USDA Natural Resources
Conservation Service

Ecological site R035XY242UT
Semidesert Gravelly Loam (Shadscale)

Accessed: 05/17/2024

General information

Provisional. A provisional ecological site description has undergone quality control and quality assurance review. It contains a working state and transition model and enough information to identify the ecological site.

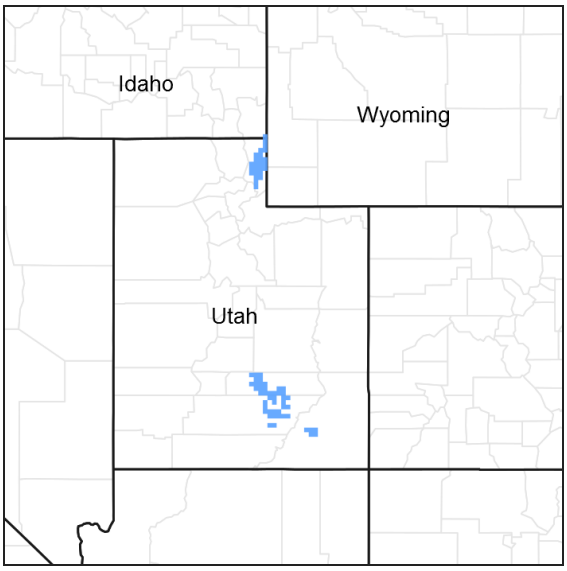

Figure 1. Mapped extent

Areas shown in blue indicate the maximum mapped extent of this ecological site. Other ecological sites likely occur within the highlighted areas. It is also possible for this ecological site to occur outside of highlighted areas if detailed soil survey has not been completed or recently updated.

MLRA notes

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

Site Concept: This site developed on deep, loamy skeletal soils in the semidesert zone of the Colorado and Green River Plateaus region of southern Utah (MLRA 35). It is found on alluvial fans, fan terraces, hills, and structural benches at elevations between 5,000 and 6,800 feet. Annual precipitation ranges from 8 to 11 inches, with about 45% occuring as convective thunderstorms from July through October. The soil moisture regime is ustic aridic and the soil temperature regime is mesic. The reference plant community is dominated by shadscale and James' galleta, and is resistant to change due to a harsh soil environment, the inability to carry fire, and resistance and resillience of the community to grazing.

Classification relationships

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

Associated sites

R035XY125UT	**Desert Shallow Clay (Shadscale)**
R035XY230UT	**Semidesert Shallow Sandy Loam (Shadscale)**

R035XY260UT	**Semidesert Very Steep Stony Loam (Salina Wildrye)**

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Atriplex confertifolia*
Herbaceous	(1) *Pleuraphis jamesii*

Physiographic features

This site occurs on alluvial fans, fan terraces, hills, and structural benches at elevations between 5,000 and 6,800 feet. Slopes typically range from 2 to 15%, but can be as high as 50%.

Table 2. Representative physiographic features

Landforms	(1) Alluvial fan (2) Hill (3) Structural bench
Flooding frequency	None
Ponding frequency	None
Elevation	1,524–2,073 m
Slope	2–15%
Aspect	Aspect is not a significant factor

Climatic features

The climate of this site is characterized by hot summers and cool winters. Average annual precipitation ranges from 8 to 11 inches, with as much as 45% of the summer moisture coming as convective thunderstorms from July through October. June is typically the driest month during the growing season, while July and August are the wettest. Large fluctuations in daily temperatures are common, and precipitation varies greatly from month to month and from year to year.

Due to the lack of climate stations near this site, the climate section was developed using modeled climate data (PRISM) for soil map units correlated to this ecological site.

Table 3. Representative climatic features

Frost-free period (average)	120 days
Freeze-free period (average)	160 days
Precipitation total (average)	279 mm

Influencing water features

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

Soil features

The soils are deep and loamy, usually with about 30-50% rock fragments in the soil profile. In some instances this site has fewer than 30% rock fragments in the soil, particularly in areas with droughty soil moisture conditions. These soils formed in alluvium and/or colluvium derived from sedimentary and igneous rock. Surface textures are loams, sandy loams or sandy clay loams, and rock fragements may or may not occur on the soil surface. The soil moisture regime is ustic aridic and soil temperature regime is mesic. Available water-holding capacity ranges from 2.5 to 4.0 inches of water in the upper 40 inches of soil.

This site has been correlated to soils in the following soil survey areas:

UT631 - Henry Mountains Area - Strych;
UT638 - San Juan County - Strych;
UT685 - Capitol Reef National Park - Abra, Beclabito, Begay family, Chilton, Clapper, Moab, Nihill family, Querencia, Saemo, Squawcave, Strych;

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Colluvium–basalt (3) Slope alluvium–volcanic sandstone
Surface texture	(1) Very gravelly fine sandy loam (2) Very gravelly loam (3) Gravelly loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	102 cm
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–35%
Available water capacity (0-101.6cm)	6.35–10.16 cm
Calcium carbonate equivalent (0-101.6cm)	1–10%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	7.9–8.4
Subsurface fragment volume <=3" (Depth not specified)	10–35%
Subsurface fragment volume >3" (Depth not specified)	10–25%

Ecological dynamics

This site developed under Colorado Plateau ecological conditions and the natural influences of herbivory and climate. This site’s plant species composition is generally dominated by James' galleta and shadscale. Torrey's tea, snakeweed, prickly pear and yellow rabbitbrush are common shrubs, and Indian ricegrass blue grama, mesa dropseed, and sand dropseed are common grasses.

There is no evidence that this site historically burned on a regular basis due to very large and persistent gaps between plants. However, modern disturbances such as recreation and livestock grazing, may result in an opportunity for invasive annuals to enter the system. Cheatgrass, Russian thistle and halogeton have all been documented on this site, but they are not dominant.

This ecological site has been grazed by domestic livestock since they were first introduced into the area around 1860. It is highly resistant to winter grazing, which is the common season of use. The introduction of domestic livestock and the use of fencing and reliable water sources have only minimally influenced the historic disturbance regime associated with this ecological site.

Suitability for rangeland seeding is very poor because of low annual precipitation, and low available water capacity. In most areas there is too much rock for conventional soil tillage.

The following State and Transition diagram shows the reference plant community. No other plant communities have been documented on this site to date. As more data are collected, new plant communities or states may be added. This model was developed using range data collected over the last 40 years in MLRA D35 in southeastern Utah. Both ocular and measured data was collected and utilized.

State and transition model

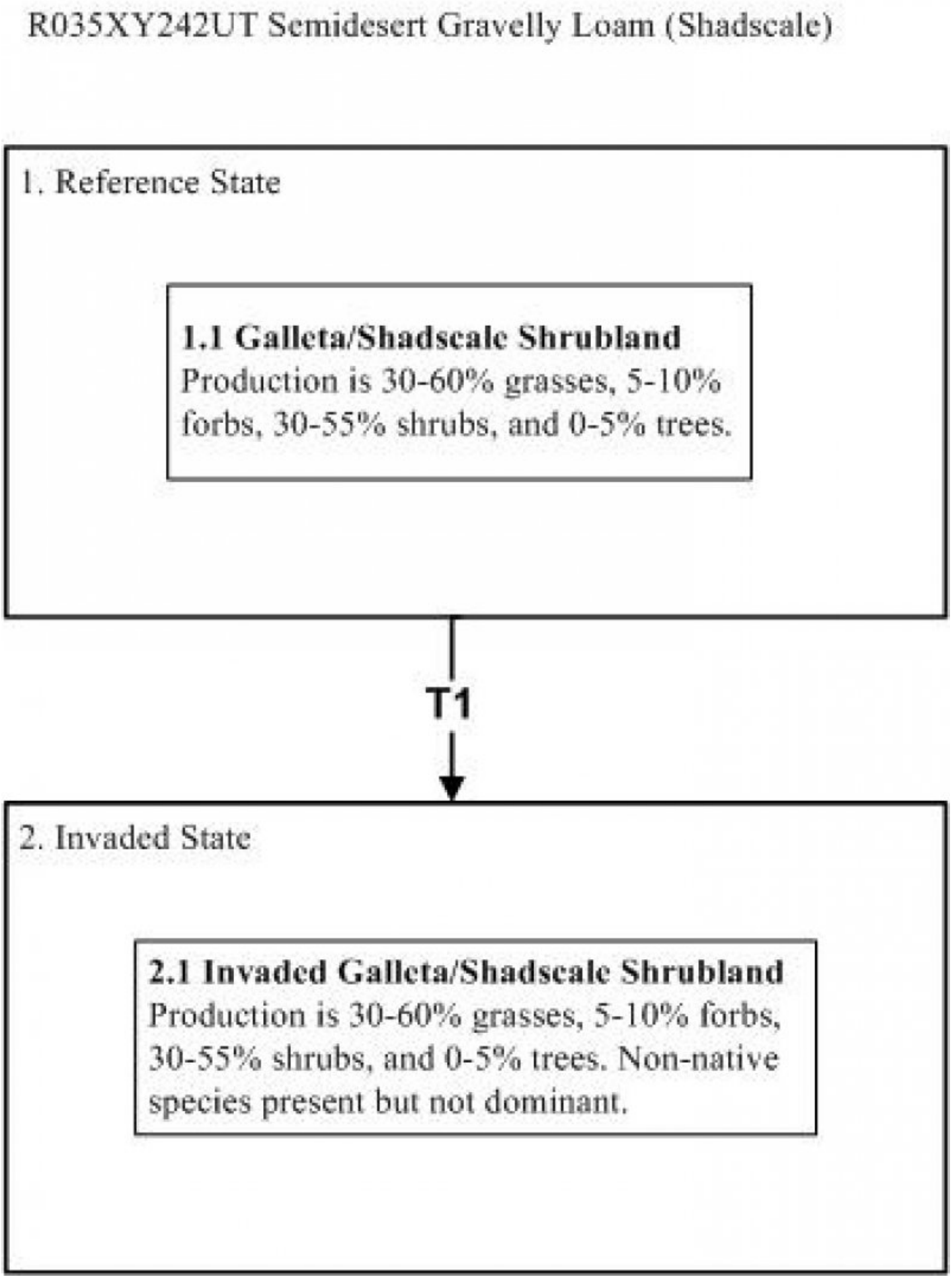

Figure 4. State and Transition Model

State 1
Reference State

The reference state is highly resistant to change due to the general lack of fire or other natural disturbances, and a harsh soil environment that does not support many invasive species. The fuel loads are too sparse to carry a fire under normal weather conditions, and insect or disease impacts have not been documented to have a major impact on the plant community of the site. The resulting condition is a reference state that perpetuates itself on the site indefinately under natural historical conditions. Soil surface disturbance from recreation, livestock, or natural means may increase the likelihood that cheatgrass, Russian thistle, or halogeton establishment on this site. These invasive species may establish in the absence of any major disturbance, but they are not known to dominate this site at the present time.

Community 1.1
Galleta / Shadscale Shubland

Figure 5. Phase 1.1

This plant community is usually dominated by shadscale and James' galleta. Composition by air-dry weight is 30-60% grasses, 5-10% forbs, 30-55% shrubs and 0-5% Utah juniper. Torrey's jointfir, snakeweed, prickly pear and yellow rabbitbrush may be abundant. Other common grasses are Indian ricegrass, sand dropseed, mesa dropseed and blue grama. Forbs are diverse but not abundant.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	196	263
Shrub/Vine	112	157	224
Forb	6	22	45
Total	**230**	**375**	**532**

Table 6. Ground cover

Tree foliar cover	0-3%
Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	10-25%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	5-15%
Surface fragments >0.25" and <=3"	0-35%

Surface fragments >3"	0-35%
Bedrock	0%
Water	0%
Bare ground	10-50%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-10%	0-10%	0-2%
>0.15 <= 0.3	–	5-15%	0-5%	0-2%
>0.3 <= 0.6	–	0-10%	0-5%	0-2%
>0.6 <= 1.4	0-2%	0-5%	0-5%	–
>1.4 <= 4	0-3%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

State 2
Invaded State

This state is functionally and structurally similar to state 1, however it allows for the presence of non-native species. As a result of the establishment of non-native species, the resilience of this state is less than the reference state. Cheatgrass, Russian thistle, and/or halogeton are the most likely invaders to occur in this state.

Community 2.1
Invaded Galleta / Shadscale Shubland

R035XY242UT—Semidesert Gravelly Loam (Shadscale). Community Phase 2.1—Invaded Shadscale and

Figure 7. Phase 2.1

This plant community is usually dominated by shadscale and James' galleta. Composition by air-dry weight is 30-60% grasses, 5-10% forbs, 30-55% shrubs and 0-5% Utah juniper. Torrey's jointfir, snakeweed, prickly pear and yellow rabbitbrush may be abundant. Other common grasses are Indian ricegrass, sand dropseed, mesa dropseed and blue grama. Forbs are diverse but not abundant. Non-native species are present but not dominant.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Grass/Grasslike	112	196	263
Shrub/Vine	112	157	224
Forb	6	22	45
Total	**230**	**375**	**532**

Table 9. Ground cover

Tree foliar cover	0-3%
Shrub/vine/liana foliar cover	5-15%
Grass/grasslike foliar cover	10-25%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-2%
Litter	5-15%
Surface fragments >0.25" and <=3"	0-35%
Surface fragments >3"	0-35%
Bedrock	0%
Water	0%
Bare ground	10-50%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-10%	0-10%	0-2%
>0.15 <= 0.3	–	5-15%	0-5%	0-2%
>0.3 <= 0.6	–	0-10%	0-5%	0-2%
>0.6 <= 1.4	0-2%	0-5%	0-5%	–
>1.4 <= 4	0-3%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Transition T1
State 1 to 2

This transition occurs with the establishment of non-native invasive species. Although disturbances such as roads, recreation, and grazing may facilitate the establishment of non-native species, they may establish on this site in the absence of major soil disturbances.

Additional community tables

Table 11. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					

0	**Dominant Shrubs**			112–224	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	56–168	4–15
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–112	1–8
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11–56	1–4
	Torrey's jointfir	EPTO	*Ephedra torreyana*	6–45	1–4
3	**Sub-Dominant Shrubs**			6–84	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–45	0–4
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–34	0–2
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–22	0–2
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–22	0–2
	winterfat	KRLA2	*Krascheninnikovia lanata*	0–22	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–22	0–2
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–11	0–1
	spineless horsebrush	TECA2	*Tetradymia canescens*	0–11	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–11	0–1
	mat saltbush	ATCO4	*Atriplex corrugata*	0–11	0–1
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	0–1
	mormon tea	EPVI	*Ephedra viridis*	0–11	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
Grass/Grasslike					
0	**Dominant Grasses**			112–263	
	James' galleta	PLJA	*Pleuraphis jamesii*	56–224	5–15
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–84	0–5
	blue grama	BOGR2	*Bouteloua gracilis*	0–56	0–4
1	**Subdominant Grasses**			0–140	
	Grass, perennial	2GP	*Grass, perennial*	0–45	0–3
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–45	0–3
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–45	0–3
	mesa dropseed	SPFL2	*Sporobolus flexuosus*	0–45	0–3
	needle and thread	HECO26	*Hesperostipa comata*	0–34	0–3
	alkali sacaton	SPAI	*Sporobolus airoides*	0–22	0–2
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–11	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–6	0–1
Forb					
2	**Forbs**			6–45	
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–28	0–2
	woolly plantain	PLPA2	*Plantago patagonica*	6–22	1–2
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–22	0–2
	Forb, annual	2FA	*Forb, annual*	0–22	0–2
	Forb, perennial	2FP	*Forb, perennial*	0–22	0–2
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–11	0–1
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	0–11	0–1

	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–11	0–1
	aster	ASTER	*Aster*	0–11	0–1
	rusty lupine	LUPU	*Lupinus pusillus*	0–11	0–1
	mountain phlox	PHAU3	*Phlox austromontana*	0–11	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–11	0–1
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–11	0–1
	Navajo tea	THSU	*Thelesperma subnudum*	0–6	0–1
	small-leaf globemallow	SPPA2	*Sphaeralcea parvifolia*	0–6	0–1
	sego lily	CANU3	*Calochortus nuttallii*	0–6	0–1
	common sunflower	HEAN3	*Helianthus annuus*	0–6	0–1
	manybranched ipomopsis	IPPO2	*Ipomopsis polycladon*	0–6	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–6	0–1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0–6	0–1
	widewing springparsley	CYPU	*Cymopterus purpurascens*	0–6	0–1
	nakedstem sunray	ENNU	*Enceliopsis nudicaulis*	0–6	0–1
	rayless shaggy fleabane	ERAP	*Erigeron aphanactis*	0–6	0–1
	pretty buckwheat	ERBI	*Eriogonum bicolor*	0–6	0–1
	Bicknell's milkvetch	ASCO16	*Astragalus consobrinus*	0–6	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–6	0–1

Table 12. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			112–224	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	56–168	4–15
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	11–112	1–8
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	11–56	1–4
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	winterfat	KRLA2	*Krascheninnikovia lanata*	0–22	0–2
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–22	0–2
	Pursh seepweed	SUCA2	*Suaeda calceoliformis*	0–11	0–1
	spineless horsebrush	TECA2	*Tetradymia canescens*	0–11	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–11	0–1
	mat saltbush	ATCO4	*Atriplex corrugata*	0–11	0–1
	blackbrush	CORA	*Coleogyne ramosissima*	0–11	0–1
	mormon tea	EPVI	*Ephedra viridis*	0–11	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
Grass/Grasslike					

0	**Dominant Grasses**			112–263	
	James' galleta	PLJA	*Pleuraphis jamesii*	56–224	5–15
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–84	0–5
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	mesa dropseed	SPFL2	*Sporobolus flexuosus*	0–45	0–3
	cheatgrass	BRTE	*Bromus tectorum*	1–39	0–3
	needle and thread	HECO26	*Hesperostipa comata*	0–34	0–3
	alkali sacaton	SPAI	*Sporobolus airoides*	0–22	0–2
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–11	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–6	0–1
Forb					
2	**Forbs**			6–45	
	prickly Russian thistle	SATR12	*Salsola tragus*	0–45	0–4
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–28	0–2
	woolly plantain	PLPA2	*Plantago patagonica*	6–22	1–2
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–22	0–2
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	cushion buckwheat	EROV	*Eriogonum ovalifolium*	0–11	0–1
	red dome blanketflower	GAPI	*Gaillardia pinnatifida*	0–11	0–1
	saltlover	HAGL	*Halogeton glomeratus*	0–11	0–1
	aster	ASTER	*Aster*	0–11	0–1
	rusty lupine	LUPU	*Lupinus pusillus*	0–11	0–1
	mountain phlox	PHAU3	*Phlox austromontana*	0–11	0–1
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	Navajo tea	THSU	*Thelesperma subnudum*	0–6	0–1
	small-leaf globemallow	SPPA2	*Sphaeralcea parvifolia*	0–6	0–1
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	nakedstem sunray	ENNU	*Enceliopsis nudicaulis*	0–6	0–1
	rayless shaggy fleabane	ERAP	*Erigeron aphanactis*	0–6	0–1

	pretty buckwheat	ERBI	*Eriogonum bicolor*	0–6	0–1
	Bicknell's milkvetch	ASCO16	*Astragalus consobrinus*	0–6	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–6	0–1

Animal community

--Livestock and Wildlife Grazing--

This site provides fair/poor grazing conditions for livestock and wildlife during fall, winter, and spring due to low availability of nutritious forage. 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, pronghorn antelope, 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 shrubs and grasses. The dominant shrub specie, shadscale, provides good browse for mule deer and domestic sheep and goats in the winter, spring, and fall. It is a minor component of bighorn sheep and pronghorn antelope diets in the winter. Cattle will only utilize the fruits/seeds due to the spiny nature of the plant. Sub-dominant shrubs include Torrey jointfir, Bigelow sagebrush, and winterfat which provide good winter browse for cattle, sheep, goats, mule deer, bighorn sheep, elk, and pronghorn antelope. The presence of grasses including galleta and Indian ricegrass provide good spring and fall grazing conditions for cattle, horses, and sheep, bighorn sheep, and elk. 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 to 79 depending on the overall watershed condition.

Recreational uses

Recreation activities include hiking and hunting.

Wood products

None

Other information

--Poisonous/Toxic Plant Communities--

Toxic plants associated with this site include woolly locoweed and broom snakeweed. Locoweed is toxic to all classes of livestock and wildlife. This plant is palatable and has similar nutrient value to alfalfa, which may cause animals to consume it even when other forage is available. Woolly 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 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 some 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. Horses tend to develop what is called a “bob” tail or “roached” main due to breakage of the long hairs.

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. Shadscale ecological sites occur on a wide variety of saline soils and thus invading plants will be tolerant of such conditions.

--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.
Due to the sparse plant cover and lack of fine fuels on this ecological site, historically shadscale dominated shrub communities were not influenced by fire. Fires were rare and non-existent; however increased presence of exotic annual grasses can greatly alter fire regimes due to the increase in fine fuels. The slow recovery period allows for cheatgrass invasions which can subsequently increase the fire regime. When fire does occur shadscale plants are killed and do not readily recover, except through re-establishment by seeds from adjacent unburned stands. Because shadscale seedlings lack spines, they are highly susceptible to browsing and thus grazing should be excluded for at least two years post fire.

--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.

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.

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Date	02/01/2007
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Few and occur throughout site. Rills may be 6 to 10 feet in length. Sides of rills may be up to 2 inches high. Rills are most likely to form below adjacent exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion.

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2. **Presence of water flow patterns:** Frequent and occur throughout area. Flow patterns are sinuous and wind between the surface rocks and plant bases.

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3. **Number and height of erosional pedestals or terracettes:** Plants may show very minor pedestalling on their down slope side. Terracettes should be few and stable.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 10 – 50%. (Soil surface is typically covered by up to 40% rock). Ground cover is measured as first raindrop impact, bare ground is the inverse of cover. Ground cover + bare ground = 100%. Well developed biological crusts should not be recorded 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.

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5. **Number of gullies and erosion associated with gullies:** Gullies may be present. Length often extends from exposed bedrock until gully reaches a stream or an area where water and sediment accumulate, but they may be wide and shallow and armored with very large rocks.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** No evidence of wind generated soil movement. Wind caused blowouts and deposition are not present.

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7. **Amount of litter movement (describe size and distance expected to travel):** Some down slope redistribution caused by water. Some litter removal may occur in flow patterns and rills with deposition occurring at points of obstruction, especially following major storm events. Litter movement will increase with slope.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 4 or 5 under the plant canopies, and a rating of 3 to 4 in the interspaces. The average should be a 4. Surface texture is gravelly loam. Vegetation, 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 is 3 inches deep. Structure is weak thick platy parting to weak fine subangular blocky. Color is strong brown (7.5YR5/6). 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.

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10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Distribution of vascular plants are expected to intercept raindrops reducing splash erosion. Vegetation distribution helps create sinuous water flow patterns along with any surface rock to reduce or eliminate runoff and erosion in all but the most extreme storm events. Plants have even distribution across the site. Spatial distribution of well developed biological soil crusts intercept raindrops reducing splash erosion and provide areas of surface detention to store water allowing additional time for infiltration. When perennial grasses and shrubs decrease, reducing ground cover and increasing bare ground, runoff is expected to increase and any associated infiltration reduced.

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11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. 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: Warm season perennial bunchgrasses > non-sprouting shrubs > = Cool season perennial bunchgrasses

    Sub-dominant: sprouting shrubs > native perennial and annual 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 and Russian wildrye etc.)

Additional: Biological soil crust is variable in it's 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 would reflect a functional community phase within the reference state.
Dominants: Shadscale, galleta. Sub-Dominants: Indian ricegrass, Mormontea, Bigelow sagebrush. 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):**

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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):** 205-475 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:** Rusty lupine, Locoweed, Broom snakeweed, Cheatgrass, common sunflower, pinyon pine, and Utah juniper 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 all years, except in drought years.
