweed, which 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 generally only graze broom snakeweed when other forage is unavailable, typically in winter when toxicity levels are at their lowest.

Potentially toxic plants associated with this site include four-wing saltbush and Wyoming

big sagebrush. Four-wing saltbush 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. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs. Wyoming big sagebrush contains sesquiterpene lactones and monoterpenes which have been suspected of being toxic to sheep. An experimental dosage of ¾ lbs of big sagebrush fed to sheep for three days was found to be lethal.

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.

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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.

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Date	04/04/2013
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** A. On more gentle slopes (< 10 %): Common and occur throughout site. Rills may be 6 to 10 feet in length. Sides of rills may be up to 3 inches deep. B. On steep slopes (> 20 %): Common. Occur throughout the site. Rills may extend down entire slope.

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2. **Presence of water flow patterns:** Frequent and occur throughout area and wind between exposed rocks and plant bases. Interspaces between rocks and well developed biological soil crusts appear to be water depression storage areas but actually serve as water flow patterns across areas covered with biological soil crust during episodic precipitation events. Evidence of flow will increases with slope.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals form at the base of plants that occur on the edge of rills. Larger rills and gullies may remove soil from the base of trees exposing roots that resemble pedestals. Interspaces between well developed biological soil crusts resemble pedestals and may be up to 2 inches high. Terracettes are present. Debris dams of small to medium sized litter (up to 2 inches in diameter) may form in water flow patterns, rills, and gullies. These debris dams may accumulate smaller litter (leaves, grass and forb stems).

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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. The soil surface is covered by up to 40-50% rock fragments. 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. Ground cover + bare ground = 100%.

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5. **Number of gullies and erosion associated with gullies:** None to few. On steeper slopes and areas below and adjacent to sites with concentrated water flow (such as exposed bedrock), gullies may increase. Length is short and is usually interrupted by large rock fragments. Gullies are shallow and wide and armored with large stones. Gullies may remove soil from the base of trees exposing roots.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None to very rare. Trees and shrubs break the wind, and rock fragments covering the soil reduce the potential for wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** Most litter accumulates at base of plants and exposed rocks. Woody stems from trees not moved unless present in water flow pattern, rill, or gully. On steeper slopes (> 20 %), woody stems may be washed from site. Large rills may remove accumulated litter from under trees.

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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 using the soil stability kit test, and a rating of 2 to 3 in the interspaces. The average should be a 3 or 4. Surface texture is stony fine sandy loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface horizon is 1 inch deep. Structure is weak thin platy. Color is yellowish brown (10YR5/4). There is little if any difference under canopy or in interspaces and a recognizable A horizon is expected to be present throughout. 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 well developed biological soil crusts (where present) intercept raindrops reduce 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. Perennial grasses obstruct water flow patterns creating sinuosity.

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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. 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.

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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: Sprouting shrubs = Trees (Juniper > Pinion) > Non-sprouting shrubs

    Sub-dominant: perennial grasses > forbs

    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, Intermediate wheatgrass, etc.)
    Biological soil crust is variable in it’s expression where present on this site and is measured

as a component of ground cover.

Additional: Disturbance regime includes parasites, infrequent fire, drought and insects. Following a recent disturbance such as fire, drought, or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. If a disturbance has not occurred for an extended period of time, woody species may continue to increase crowding out the perennial herbaceous understory species. In either case, these conditions would reflect a functional community phase within the reference state. Dominants— Utah juniper, Roundleaf buffaloberry, Indian ricegrass. Sub Dominants— Pinion, Galleta, Wyoming big sagebrush, Mormontea. Perennial and annual forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

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13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** Several standing dead trees may be present on the site and approximately 20% of the trees and shrubs can show evidence of decadence.

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14. **Average percent litter cover (%) and depth (in):**

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 250-350 lbs/ac

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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 mustards are most likely to invade this site.

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17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in most years, except in drought years.