USDA Natural Resources
Conservation Service

Ecological site R035XY146UT
Desert Very Steep Stony Loam (Shadscale)

Accessed: 05/11/2025

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.

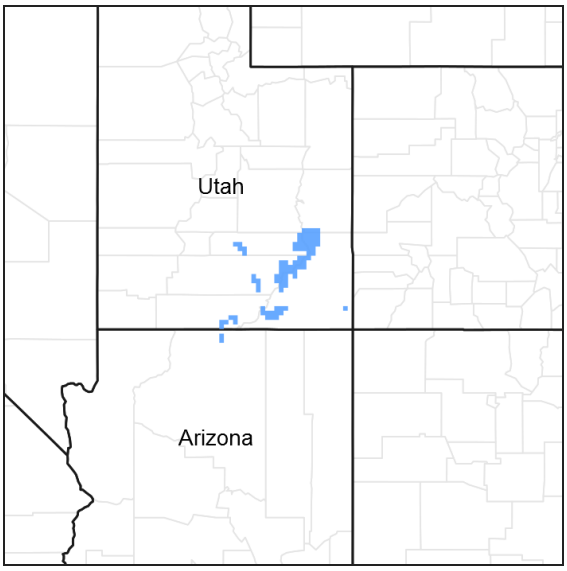


Figure 1. Mapped extent

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

This ecological site occurs in the northern portion of MLRA 35, Colorado Plateau Province. It is found principally in the Canyon Lands and High Plateaus of Utah sections within that MLRA. This area has been stucturally uplifted over time while rivers flowing across it were cutting down into its bedrock. Areas of shale, sandstone, limestone, dolomite, and volcanic rock outcrop are found throughout the region.

Associated sites

R035XY018UT	**Talus Slope (Blackbrush-Shadscale)**
R035XY136UT	**Desert Stony Loam (Shadscale-Bud Sagebrush)**

Similar sites

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

Table 1. Dominant plant species

Tree	(1) *Atriplex confertifolia* (2) *Ephedra torreyana*
Shrub	Not specified
Herbaceous	(1) *Pleuraphis jamesii*

Physiographic features

This site occurs on hillslopes, structural benches,talus slopes, and scarp slopes. Slopes range from 35 to 80 percent. Elevations range from 3,740 to 6,400 feet. Runoff is high to very high due to steep slopes.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Scarp slope (3) Hill
Flooding duration	Extremely brief (0.1 to 4 hours)
Flooding frequency	None
Ponding duration	Very brief (4 to 48 hours)
Ponding frequency	None
Elevation	1,140–1,951 m
Slope	35–80%
Aspect	Aspect is not a significant factor

Climatic features

The climate is characterized by hot summers and cool to warm winters, which can be slightly modified by local topographic conditions, such as aspect. Large fluctuations in daily temperatures are common. Mean annual temperatures range from 53-59 degrees Fahrenheit. Approximately 43-67% of moisture occurs as rain from March to October as convection thunderstorms. Precipitation is variable from month to month and from year to year but averages between 5-9 inches. Snow packs when present are generally light and not persistent.

Table 3. Representative climatic features

Frost-free period (average)	197 days
Freeze-free period (average)	228 days
Precipitation total (average)	254 mm

Influencing water features

There are no water features influencing this site.

Soil features

The soils are shallow and well drained with depth to a lithic contact normally 4 to 20 inches. The dry surface color is typically dark reddish brown. Soil surface fragments average 35% gravels and 5% cobbles. The soil temperature and moisture regimes are mesic and typic aridic respectively. Surface and subsurface textures are generally channery loams and clay loams. Biological crusts are not normally present. This site has been used in the following soil surveys and has been correlated to the following components:

UT685 - Capitol Reef National Park - Myton, Catahoula, Somorent;
UT688 – Canyonlands National Park – Tsaya;
UT689 – Glen Canyon National Park Recreation Area – Tsaya;

Table 4. Representative soil features

Parent material	(1) Colluvium–sandstone and shale (2) Residuum–limestone
Surface texture	(1) Very channery loam (2) Fine sandy loam (3) Very gravelly sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderate to moderately rapid
Soil depth	10–203 cm
Surface fragment cover <=3"	0–35%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	0.51–3.3 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–4 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–5
Soil reaction (1:1 water) (0-101.6cm)	7.4–9
Subsurface fragment volume <=3" (Depth not specified)	0–50%
Subsurface fragment volume >3" (Depth not specified)	0–5%

Ecological dynamics

This site developed under the Colorado Plateau ecological conditions and the natural influences of herbivory and climate. It is typically dominated by shadscale, however at some locations such as Upheaval Dome in Canyonlands National Park shadscale is not present. Wet and dry weather cycles appear to be the principle ecological drivers in this site. During periods of drought, perennial warm and cool season grasses decrease, while during periods of normal and above average precipitation in perennial warm and cool season grasses increase. Shrub cover is also generally lower under dry drought conditions. Locations that receive more precipitation typically have a larger diversity of shrubs that may include sumac and cliffrose. There is little natural herbivory attributed to large herbivores on the site due to it's steep slopes. However, desert bighorn sheep are adapted to navigating on steep hillslopes and are often seen foraging on and near this site.

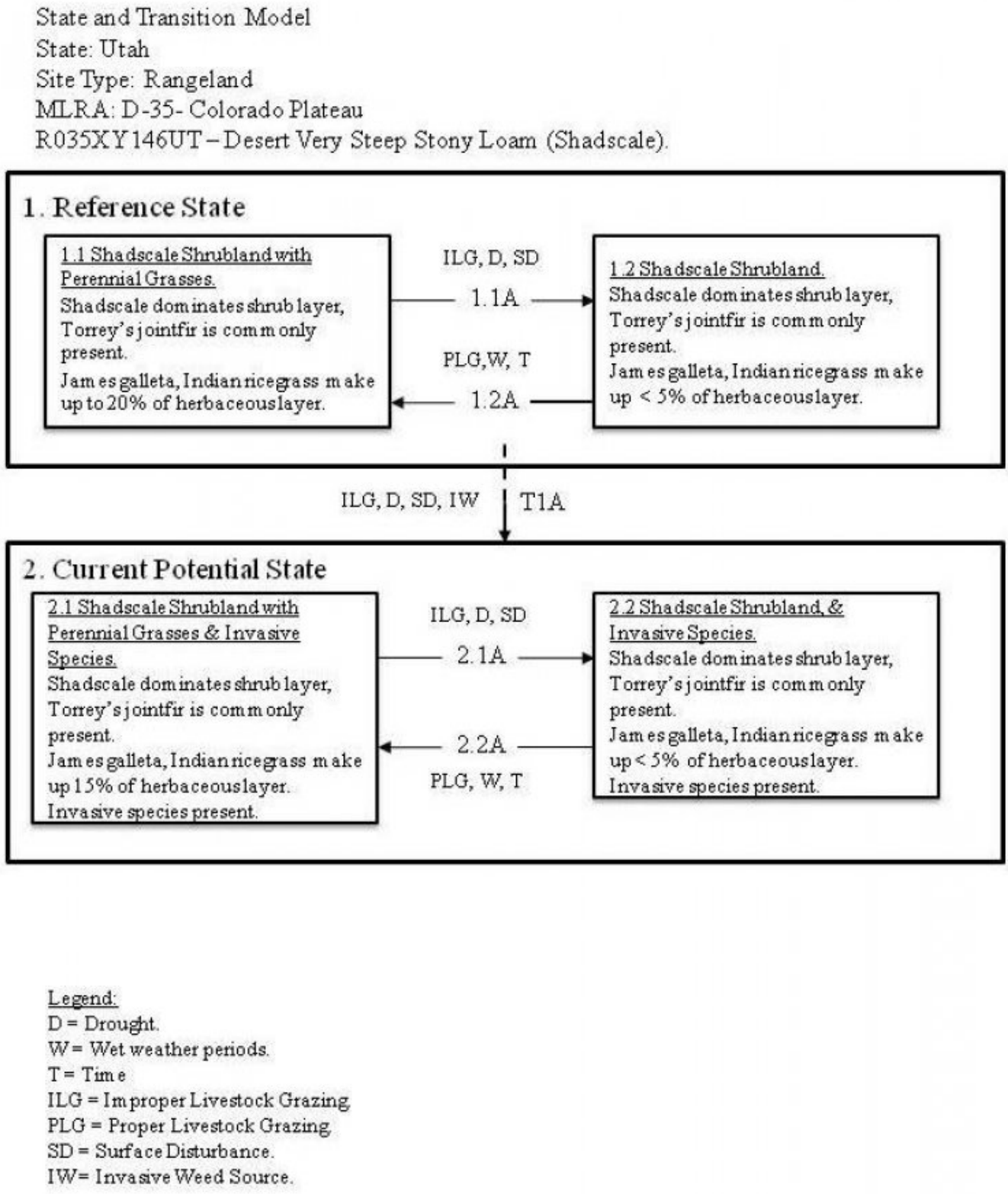
Livestock grazing has historically had only a minor impact on altering the species composition of this site because of it's steep slopes. Also, shadscale due to its spinescent nature, is resistant to moderate browsing pressures, however, improper grazing may stress this species and allow nutrients to become available for invasive species to utilize (Simonin, 2001). Timing of grazing also affects the sites ecological dynamics, for example, spring grazing can result in a decline of cool season grasses, while heavy summer/early fall grazing can result in a decline of warm season grasses.

When vegetation communities respond to changes in management or to natural influences which move them to different ecological states, a return to previous states may not be possible. The amount of energy needed to affect vegetative shifts depends on present biotic and abiotic features and the desired results.

The following state and transition model diagram describes the most commonly occurring plant communities identified on this site. These plant communities may not represent every possibility, but they are the most prevalent

and repeatable. As more data are collected, some of these plant communities may be revised or removed, and new ones may be added. This model was developed using range data collected in 2006 and 2007 in Canyonlands National Park in Southeastern Utah as part of a national park soil survey update. Both ocular and measured data was collected and utilized. Range data collected by the NRCS (1982) was also used.

State and transition model



Legend:
D = Drought.
W = Wet weather periods.
T = Time
ILG = Improper Livestock Grazing
PLG = Proper Livestock Grazing
SD = Surface Disturbance.
IW = Invasive Weed Source.

State 1
Reference State

The reference state represents the historic plant communities and ecological dynamics of the Desert Very Steep

Stony Loam, shadscale site. This state includes the biotic communities that become established on the ecological site if all successional sequences are completed under current climatic conditions; natural disturbances are inherent in its development. This state is dominated by shadscale. The primary disturbance mechanism is climate fluctuations. The reference state is self sustaining and resistant to change due to high resistance to natural disturbances and high resilience following natural disturbances. When natural disturbances occur, the rate of recovery is relatively rapid due to niches being filled with highly adapted native vegetation. The reference state was determined by study of rangeland relic areas, areas protected from excessive disturbance and outside influences, such as grazing and recreation. Literature reviews, trends in plant community dynamics, and historical accounts are also considered. Reference State: Community phases disturbed by climate fluctuations. Indicators: A site dominated by shadscale where James galleta and Indian ricegrass may also be present. Feedbacks: Fluctuations in climate that allow for a self sustaining shadscale shrubland community. At-risk Community Phase: All communities are at risk when nutrients are available for invasive plants to establish. Trigger: Introduction of invasive plants to fill available niches.

Community 1.1
Shadscale Shrubland with Perennial Grasses.

Figure 4. Shadscale with Perennial Grasses.

This plant community phase is dominated by shadscale. Torrey's jointfir, and a diversity of shrubs are commonly present. Dominant herbaceous species include Indian ricegrass and James galleta. James galleta is typically the dominant perennial grass species in this plant community phase. Other perennial grasses, shrubs, and forbs may also be present and cover is variable. Bare ground is 5-40% and biological crusts are 0-25%. Surface rock fragments 0-60% are very prevalent. The following tables provide an example of the typical vegetative floristics of a Community Phase 1.1 site.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	84	95	112
Grass/Grasslike	50	62	67
Forb	34	39	45
Total	**168**	**196**	**224**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	15-25%
Grass/grasslike foliar cover	5-25%
Forb foliar cover	5-10%
Non-vascular plants	0%

Biological crusts	0-25%
Litter	3-5%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-35%
Bedrock	0%
Water	0%
Bare ground	5-40%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-5%
>0.15 <= 0.3	–	3-10%	0-2%	0-3%
>0.3 <= 0.6	–	3-10%	0-1%	0-1%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Shadscale Shrubland.

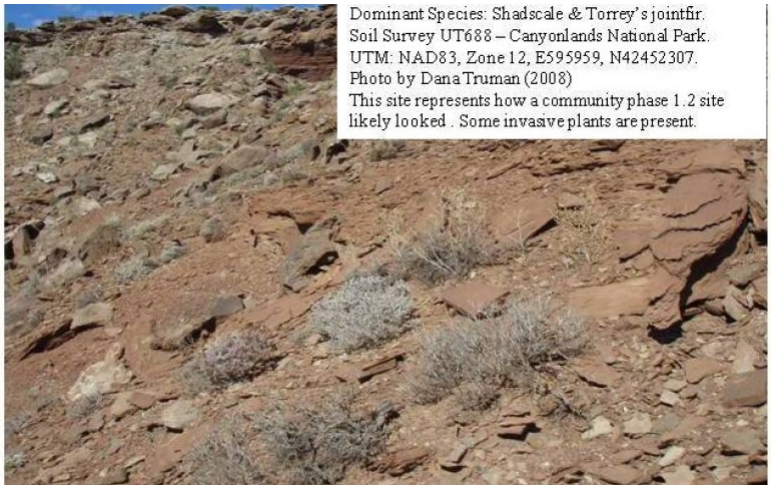


Figure 6. Shadscale Shrubland

This plant community phase is dominated by shadscale, Torrey's jointfir is commonly present. Perennial grasses may also be present and if present, may include Indian ricegrass and James galleta. James galleta is typically the dominant perennial grass species in this plant community phase. Other perennial shrubs, and forbs may be present and cover is variable. Bare ground is 5-40% and biological crusts are 0-25%. Surface rock fragments (4-60%) can be very prevalent. The following tables provide an example of the typical vegetative floristics of a Community Phase 1.2 site.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	67	84	95
Forb	6	11	17
Grass/Grasslike	–	11	17
Total	**73**	**106**	**129**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-17%
Grass/grasslike foliar cover	0-6%
Forb foliar cover	0-6%
Non-vascular plants	0%
Biological crusts	0-25%
Litter	1-2%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-35%
Bedrock	0%
Water	0%
Bare ground	5-40%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-4%	0-5%
>0.15 <= 0.3	–	3-10%	0-2%	0-3%
>0.3 <= 0.6	–	3-10%	0-1%	0-1%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	0%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2

Shadscale Shrubland with Perennial Grasses.

Shadscale Shrubland.

This phase occurs when prolonged drought reduces the percent of native perennial grasses present in the Reference State. Surface disturbances and/or improper livestock grazing, where they occur may accelerate this transition.

Pathway 1.2A
Community 1.2 to 1.1

Shadscale Shrubland.

Shadscale Shrubland with Perennial Grasses.

This community phase occurs when a series of above average precipitation years allows for an increase in the perennial herbaceous species found on this site. Where grazing occurs, proper grazing management and it's associated reduction of any surface disturbance present, can accelerate this transition.

State 2
Current Potential State

This state is similar to state one, however, now there are invasive species established in the understory with cheatgrass being the most common. The primary disturbance mechanism is climate fluctuations. Current Potential State: Plant communities disturbed by fluctuating climatic conditions. Indicators: A site dominated by shadscale and James galleta, where Indian ricegrass and sand dropseed may also be present. Invasive species are present. Feedbacks: Fluctuations in climate allow for the maintenance of both shrubs and perennial grasses.

Community 2.1
Shadscale Shrubland with Perennial grasses & Invasive Species.

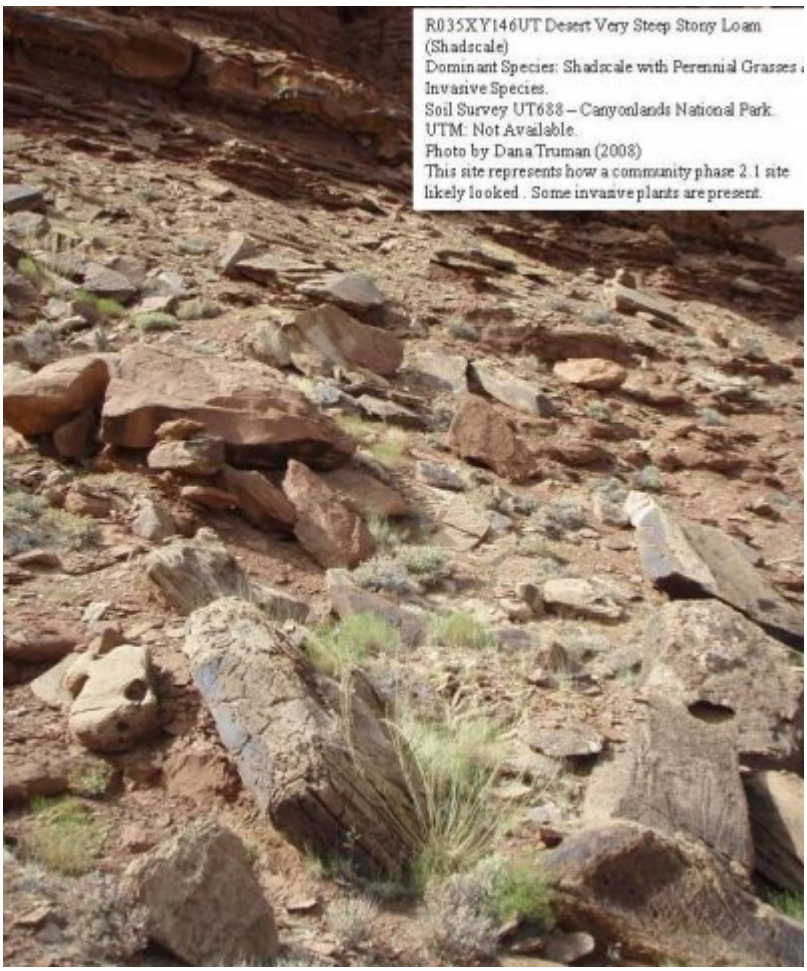


Figure 8. Shadscale with Perennial Grasses and Weeds

This plant community phase is dominated by shadscale, Torrey’s jointfir, and a diversity of shrubs where warm and cool season perennial grasses are present. Grasses may include but are not limited to, Indian ricegrass and James galleta. James galleta is typically the dominant perennial grass species in this plant community phase. Other

perennial grasses, shrubs, and forbs may also be present. This plant community is very similar to plant community 1.1 in production and cover. The main difference is that invasive species are present in this phase. Bare ground is 5-40% and biological crusts are 0-25%. Surface rock fragments 0-60% are very prevalent. The following tables provide an example of the typical vegetative floristics of a Community Phase 2.1 site.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	84	95	112
Grass/Grasslike	50	62	67
Forb	34	39	45
Total	**168**	**196**	**224**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	16-21%
Grass/grasslike foliar cover	6-26%
Forb foliar cover	4-9%
Non-vascular plants	0%
Biological crusts	0-25%
Litter	3-5%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-35%
Bedrock	0%
Water	0%
Bare ground	5-40%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-4%	0-5%
>0.15 <= 0.3	–	3-10%	0-2%	0-3%
>0.3 <= 0.6	–	3-10%	0-1%	0-1%
>0.6 <= 1.4	–	3-10%	–	–
>1.4 <= 4	–	0-5%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Shadscale Shrubland with Invasive Species.

Figure 10. Shadscale Shrubland with Invasive Weeds

This plant community phase is dominated by shadscale and Torrey's jointfir. Perennial grasses may also present and include Indian ricegrass and James galleta. James galleta is typically the dominant perennial grass species in this plant community phase. Other perennial shrubs, and forbs may be present. This plant community is very similar to plant community 1.2 in production and cover. The main difference is that invasive species are present in this phase. Bare ground is 5-40% and biological crusts are 0-25%. Surface rock fragments (4-60%) can be very prevalent. The following tables provide an example of the typical vegetative floristics of a Community Phase 2.2 site.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	67	84	95
Forb	6	11	17
Grass/Grasslike	–	11	17
Total	**73**	**106**	**129**

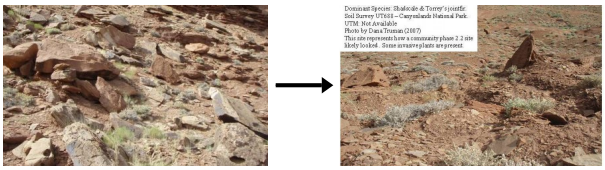
Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	5-17%
Grass/grasslike foliar cover	0-6%
Forb foliar cover	0-6%
Non-vascular plants	0%
Biological crusts	0-25%
Litter	1-2%
Surface fragments >0.25" and <=3"	0-10%
Surface fragments >3"	0-35%
Bedrock	0%
Water	0%
Bare ground	5-40%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-4%	0-5%
>0.15 <= 0.3	–	3-10%	0-2%	0-3%
>0.3 <= 0.6	–	3-10%	0-1%	0-1%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	0%	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 2.1A
Community 2.1 to 2.2



Shadscale Shrubland with Perennial grasses & Invasive Species.

Shadscale Shrubland with Invasive Species.

This phase occurs when prolonged drought reduces the percent of native perennial grasses present in the Reference State. Surface disturbances and/or improper livestock grazing, where they occur, may accelerate this transition. Invasive species may increase during periods of short term precipitation.

Pathway 2.2A
Community 2.2 to 2.1

Shadscale Shrubland with Invasive Species.

Shadscale Shrubland with Perennial grasses & Invasive Species.

This community phase occurs when a series of above average precipitation years allows for an increase in the perennial herbaceous species found on this site. Where grazing occurs, proper grazing management and it's associated reduction of any surface disturbance present, can accelerate this transition.

Transition T1A
State 1 to 2

Transition from Reference State (State 1) to Current Potential State (State 2). This transition occurs as any combination of improper livestock grazing, drought, and/or surface disturbance allow invasive species become established in the plant community. The most common invasive species is cheatgrass. Invasive species, however, have been known to invade intact perennial plant communities where no disturbance has occurred.

Additional community tables

Table 17. Community 1.1 plant community composition

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

Grass/Grasslike					
1	**Dominant Grass**			22–45	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	6–17	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–9	15–30
3	**Sub-Dominant Grasses**			11–45	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–34	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–22	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–17	–
	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–11	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–2	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–2	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–2	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–2	–
Shrub/Vine					
2	**Dominant Shrubs**			34–101	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	34–101	–
5	**Sub-Dominant Shrubs**			45–67	
	saltbush	ATRIP	*Atriplex*	0–17	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–17	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–17	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–11	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–6	–
	mormon tea	EPVI	*Ephedra viridis*	0–6	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	–
	sumac	RHUS	*Rhus*	0–6	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–6	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–6	–
	brickellbush	BRICK	*Brickellia*	0–6	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–6	–
Forb					
4	**Forbs**			11–45	
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–34	–
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	desert princesplume	STPI	*Stanleya pinnata*	0–11	–
	woodyaster	XYLOR	*Xylorhiza*	0–6	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–6	–
	blazingstar	MENTZ	*Mentzelia*	0–6	–
	Remy's sandmat	CHRE3	*Chamaesyce remyi*	0–2	–
	cryptantha	CRYPT	*Cryptantha*	0–2	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–
	gilia	GILIA	*Gilia*	0–1	–

	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–1	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–1	–

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grass**			0–11	
	James' galleta	PLJA	*Pleuraphis jamesii*	0–9	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–3	–
3	**Sub-Dominant Grasses**			0–11	
	Grass, perennial	2GP	*Grass, perennial*	0–6	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–4	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–4	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–3	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–2	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–1	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–1	–
Shrub/Vine					
2	**Dominant Shrubs**			34–108	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	34–108	–
5	**Sub-Dominant Shrubs**			9–45	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–45	–
	saltbush	ATRIP	*Atriplex*	0–18	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–8	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–7	–
	mormon tea	EPVI	*Ephedra viridis*	0–6	–
	brickellbush	BRICK	*Brickellia*	0–4	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–1	–
Forb					
4	**Forbs**			6–17	
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–9	–
	Forb, annual	2FA	*Forb, annual*	0–6	–
	Forb, perennial	2FP	*Forb, perennial*	0–6	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–6	–
	desert princesplume	STPI	*Stanleya pinnata*	0–6	–
	woodyaster	XYLOR	*Xylorhiza*	0–4	–
	blazingstar	MENTZ	*Mentzelia*	0–3	–

	Remy's sandmat	CHRE3	*Chamaesyce remyi*	0–3	–
	cryptantha	CRYPT	*Cryptantha*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–
	gilia	GILIA	*Gilia*	0–1	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–1	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–1	–

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grass**			22–45	
	cheatgrass	BRTE	*Bromus tectorum*	2–34	–
	James' galleta	PLJA	*Pleuraphis jamesii*	18–34	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	7–18	–
3	**Sub-Dominant Grasses**			11–45	
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–34	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–22	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–18	–
	Grass, annual	2GA	*Grass, annual*	0–11	–
	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–11	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–4	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–2	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–1	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	–
Shrub/Vine					
2	**Dominant Shrub**			34–108	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	34–108	–
5	**Sub-Dominant Shrubs**			45–67	
	sumac	RHUS	*Rhus*	22–34	–
	saltbush	ATRIP	*Atriplex*	0–18	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	0–18	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–18	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–9	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–7	–
	mormon tea	EPVI	*Ephedra viridis*	0–6	–
	brickellbush	BRICK	*Brickellia*	0–4	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–1	–

Forb					
4	**Forbs**			11–45	
	woodyaster	XYLOR	*Xylorhiza*	0–45	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–34	–
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–9	–
	desert princesplume	STPI	*Stanleya pinnata*	0–8	–
	blazingstar	MENTZ	*Mentzelia*	0–3	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–3	–
	cryptantha	CRYPT	*Cryptantha*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	gilia	GILIA	*Gilia*	0–1	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–1	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–1	–

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Grass/Grasslike					
1	**Dominant Grass**			0–12	
	cheatgrass	BRTE	*Bromus tectorum*	2–11	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–9	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–3	–
3	**Sub-Dominant Grasses**			0–11	
	Grass, annual	2GA	*Grass, annual*	0–6	–
	Grass, perennial	2GP	*Grass, perennial*	0–6	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–4	–
	Sandberg bluegrass	POSE	*Poa secunda*	0–4	–
	low woollygrass	DAPU7	*Dasyochloa pulchella*	0–3	–
	desert needlegrass	ACSP12	*Achnatherum speciosum*	0–3	–
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–2	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–1	–
	sideoats grama	BOCU	*Bouteloua curtipendula*	0–1	–
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–1	–
Shrub/Vine					
2	**Dominant Shrubs**			34–108	
	shadscale saltbush	ATCO	*Atriplex confertifolia*	34–108	–
5	**Sub-Dominant Shrubs**			9–45	
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	6–45	–
	saltbush	ATRIP	*Atriplex*	0–18	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–9	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–8	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–7	

	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–7	–
	mormon tea	EPVI	*Ephedra viridis*	0–6	–
	sumac	RHUS	*Rhus*	0–6	–
	brickellbush	BRICK	*Brickellia*	0–4	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–1	–
Forb					
4	**Forbs**			6–17	
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–9	–
	desert princesplume	STPI	*Stanleya pinnata*	0–8	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–6	–
	Forb, annual	2FA	*Forb, annual*	0–6	–
	Forb, perennial	2FP	*Forb, perennial*	0–6	–
	woodyaster	XYLOR	*Xylorhiza*	0–4	–
	blazingstar	MENTZ	*Mentzelia*	0–3	–
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–3	–
	cryptantha	CRYPT	*Cryptantha*	0–2	–
	tansymustard	DESCU	*Descurainia*	0–2	–
	buckwheat	ERIOG	*Eriogonum*	0–1	–
	gilia	GILIA	*Gilia*	0–1	–
	hairy false goldenaster	HEVI4	*Heterotheca villosa*	0–1	–
	hoary tansyaster	MACA2	*Machaeranthera canescens*	0–1	–

Animal community

--Wildlife Interpretation--
Small herds of mule deer and pronghorn antelope can be seen grazing/browsing on these sites, especially when near water sources and in the winter. Desert bighorn sheep may utilize this site, when occurring on steeper slopes. The hot climate and lack of water favors small mammals, which have an easier time finding shelter, food, and water to live. Many species of rats, mice, squirrels, bats, and chipmunks can be observed, along with coyotes and foxes. Lizards are the most visible and can be observed during the day. Species may include the northern whiptail, desert spiny, and the colorful western collard lizard. (NPS.gov, 2008)

--Grazing Interpretations--
This site provides very limited grazing for livestock and wildlife during fall, winter, and spring due to the steep slopes. It also often lacks natural perennial water sources, which can influence its suitability for both livestock and wildlife grazing. Intense late spring or summer grazing of shadscale can result in reduction of shadscale (USU.edu, 2009). However, shadscale can be a good browse for livestock and wildlife winter ranges. 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 sites steep slopes, extreme temperatures, and variability in time and amount of precipitation. This site may occur in mule deer, desert bighorn sheep, and pronghorn antelope, habitat; however in many places their populations will be small and will have little grazing impact on the site.

The plant community is generally an equal mixture shrubs and grasses. The dominant shrub species, 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 Bigelow’s sagebrush and Torrey’s jointfir, which provide good winter browse for cattle, sheep, goats, mule deer, bighorn sheep, and pronghorn antelope. The

presence of grasses including James galleta and Indian ricegrass, provide good grazing conditions for all classes of livestock and wildlife. Forb composition and annual production depend primarily on precipitation amounts and thus creates challenges for those making livestock grazing management decisions. Forb composition should also 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 and grazing should be based on a science based management plan.

Hydrological functions

Due to the varying depths of this soil, the soils of this site may belong to multiple hydrologic groups. The most common soil series on which this site occurs is Tsaya. Tsaya soils are shallow and thus are in hydrologic group D (NRCS National Engineering Handbook). Soils in hydrologic group D are saturated quickly due to high infiltration rates and shallow depth; once soils are saturated run off potential is high. Hydrological groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water.

Recreational uses

Recreation activities include aesthetic value and good opportunities for hiking, horseback riding, hunting, and off-road vehicle use. Camp sites are usually limited due to lack of sheltering trees.

Wood products

There are no wood products on this site.

Other information

--Poisonous and Toxic Plant Communities--
Toxic plants associated with this site include woolly locoweed, broom snakeweed and potentially Russian thistle.

Woolly locoweed is toxic to all classes of livestock and wildlife. Locoweed 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 (Knight and Walter, 2001).

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. (Knight and Walter, 2001)

Potentially toxic plants associated with this site can include four-wing saltbush and buckwheat species, which may accumulate selenium when 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.

--Invasive Plant Communities--
As ecological conditions deteriorate and native vegetation decreases due to disturbance (fire, improper livestock grazing, drought, off road vehicle overuse, erosion, etc.) invasive species can establish on the site. Of particular concern in arid environments are the non-native annual invaders including cheatgrass, red brome, Russian thistle, kochia, halogeton, and 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 control may be 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 desert plant communities in the Colorado Plateau may have evolved without a significient influence of fire. However, a year of exceptionally heavy winter rains can generate sufficient fuels to carry fire by producing heavy stands of annual forbs and grasses. When fires do occur, however, the effect on the plant community may be extreme due to the harsh environment and sites slow rate of recovery.

This ecological site was not historically heavily influenced by fire. However, the increased presence of exotic annual grasses can greatly alter it's fire regimes due to the increase in fine fuels. It's slow recovery period after disturbance allows for cheatgrass invasions which can subsequently increase the fire cycle. When fire does occur, Torrey's jointfir plants are often killed. Recovery is often slow, and usually occurs through resprouting and/or re-establishment from adjacent unburned stands.

Inventory data references

This model was developed using range data collected in 2006 and 2009 in Canyonlands National Park in Southeastern Utah as part of a national park soil survey update.

Type locality

Location 1: San Juan County, UT	
UTM zone	N
UTM northing	4242407
UTM easting	595959
General legal description	Canyonlands National Park

Other references

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

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Contributors

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Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Jacob Owens (NRCS), Shane Green, (NRCS)
Contact for lead author	shane.green@ut.usda.gov
Date	12/11/2009
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** None to very few. Due to the stony characteristic of this site, rill formation is impaired. However, the overall surface is expected to be resistant to rill formation and accelerated erosion in general.

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2. **Presence of water flow patterns:** Flow patterns are very sinuous and wind around gravel and/or boulders, and perennial plant bases. During episodic precipitation events e.g. thunderstorms, these sites are expected to shed large volumes of water to adjacent ecological sites.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals or terracettes are rare due to the talus nature of the site. They may naturally occur where the water flows around the gravel, rock or boulders.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 5 – 40%. Ground cover is based on first raindrop impact, and bare ground is the opposite of ground cover. Ground cover + Bare ground = 100%. With a surface texture ranging from gravelly loam to channery loam and a in some locations a talus surface, actual bare ground (soil) is typically a minor component (5-10%). 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.

5. **Number of gullies and erosion associated with gullies:** None to few. 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.

6. **Extent of wind scoured, blowouts and/or depositional areas:** None. The stony surface of this site precludes this from occurring.

7. **Amount of litter movement (describe size and distance expected to travel):** Due to the steepness of slope being between 35 to 80 percent, down slope redistribution of any incident litter caused by water is expected. Deposition would likely occur at points of obstruction such as the uphill side of gravel, rocks and boulders, especially following major storm events.

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 plant canopies and a rating of 3 to 4 in the interspaces using the soil stability test kit. Surface texture is gravelly sandy loam to channery 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 horizon is 0 to 3 inches deep. Structure is weak fine subangular to granular. Color is dark reddish brown (2.5YR ¾). 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:** Due to the stony and steep nature of this site, plants would be expected to only have a minor effect on infiltration and runoff. The armored surface would naturally shed a majority of the incident water.

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None.

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: Dominance by average annual production: Perennial bunchgrasses > non-sprouting shrubs > sprouting shrubs >= perennial and native annual forbs 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.)

    Sub-dominant:

    Other: Biological soil crust is variable in it’s expression where present on this site and is measured as a component of ground cover.

Additional: 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: Indian ricegrass, galletta, and shadscale; Sub-dominants: other perennial grasses, Torrey's jointfir, broom snakeweed, and Stansburry Mexican cliffrose. 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):** All age classes of perennial grasses should be present under average growing conditions with age class expression likely subdued during below average years, or on sites with high (usually greater than 65%) similarity index (late seral to historic climax). Reference state includes a mixture of plants of various ages with some plants being dead or showing characteristics of decadence. The overall plant vigor of a steep stony loam (shadscale) site is expected to be good due to the "highway runoff water concentrating effect" of the gravel, rocks and/or boulders.

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14. **Average percent litter cover (%) and depth (in):** Variability may occur due to weather.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 65 - 115 #/acre on an average year.

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16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Due to the low productive and steep characteristics of this site, grazing and fire are not usually an important factor impacting the site. However, cheatgrass may invade 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 extreme drought years.
