USDA Natural Resources
Conservation Service

Ecological site R035XY126UT
Desert Shallow Gypsum (Torrey's Jointfir)

Accessed: 05/19/2024

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.

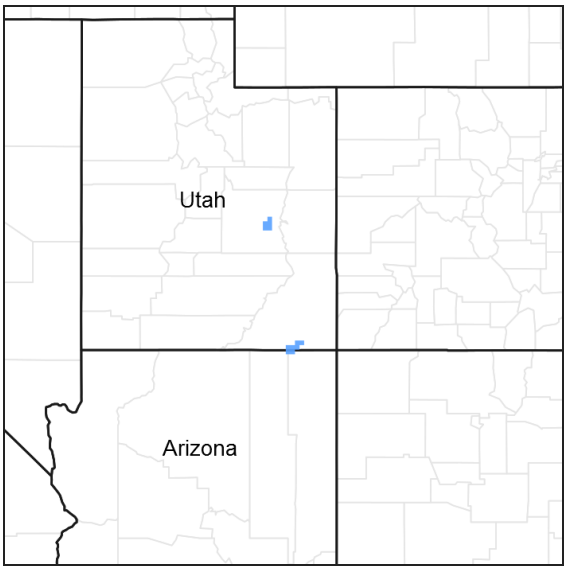


Figure 1. Mapped extent

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

This site occurs on shallow, gypsum-affected soils in the desert zone of MLRA D35 (Colorado and Green River Plateaus). It recieves 6 to 9 inches of annual precipitation, most notably as convective thunderstorms from July through October. It most commonly occurs on dipslopes and sideslopes of cuestas and structural benches. Slope is usually less than 30% and elevations range from 4100-6500 feet. The reference plant community is sparsley vegetated and dominated by Torrey's jointfir, shadscale, James' galleta, and Indian ricegrass. The reference plant community is highly resistant to change due to its inability to carry fire, along with a harsh soil environment that resists invasion and dominance by other species. Drought, however, can cause mortality in perennial grasses, and Russian thistle can establish on the site.

Classification relationships

Modal Soil: Raplee VFSL — coarse-loamy, gypsic, mesic Typic Torriorthents

Type Location: West of Comb Wash between HWY. 163 and the Mormon Trail.

Similar sites

R035XY237UT	**Semidesert Shallow Gypsum (Mormontea)** This site is also shallow, but it recieves greater than 9 inches of annual precipitation. Plant community composition is similar, but the higher precipitation results in 20-40% more production.
R035XY142UT	**Desert Very Shallow Gypsum (Torrey's Jointfir)** This site is very shallow and has very high amounts of gypsum. Composition is similar, but production is about half.
R035XY106UT	**Desert Gypsum Loam (Torrey's Jointfir)** This site has soils greater than 20 inches deep and therefore supports more perennial grass. It is more resilient against drought due to higher water holding capacity.
R035XY264UT	**Semidesert Gypsum (Torrey's Jointfir)** This site has deep soils and receives greater than 9 inches of annual precipitation. As a result, production is more than double, though composition is similar.

Table 1. Dominant plant species

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

Physiographic features

This site occurs on dipslopes of cuestas and sideslopes of structural benches. Slopes are usually less than 30% but can be as high as 70% in highly dissected areas.

Table 2. Representative physiographic features

Landforms	(1) Dip slope (2) Structural bench
Flooding frequency	None
Ponding frequency	None
Elevation	1,250–1,981 m
Slope	2–30%
Aspect	Aspect is not a significant factor

Climatic features

This site is hot in the summer and cool in the winter. Average annual precipitation is 6 to 9 inches, with about half of the precipitation occuring as convection thunderstorms from July through October. June is typically the driest month during the growing season. Precipitation is extremely variable from month to month and from year to year. Large fluctuations in daily temperatures are also common.

Modeled climate data (PRISM) was used in addition to the Weather Station data for this site.

Table 3. Representative climatic features

Frost-free period (average)	175 days
Freeze-free period (average)	200 days
Precipitation total (average)	229 mm

Influencing water features

Due to its landscape position, this site is not typically influenced by streams or wetlands. Ephemeral washes may cross this site, but these washes olny carry water during intense storms. As a result, production may increase and composition may differ near washes, but they do not support riparian-obligate vegetation.

Soil features

Soils for this site are shallow and gypsum affected. They are typically well-drained, fine sandy loams with moderately rapid permeability. These soils formed in residuum or slope aluvium derived from sandstone material high in gypsum. Rock fragments are not usually present on the soil surface or throughout the profile. The soil moisture regime is typic aridic and the soil temperature regime is mesic. Water-holding capacity ranges from 0.5 to 1.5 inches of water in the upper 40 inches of soil.

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

UT685 Capitol Reef: Goblin

Table 4. Representative soil features

Parent material	(1) Residuum–rock gypsum
Surface texture	(1) Fine sandy loam
Family particle size	(1) Loamy
Drainage class	Well drained
Permeability class	Moderately rapid
Soil depth	13–51 cm
Surface fragment cover <=3"	0–25%
Surface fragment cover >3"	0–5%
Available water capacity (0-101.6cm)	1.27–3.81 cm
Calcium carbonate equivalent (0-101.6cm)	1–5%
Electrical conductivity (0-101.6cm)	4–8 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)	0–20%
Subsurface fragment volume >3" (Depth not specified)	0–5%

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 Torrey's jointfir, shadscale, James' galleta, and Indian ricegrass. Production of James' galleta, Indian ricegrass and other perennial grasses is influenced by precipitation timing and amounts. During drought, perennial grasses may become temporarily absent from the plant community.

There is no evidence that this site historically burned on a regular basis due to very large and persistent gaps between plants. Invasive species, particulrly Russian thistle, are capable of establishing on this site, but they have

not been documented as gaining dominance.

This ecological site has been grazed by domestic livestock since they were first introduced into the area around 1860. The site is highly resistant to grazing due to the low palatability of Torrey's jointfir and the general lack of forage plants. The introduction of domestic livestock and the use of fencing and reliable water sources have therefore only minimally influenced the historic disturbance regime associated with this ecological site. Still, livestock-related disturbance may facilitate establishment of non-native species.

Suitability for rangeland seeding is very poorbecause of low annual precipitation, shallow soils, and very low available water capacity.

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

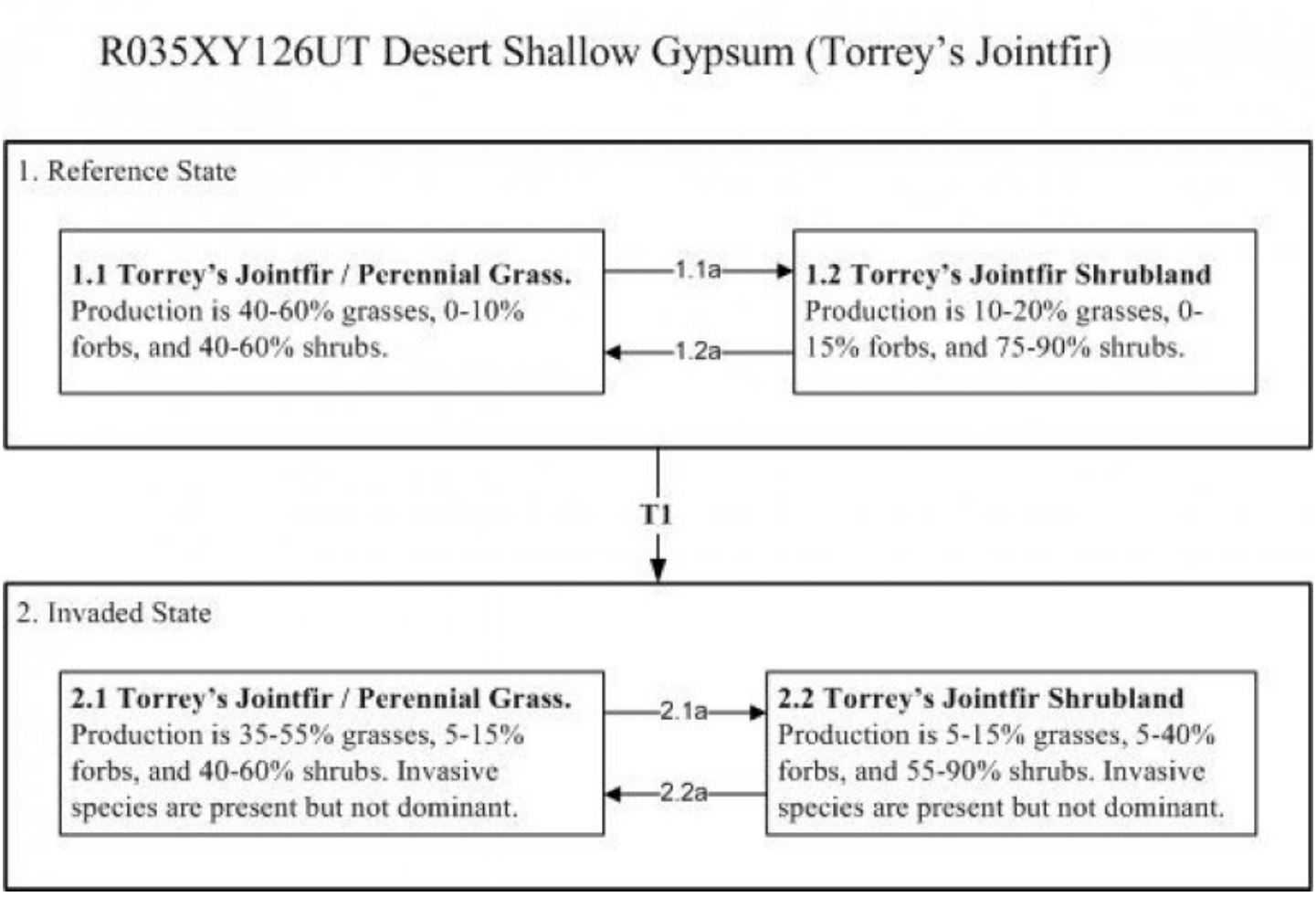


Figure 4. State-and-Transition Model

State 1
Reference State

The main driver of plant community change in the reference state is drought. In wet years, this site can support perennial grasses, particularly James' galleta and Indian ricegrass. However, due to harsh gypsum soils and low water-holding capacity, dry years can result in a loss of perennial grasses. The resillience of this site to drought conditions will be lower on shallower soils with lower water holding capacity and/or harsher soil conditions. This state is susceptible to non-native invasive species establishment. Disturbances such as livestock grazing and recreation can increase the likelihood of invasion by promoting germination sites and/or seed sources for non-native species. However, Russian thistle is capable of establishing on this site in the absense of disturbance.

Community 1.1
Torrey's jointfir Shrubland with perennial grasses.

component. NAD83 0486131 E. 4239052 N. Photo by Jake Owens, June 28, 2010.

Figure 5. Phase 1.1

This plant community phase is dominated by Torrey’s jointfir, shadscale, James' galleta, and Indian ricegrass. Galleta is typically the dominant perennial grass species. Other perennial grasses may or may not be present. Other perennial shrubs, and forbs may be present and cover is variable.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	56	84	112
Grass/Grasslike	28	56	84
Forb	6	11	17
Total	**90**	**151**	**213**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	8-15%
Grass/grasslike foliar cover	3-8%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	20-50%
Litter	2-8%
Surface fragments >0.25" and <=3"	0-30%
Surface fragments >3"	0-20%
Bedrock	0%
Water	0%
Bare ground	20-60%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-4%
>0.15 <= 0.3	–	0-10%	0-8%	0-4%
>0.3 <= 0.6	–	5-15%	0-5%	0-2%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Torrey's jointfir Shrubland.

Figure 7. 1.2

This plant community phase is dominated by Torrey's jointfir, and other shrubs. Grasses are limited or absent from the community.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	56	84	112
Forb	6	17	28
Grass/Grasslike	6	17	28
Total	**68**	**118**	**168**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	8-15%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-50%
Litter	2-8%

Surface fragments >0.25" and <=3"	5-20%
Surface fragments >3"	0-20%
Bedrock	0%
Water	0%
Bare ground	20-40%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-1%	0-3%
>0.15 <= 0.3	–	0-10%	0-5%	0-5%
>0.3 <= 0.6	–	8-20%	0-2%	–
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1A
Community 1.1 to 1.2

Torrey's jointfir Shrubland with perennial grasses.

Torrey's jointfir Shrubland.

This pathway occurs when climatic events, such as drought disfavor the establishment and persistence of perennial grasses. Improper livestock grazing and/or surface disturbance may accelerate this transition.

Pathway 1.2A
Community 1.2 to 1.1

Torrey's jointfir Shrubland.

Torrey's jointfir Shrubland with perennial grasses.

This pathway occurs when weather events, such as years with normal to above average precipitation favor the establishment and persistence of perennial grasses.

State 2
Invaded State

The invaded state resembles the reference state in both community structure and function, but non-native species, notably Russian thistle, are present. As a result, the resilience of the state is somewhat reduced and the possibility of further degradation is greater.

Community 2.1
Torrey's jointfir / Perennial grasses

Survey, Goblin soil component. NAD83 0486131 E. 4239052 N. Photo by Jake Owens, June 28, 2010.

Figure 9. Phase 2.1

This plant community is similar to Reference State Community 1.1. except that invasive species are now present. Dominant species are Torrey’s jointfir, shadscale, James' galleta and Indian ricegrass. Galleta is typically the dominant perennial grass species in this plant community phase.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	56	84	112
Grass/Grasslike	28	56	84
Forb	6	17	28
Total	**90**	**157**	**224**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	8-15%
Grass/grasslike foliar cover	3-8%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	20-50%
Litter	2-8%
Surface fragments >0.25" and <=3"	0-30%
Surface fragments >3"	0-20%
Bedrock	0%
Water	0%
Bare ground	20-60%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	0-4%
>0.15 <= 0.3	–	0-10%	0-8%	0-4%
>0.3 <= 0.6	–	5-15%	0-5%	0-2%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Torrey's jointfir with invasives

0485732 E. 4238717 N. Photo by Jake Owens, July 20, 2010.

Figure 11. Phase 2.2

This plant community is similar to Reference State Community 1.2 except that invasive species are now present. Perennial grasses are greatly reduced, and Russian thistle or other invasive annuals may take advantage of the unused resources. This phase may produce annuals, but it is still dominated by Torrey's jointfir and other native shrubs.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	56	84	112
Forb	6	17	28
Grass/Grasslike	6	17	28
Total	**68**	**118**	**168**

Table 15. Ground cover

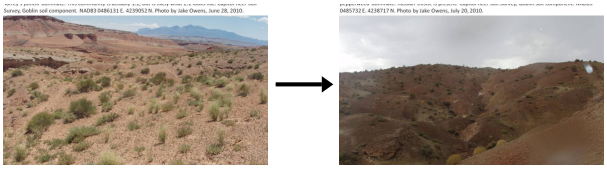
Tree foliar cover	0%
Shrub/vine/liana foliar cover	8-15%
Grass/grasslike foliar cover	0-5%
Forb foliar cover	0-5%
Non-vascular plants	0%
Biological crusts	0-50%

Litter	2-8%
Surface fragments >0.25" and <=3"	0-30%
Surface fragments >3"	0-20%
Bedrock	0%
Water	0%
Bare ground	20-40%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-1%	0-3%
>0.15 <= 0.3	–	0-10%	0-5%	0-5%
>0.3 <= 0.6	–	8-20%	0-2%	–
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 2.1A
Community 2.1 to 2.2



Torrey's jointfir / Perennial grasses

Torrey's jointfir with invasives

This pathway occurs when weather events, such as drought disfavor the establishment and persistence of perennial grasses. Improper livestock grazing and/or surface disturbance may accelerate this transition. Annuals such as Russian thistle, mustards, and cheatgrass may be able to take advantage of these conditions during short term wet spells.

Pathway 2.2A
Community 2.2 to 2.1

Torrey's jointfir with invasives

Torrey's jointfir / Perennial grasses

This pathway occurs when weather events, such as years with normal to above average precipitation favor the establishment and persistence of perennial grasses. Carefully managed livestock grazing, where present can accelerate this transition. Annual species such as Russian thistle, mustards, and cheatgrass may also increase during this period--especially if they have banked seed in the soil for many years.

Transition T1A
State 1 to 2

This transition occurs with the establishment of non-native invasive species. Disturbances that promote this transition include season long continuous grazing of perennial grasses, prolonged drought, recreation or other surface disturbances. However, invasive species such as Russian thistle can invade intact perennial plant communities with little to no disturbance. Once invasive plants are found in the plant community, a return to the reference state is not likely.

Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			56–112	
	Torrey's jointfir	EPTO	*Ephedra torreyana*	34–78	3–8
	shadscale saltbush	ATCO	*Atriplex confertifolia*	6–34	1–3
3	**Sub-dominant Shrubs**			0–56	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–22	0–2
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–22	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–11	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	Utah juniper	JUOS	*Juniperus osteosperma*	0–6	0–1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0–6	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–3	0–1
	valley saltbush	ATCU	*Atriplex cuneata*	0–3	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	0–1
Grass/Grasslike					
0	**Dominant Grasses**			28–84	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–56	1–4
	James' galleta	PLJA	*Pleuraphis jamesii*	11–56	1–4
1	**Sub-dominant Grasses**			6–22	
	Grass, annual	2GA	*Grass, annual*	0–6	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–6	0–1
	alkali sacaton	SPAI	*Sporobolus airoides*	0–6	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	0–1
	needle and thread	HECO26	*Hesperostipa comata*	0–3	0–1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–3	0–1
Forb					
2	**Forbs**			6–22	
	matted crinklemat	TILA6	*Tiquilia latior*	0–6	0–1
	woodyaster	XYLOR	*Xylorhiza*	0–6	0–1
	nakedstem sunray	ENNU	*Enceliopsis nudicaulis*	0–6	0–1

	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–6	0–1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1
	Forb, annual	2FA	*Forb, annual*	0–6	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–6	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–6	0–1
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	0–6	0–1
	redroot buckwheat	ERRA3	*Eriogonum racemosum*	0–3	0–1
	prairie sunflower	HEPE	*Helianthus petiolaris*	0–3	0–1
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–3	0–1
	rusty lupine	LUPUP	*Lupinus pusillus ssp. pusillus*	0–3	0–1
	Crescent milkvetch	ASAM5	*Astragalus amphioxys*	0–3	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–3	0–1
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–3	0–1
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–2	0–1
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–2	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–2	0–1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0–2	0–1
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–2	0–1
	blazingstar	MENTZ	*Mentzelia*	0–1	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	0–1

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			56–112	
	Torrey's jointfir	EPTO	*Ephedra torreyana*	34–78	3–8
	shadscale saltbush	ATCO	*Atriplex confertifolia*	11–34	1–3
	James' galleta	PLJA	*Pleuraphis jamesii*	0–22	–
	matted crinklemat	TILA6	*Tiquilia latior*	3–11	–
	fanleaf hawthorn	CRFL	*Crataegus flabellata*	1–6	–
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	1–6	–
3	**Sub-dominant shrubs**			0–56	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	6–22	1–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–17	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–11	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	valley saltbush	ATCU	*Atriplex cuneata*	0–3	0–1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0–3	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–3	0–1

	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	0–1
Grass/Grasslike					
1	**Grasses**			6–28	
	James' galleta	PLJA	*Pleuraphis jamesii*	2–22	0–2
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	0–1
	Grass, annual	2GA	*Grass, annual*	0–6	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–6	0–1
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–6	0–1
	needle and thread	HECO26	*Hesperostipa comata*	0–3	0–1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–3	0–1
	alkali sacaton	SPAI	*Sporobolus airoides*	0–3	0–1
Forb					
2	**Forbs**			6–28	
	nakedstem sunray	ENNU	*Enceliopsis nudicaulis*	0–9	0–1
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	0–9	0–1
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–6	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–6	0–1
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	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
	Forb, annual	2FA	*Forb, annual*	0–6	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–6	0–1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1
	matted crinklemat	TILA6	*Tiquilia latior*	0–6	0–1
	woodyaster	XYLOR	*Xylorhiza*	0–6	0–1
	stemless four-nerve daisy	TEACA2	*Tetraneuris acaulis var. acaulis*	0–3	0–1
	Crescent milkvetch	ASAM5	*Astragalus amphioxys*	0–3	0–1
	woolly locoweed	ASMO7	*Astragalus mollissimus*	0–3	0–1
	prairie sunflower	HEPE	*Helianthus petiolaris*	0–3	0–1
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–3	0–1
	rusty lupine	LUPUP	*Lupinus pusillus ssp. pusillus*	0–3	0–1
	redroot buckwheat	ERRA3	*Eriogonum racemosum*	0–3	0–1
	blazingstar	MENTZ	*Mentzelia*	0–1	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	0–1

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			56–112	
	Torrey's jointfir	EPTO	*Ephedra torreyana*	34–78	3–8

	shadscale saltbush	ATCO	*Atriplex confertifolia*	6–34	1–3
3	**Subdominant Shrubs**			0–56	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–22	0–2
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–17	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–17	0–1
	California saltbush	ATCA	*Atriplex californica*	0–6	0–1
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–6	0–1
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–3	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	0–1
Grass/Grasslike					
0	**Dominant Grasses**			28–84	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	11–56	1–4
	James' galleta	PLJA	*Pleuraphis jamesii*	11–56	1–4
1	**Subdominant Grasses**			6–22	
	Grass, annual	2GA	*Grass, annual*	0–6	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–6	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	0–1
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–3	0–1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–3	0–1
	alkali sacaton	SPAI	*Sporobolus airoides*	0–3	0–1
Forb					
2	**Forbs**			6–28	
	prickly Russian thistle	SATR12	*Salsola tragus*	0–17	0–1
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–13	0–1
	nakedstem sunray	ENNU	*Enceliopsis nudicaulis*	0–9	0–1
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	0–9	0–1
	Forb, annual	2FA	*Forb, annual*	0–6	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–6	0–1
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–6	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–6	0–1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1
	matted crinklemat	TILA6	*Tiquilia latior*	0–6	0–1
	woodyaster	XYLOR	*Xylorhiza*	0–6	0–1
	stemless four-nerve daisy	TEAC	*Tetraneuris acaulis*	0–3	0–1
	Crescent milkvetch	ASAM5	*Astragalus amphioxys*	0–3	0–1
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–3	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–3	0–1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0–3	0–1
	curlycup gumweed	GRSQ	*Grindelia squarrosa*	0–3	0–1

	prairie sunflower	HEPE	*Helianthus petiolaris*	0–3	0–1
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–3	0–1
	blazingstar	MENTZ	*Mentzelia*	0–1	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	0–1

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Shrub/Vine					
0	**Dominant Shrubs**			56–112	
	Torrey's jointfir	EPTO	*Ephedra torreyana*	34–78	3–8
	shadscale saltbush	ATCO	*Atriplex confertifolia*	6–34	1–3
	cheatgrass	BRTE	*Bromus tectorum*	6–17	–
	James' galleta	PLJA	*Pleuraphis jamesii*	0–17	–
3	**Subdominant Shrubs**			0–56	
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–17	0–1
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–17	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–6	0–1
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	0–3	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	0–1
Grass/Grasslike					
1	**Grasses**			6–28	
	James' galleta	PLJA	*Pleuraphis jamesii*	6–17	0–2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–11	0–1
	needle and thread	HECO26	*Hesperostipa comata*	0–6	0–1
	Grass, annual	2GA	*Grass, annual*	0–6	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–6	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–6	0–1
	alkali sacaton	SPAI	*Sporobolus airoides*	0–3	0–1
	sandhill muhly	MUPU2	*Muhlenbergia pungens*	0–3	0–1
Forb					
2	**Forbs**			6–28	
	prickly Russian thistle	SATR12	*Salsola tragus*	6–17	1–2
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–13	0–1
	nakedstem sunray	ENNU	*Enceliopsis nudicaulis*	0–9	0–1
	cushion buckwheat	EROV	*Eriogonum ovalifolium*	0–9	0–1
	Forb, annual	2FA	*Forb, annual*	0–6	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–6	0–1
	cleftleaf wildheliotrope	PHCR	*Phacelia crenulata*	0–6	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–6	0–1
	scarlet globemallow	SPCO	*Sphaeralcea coccinea*	0–6	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1

	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1
	matted crinklemat	TILA6	*Tiquilia latior*	0–6	0–1
	woodyaster	XYLOR	*Xylorhiza*	0–6	0–1
	stemless four-nerve daisy	TEAC	*Tetraneuris acaulis*	0–3	0–1
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–3	0–1
	Crescent milkvetch	ASAM5	*Astragalus amphioxys*	0–3	0–1
	Wright's bird's beak	COWR2	*Cordylanthus wrightii*	0–3	0–1
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–3	0–1
	roughseed cryptantha	CRFL6	*Cryptantha flavoculata*	0–3	0–1
	prairie sunflower	HEPE	*Helianthus petiolaris*	0–3	0–1
	Jones' pepperweed	LEMOJ	*Lepidium montanum var. jonesii*	0–3	0–1
	blazingstar	MENTZ	*Mentzelia*	0–1	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–1	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. Torrey's jointfir provides fair forage for cattle and sheep on winter range. When present, grasses, primarily Indian ricegrass and James galleta, provide good forage for livestock, however, these species are often not abundant enough to support many livestock. Forage composition and annual production depend largely on yearly precipitation amounts and thus provide challenges for those making livestock grazing management decisions. Regardless of class of livestock, this sites carrying capacity is always low. A lack of available drinking water, can also influence its suitability for livestock grazing. Care should be taken to maintain the native perennial grasses and shrubs present on this site because they are hard to restore one gone.

This site may serve a duel purpose by also being important habitat for wildlife species such as pronghorn antelope, mule deer, and desert bighorn sheep, and can be important for wintering areas for bighorn sheep. In many places, however, wildlife populations are small and thus have little grazing/beowsing impact on the site.

Grazing management should be based on a science based management plan that includes an on site resource inventories.

Hydrological functions

The soil is in hydrologic group D. The hydrologic curve numbers are 80 to 89 depending on the watershed condition. These soils are saturated quickly due to high infiltration rates and shallow depth; once soils are saturated, run off potential is high. Hydrologic groups are used in equations that estimate runoff from rainfall. These estimates are needed for solving hydrologic problems that arise in planning watershed-protection and flood-prevention projects and for designing structures for the use, control and disposal of water. Heavy grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire, when present, can also affect hydrology, but its affects are variable. Fire intensity, fuel type, soil, climate, and topography can each have different influences. Fires can increase areas of bare ground and hydrophobic layers that reduce infiltration and increase runoff. (National Range and Pasture Handbook, 2003).

Recreational uses

Resources that have special aesthetic and landscape values are wildflowers. Some recreation uses of this site include hiking, hunting, and horseback riding.

Wood products

None

Other products

None

Other information

--Poisonous/Toxic Plant Communities--
Toxic plants associated with this site include broom snakeweed. 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.

Other potentially toxic plants associated with this site can include 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.

Although not found on this site yet, Russian thistle is a toxic plant of concern in arid environments that could become established on this site. It can cause 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, during a period with cool/cloudy days, and on soils high in nitrogen and low in sulfur and phosphorus. 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).

--Invasive Plant Communities--
When ecological conditions deteriorate and perennial vegetation decreases due to disturbance (i.e., fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses may invade this site. Of particular concern in semi-arid environments are 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. Due to Torrey jointfir’s slow growth rate it does not compete well with invading plants after a disturbance and thus restoration efforts could be hindered.

--Fire Ecology--

The ability for an ecological site to carry fire depends primarily on its 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 a significant influence of fire. However, a year with exceptionally heavy winter rains can generate sufficient fuels for fire by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on plant communities may be extreme due to the sites harsh environment and slow rate of recovery.

Fires on Torrey jointfir ecological sites are relatively uncommon due to sparse vegetation and insufficient fuels. Its fire regime depends on the adjacent plant communities and has a wide range of return intervals. This plant generally sprouts from the roots or woody crown after fire, but it also has the capability of reestablishing through seed. While it establishes quickly after fire, its slow growth rate inhibits vigorous competition with invading annuals which could change the fire regime due to an increase in fine fuels.

Inventory data references

The data collected in 2005-2008 were in conjunction with the soil survey update for Arches and Canyonlands National Park. The vegetation data was collected in associated with a soil pit and geo-referenced. All the data is stored as hard copy files and in electronic format in the NRCS Utah State Office.

Type locality

Location 1: Wayne County, UT	
Township/Range/Section	T27 S R5 E S3
Location 2: Wayne County, UT	
UTM zone	N
UTM northing	4231962
UTM easting	583806
General legal description	Canyonlands National Park

Other references

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Contributors

George Cook
Jamin Johanson

Rangeland health reference sheet

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

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

Indicators

1. **Number and extent of rills:** A. On more gentle slopes (< 10 %): Very few typically occur on the site. B. On steeper slopes (> 10 %): Rills are common and occur throughout the site. Rills commonly extend down entire slope.

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2. **Presence of water flow patterns:** Frequent and occur throughout the area. They are expected to be slightly sinuous (wind around well formed crust and perennial plant bases), > 15 feet long, <1 foot wide, and not widely spaced (6-12 feet) and connected into drainage networks. Evidence of flow will increase with slope.

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3. **Number and height of erosional pedestals or terracettes:** Pedestals form at the base of some plants that occur on the edge of rills and water flow patterns. On steeper slopes (>10%), gullies may remove soil from the base of shrubs exposing roots that resemble pedestals. Teracettes are not present.

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** Up to 80%. Soil surface may have 0 to 35 percent rock fragments. Ground cover is based on first raindrop impact, and bare ground is the opposite of ground cover. Some soils associated with this site have more biological soil crusts and less bare ground. Ground cover + bare ground = 100%. 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:** Common. This site appears as a gullied landscape. On slopes and areas below adjacent exposed bedrock, gullies may be more numerous. Length often extends the entire slope until it reaches an area where water and sediment accumulate. Gullies are typically active, but the shoulders are muted (truncated) and have perennial vegetation establishing on them. Gully bottoms are typically active and flow during most rainfall events.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None. While there may be some evidence of wind

generated soil movement, wind caused blowouts would not be expected. Some depositional areas may exist.

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7. **Amount of litter movement (describe size and distance expected to travel):** On gentle slopes (< 10 %) most litter accumulates at base of plants moved by wind or water. Some down slope redistribution caused by water. Some litter removal may occur in flow patterns or rills with deposition occurring at points of obstruction, especially following major storm events. Litter movement will increase with slopes > 10%.

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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 5 under vegetation or biological soil crusts and a 2 to 3 in the interspaces using the soil stability kit test. Surface texture is fine sandy loam to gravelly loam. Vegetation cover, litter, biological soil crusts and surface rock reduce erosion.

---

9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is typically 3 inches deep. Structure is typically weak fine granular. Color is typically light reddish brown (2.5YR6/4). The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

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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 is naturally sparse at this site. Plants are expected to intercept raindrops reducing splash erosion and biological crust is a factor reducing raindrop splash erosion. All plants are usually distributed to slow runoff a little to allow time for some infiltration. With the physiographic location of the site being on remnant hillsides, rolling hills, pediment surfaces, alluvial fans, dissected benches and upland valley plains infiltration is somewhat reduced by slope and less plant cover. Natural erosion would be expected and especially in severe thunder storms or heavy spring runoff. 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. The associated structure is weak fine granular in the shallow A horizon with weak subangular blocky structure to gypsiferous shale in the C horizons. 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: Biological soil crusts > sprouting shrubs (Torrey jointfir)

    Sub-dominant: warm season perennial grass (Galleta) > = cool season perennial bunch grasses (Indian ricegrass) > = perennial and native annual forbs (matted crinklemat (Tiquilia latior) > = sprouting shrubs (rabbitbrush)

    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. Siberian Wheatgrass, Forage kochia etc.)

    Additional: Temporal variability factors include erosion events, drought and insects or other pathogens. Spatial variability includes adjacency to other sites that produce runoff, and topography.

Following a recent disturbance such as drought or insects that removes the woody vegetation, forbs and perennial grasses (herbaceous species) may dominate the community. These conditions would reflect a community phase within the reference state.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with above average precipitation, there should be very little recent plant mortality and decadence in either the shrubs or grasses. During severe (multi year) drought, up to 20% of the Torrey mormontea stems will die. Some mortality of perennial grass and other shrubs may also occur during severe droughts. There may be partial mortality of individual grasses and shrubs during less severe drought

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14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1 leaf thickness.

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15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 50-100 #/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:** The only species expected to invade this site are those that can tolerate high gypsum and arid conditions, none known.

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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. The highly gypsic and arid nature of this site would be expected to inhibit most successful reproduction.
