USDA Natural Resources
Conservation Service

Ecological site R035XY139UT
Desert Stony Loam (Blackbrush)

Accessed: 05/13/2025

General information

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

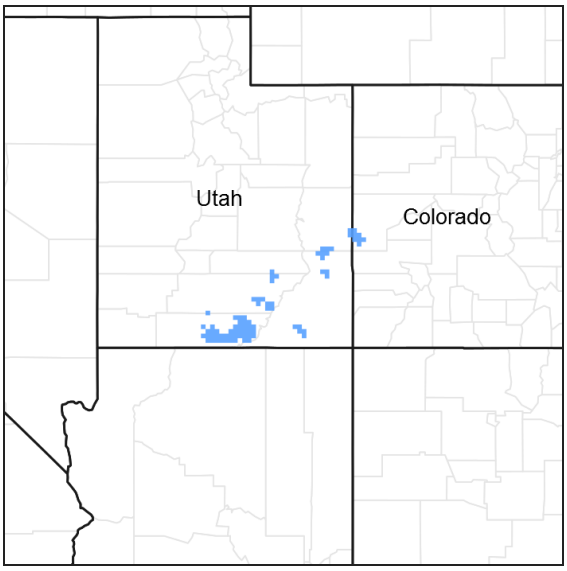


Figure 1. Mapped extent

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

MLRA notes

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

Site Concept: This site developed on stony loam soils in the desert zone of the Colorado and Green River Plateaus region of southern Utah (MLRA 35). It is most commonly found on fan remnants, plateaus, and terraces at elevations between 4,000 and 5,200 feet. Annual precipitation ranges from 7 to 10 inches, with much of the precipitation coming in the form of convective thunderstorms from July through October. Soils are deep with many rock fragments on the soil surface and throughout the profile. The soil moisture regime is aridic and the soil temperature regime is mesic. The reference plant community is dominated by blackbrush, with James' galleta as the most common understory grass species. The reference plant community is resistant to change due to the inability to carry fire and the low utilization of blackbrush.

Classification relationships

Modal Soil: Blackston GR-FSL — loamy-skeletal, mixed, mesic Typic Calciorthids

Similar sites

R035XY133UT	**Desert Shallow Sandy Loam (Blackbrush)** This has shallow, sandy soils. It produces a similar plant community, but production is higher.

Table 1. Dominant plant species

Tree	Not specified
Shrub	(1) *Coleogyne ramosissima*
Herbaceous	(1) *Pleuraphis jamesii*

Physiographic features

This site most commonly occurs on fan remnants, plateaus, and terraces; but it can also be found on canyon bottoms, hills, and structural benches. Slopes range from 2 to 50% (sometimes greater) and elevations are 4000-5200 feet. Runoff is variable, depending primarily on slope.

Table 2. Representative physiographic features

Landforms	(1) Fan remnant (2) Plateau (3) Terrace
Flooding frequency	None
Ponding frequency	None
Elevation	1,219–1,585 m
Slope	2–50%

Climatic features

The climate of this site is characterized by hot summers and cool winters. Average annual precipitation is 7 to 10 inches. Approximately 70 percent occurs as rain from March through October. June is typically the driest month during the growing season. Precipitation is extreamly variable from month to month and from year to year. Much of the summer precipitation occurs as convection thunderstorms. In average years, plants begin growth around February 20 and end growth around October 30.

Due to the lack of climate stations for this site, modeled climate data (PRISM) was used to develop this section.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	220 days
Precipitation total (average)	254 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

The characteristic soils in this site are deep loams that are high in rock fragments and well-drained. They formed in alluvium and/or colluvium derived mainly from diorite, sandstone, shale, and igneous rock. Soils are loamy-skeletal with more than 50 percent rock fragments throughout the soil profile. Water holding capacity ranges from 2 to 5 inches of water in the upper 40 inches of soil. The soil moisture regime is aridic and the soil temperature regime is mesic.

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

UT631-Henry Mtns Area: Blackston;
UT686-Escalante Grand Staircase: Dient, Nepalto, Seeg;
UT689-Glen Canyon: Dient, Moepitz family;
UT633-Canyonlands: Nepalto;
UT685-Capitol Reef: Seeg;

Table 4. Representative soil features

Parent material	(1) Alluvium–sandstone and shale (2) Colluvium–volcanic sandstone
Surface texture	(1) Very stony loam (2) Very gravelly loam (3) Gravelly fine sandy loam
Drainage class	Well drained to somewhat excessively drained
Permeability class	Moderate to moderately rapid
Soil depth	152 cm
Surface fragment cover <=3"	10–45%
Surface fragment cover >3"	15–45%
Available water capacity (0-101.6cm)	5.08–12.7 cm
Calcium carbonate equivalent (0-101.6cm)	0–15%
Electrical conductivity (0-101.6cm)	0–1 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0–4
Soil reaction (1:1 water) (0-101.6cm)	7.4–8.4
Subsurface fragment volume <=3" (Depth not specified)	10–45%
Subsurface fragment volume >3" (Depth not specified)	20–40%

Ecological dynamics

This site developed under Colorado Plateau ecological conditions and the natural influences of herbivory and climate. Blackbrush dominates all documented plant communities. Some shadscale can occur on loamier textured soils. The amount of James galleta and Indian ricegrass present is dependant on weather patterns (summer or winter precipitation). Blackbrush appears to act as a paleo-endenmic species on some sites in this MLRA and may not be able to reestablish itself after significant disturbance.

There is little evidence to indicate that this site historically maintained a short burn frequency. Large gaps between plants (very discontinuous fuels) in relic areas indicate that this site may have historically rarely burned. Until further research indicates that fire played a significient role in the ecosystem processes of this site, this ecological site description will not include fire as a disturbance in the reference state. However, due to modern disturbances such as livestock grazing and recreation, the resistance of the site to invasive species may be lower. Disturbances that create germination sites or provide a seed source for non-native invasive species can facilitate their establishment. Cheatgrass, red brome, and Russian thistle are the non-native species most likely to invade this site.

This ecological site has been grazed by domestic livestock since they were first introduced into the area around 1860. It is highly resistant to grazing due to the unpalatable nature of blackbrush and 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.

Improper livestock grazing, including season long grazing and\or heavy stocking rates, may accelerate a departure from the reference plant community. As ecological condition deteriorates, perennial grasses and jointfir decrease while yellow cryptantha, locoweed, desert trumpet, blackbrush, and snakeweed increase. Improper grazing may also increase the chance of invasion by cheatgrass, red brome and invasive annual forbs. On the Colorado Plateau, however, these species are capable of establishing themselves even in the abscence of grazing but rarely increase to a point where they dominate blackbrush communities.

Management practices that maintain or improve rangeland vegetation include prescribed grazing and the proper location of water developments. Severe drought may adversely affect the production of the herbaceous perennial vegetation.

Suitability for rangeland seeding is very poor. It is not practical to revegetate large areas of this ecological site because of the rocky soil, low annual precipitation, and in many cases steep slopes.

As vegetation communities respond to changes in management or natural influences that move them to a different ecological state, a return to previous states may not be possible without major energy inputs. 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 diagram shows some of the most commonly occurring plant communities found on this ecological site. These plant communities may not represent every possibility, but they are the most prevalent and repeatable. As more data is collected, some of these plant communities may be revised or removed, and new ones 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

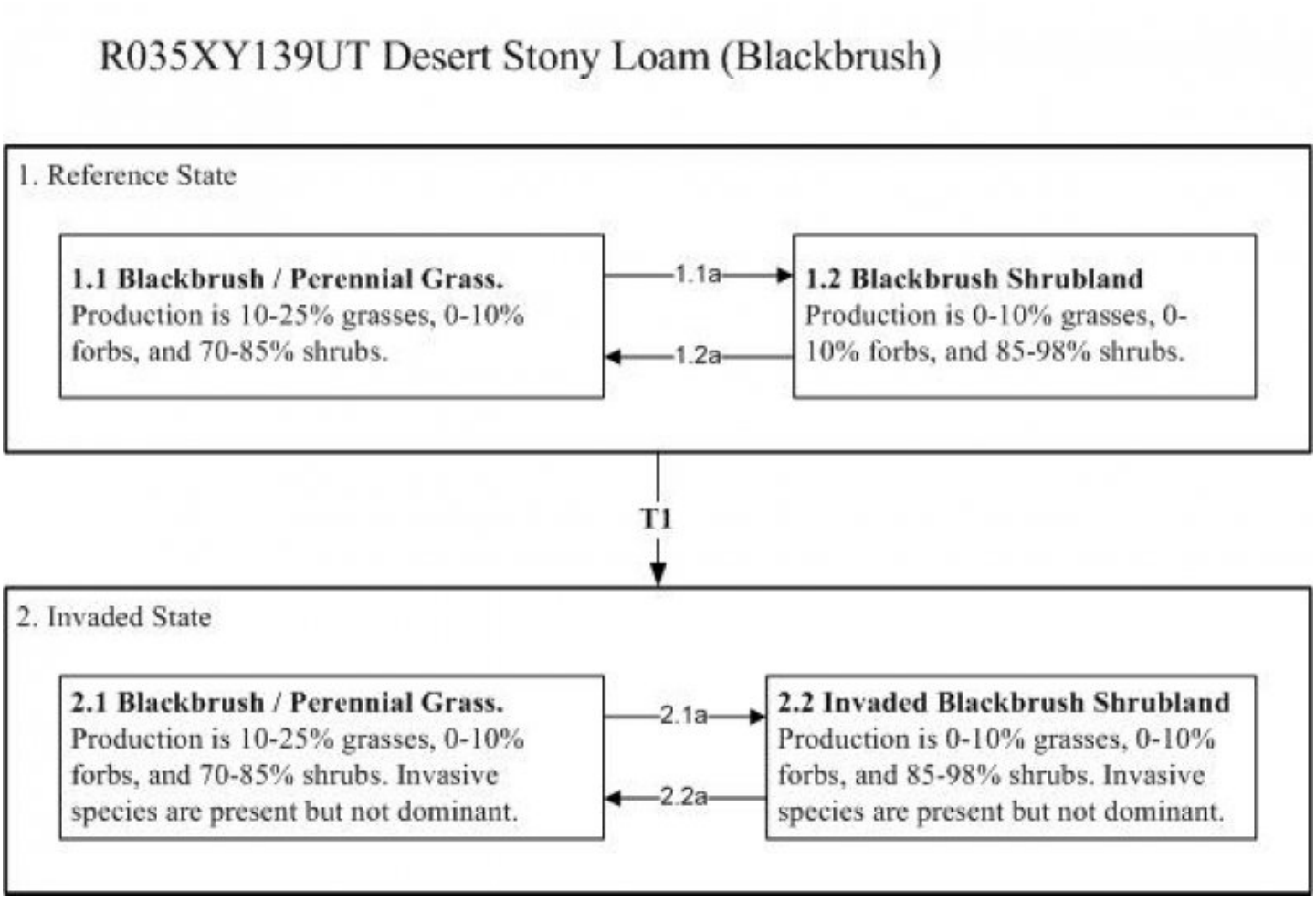


Figure 4. State-and-Transition Model

State 1

Reference State

The reference state is dominated by blackbrush, with perennial grasses present during wet periods and absent during prolonged drought. Fire is not expected to be an ecological driver in the reference state due to incontinuous fuels and the general fire-resistence of blackbrush communities. This state is susceptible to invasion by non-native invasive species, particularly cheatgrass, red brome, and Russian thistle. Once these species establish, a return to the reference state is not likely.

Community 1.1
Blackbrush / Perennial Grass

Figure 5. Phase 1.1

The dominant aspect of the plant community is blackbrush and galleta. The composition by air-dry weight is approximately 10-25 percent perennial grasses, 0-10 percent forbs and 70-85 percent shrubs.

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	140	196	252
Grass/Grasslike	28	50	73
Forb	11	22	34
Total	**179**	**268**	**359**

Table 6. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-16%
Grass/grasslike foliar cover	2-8%
Forb foliar cover	2-8%
Non-vascular plants	0%
Biological crusts	0-10%
Litter	5-15%
Surface fragments >0.25" and <=3"	10-45%
Surface fragments >3"	15-45%
Bedrock	0%
Water	0%
Bare ground	15-45%

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	–	0-5%	2-8%	2-5%
>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
Blackbrush Shrubland

Figure 7. Phase 1.2

This community phase is characterized by a blackbrush shrub canopy, where perennial grasses are mostly absent. Minor amounts of Indian ricegrass, James galleta, needle-and-thread, six weeks fescue, and dropseeds, may be present often solely located within the shrub canopy. Composition by dry weight is approximately 0-10 percent forbs, 0-10 percent grasses, and 85-98 percent shrubs.

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	140	224	308
Grass/Grasslike	6	17	28
Forb	–	6	11
Total	**146**	**247**	**347**

Table 9. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	12-20%
Grass/grasslike foliar cover	0-2%
Forb foliar cover	0-1%
Non-vascular plants	0%

Biological crusts	10-40%
Litter	2-10%
Surface fragments >0.25" and <=3"	10-45%
Surface fragments >3"	15-45%
Bedrock	0%
Water	0%
Bare ground	15-45%

Table 10. Canopy structure (% cover)

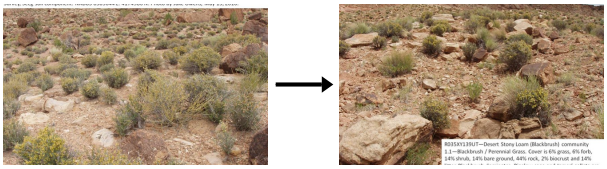
Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-2%	0-1%
>0.15 <= 0.3	–	0-5%	0-2%	0-1%
>0.3 <= 0.6	–	5-20%	–	–
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1a
Community 1.1 to 1.2

Blackbrush / Perennial Grass **Blackbrush Shrubland**

This community pathway occurs when any combination of improper livestock grazing, drought or surface disturbance reduces the amount of herbaceous vegetation on the site.

Pathway 1.2a
Community 1.2 to 1.1



Blackbrush Shrubland **Blackbrush / Perennial Grass**

This community pathway occurs when proper livestock grazing, wet weather periods and time allow for the recovery of surface disturbance which increases the amount of perennial herbaceous vegetation on the site.

State 2
Invaded State

The invaded state is similar to the reference state in plant community structure and function, however the presencs of invasive species decreases the resistance and resillience of the site to further degradataion. Due to lack of disturbed areas, the community responses to such disturbances are not documented, and are not currently included

in the state and transition model. This state is generally dominated by blackbrush. Primary disturbance mechanisms include climate fluctuations, native herbivore grazing, domestic livestock grazing, and surface disturbances such as road and pipeline development and off road vehicle (OHV) use.

Community 2.1
Blackbrush / Perennial Grass

Figure 9. Phase 2.1

This community phase is characterized by a blackbrush shrub canopy, where perennial grasses are also present. Invasive plants, primarily Cheatgrass, Red brome and/or Russian thistle are present. Commonly seen grasses include Indian ricegrass, galleta, needle-and-thread, six weeks fescue, purple threeawn, and cheatgrass. Other grasses, shrubs, and forbs may or may not be present and cover is variable.

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	140	196	252
Grass/Grasslike	28	50	73
Forb	11	22	34
Total	**179**	**268**	**359**

Table 12. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-16%
Grass/grasslike foliar cover	2-8%
Forb foliar cover	2-8%
Non-vascular plants	0%
Biological crusts	0-10%
Litter	5-15%
Surface fragments >0.25" and <=3"	10-45%
Surface fragments >3"	15-45%
Bedrock	0%
Water	0%
Bare ground	15-45%

Table 13. 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	–	0-5%	2-8%	2-5%
>0.3 <= 0.6	–	5-15%	–	–
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	–	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Invaded Blackbrush Shrubland

Figure 11. Phase 2.2

This community phase is characterized by a blackbrush shrub canopy, where perennial grasses are mostly absent. Minor amounts of Indian ricegrass, James galleta, needle-and-thread, six weeks fescue, and dropseeds, may be present often solely located within the shrub canopy. Cheatgrass, Red brome and/or Russian thistle are present. Composition by dry weight is approximately 0-10 percent forbs, 0-10 percent grasses, and 85-98 percent shrubs.

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	140	224	308
Grass/Grasslike	6	17	28
Forb	–	6	17
Total	**146**	**247**	**353**

Table 15. Ground cover

Tree foliar cover	0%
Shrub/vine/liana foliar cover	10-20%
Grass/grasslike foliar cover	0-2%
Forb foliar cover	0-1%
Non-vascular plants	0%
Biological crusts	10-40%

Litter	2-10%
Surface fragments >0.25" and <=3"	10-45%
Surface fragments >3"	15-45%
Bedrock	0%
Water	0%
Bare ground	15-45%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-2%	0-1%
>0.15 <= 0.3	–	0-5%	0-2%	0-1%
>0.3 <= 0.6	–	5-20%	–	–
>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

Blackbrush / Perennial Grass

Invaded Blackbrush Shrubland

This community pathway occurs when any combination of improper livestock grazing, drought or surface disturbance reduces the amount of perennial herbaceous vegetation on the site. This may allows for non-native invasive plants to take advantage of unused resources, further degrading the function of the site.

Pathway 2.2a
Community 2.2 to 2.1

Invaded Blackbrush Shrubland

Blackbrush / Perennial Grass

This community pathway occurs when proper livestock grazing, wet weather periods and time allow for the recovery of surface disturbance which increases the amount of perennial herbaceous vegetation on the site.

Transition T1
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**			140–252	
	blackbrush	CORA	*Coleogyne ramosissima*	140–252	8–16
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–22	0–2
3	**Sub-dominant Shrubs**			0–45	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–22	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–22	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–17	0–1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0–11	0–1
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–6	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–6	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–6	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
Grass/Grasslike					
0	**Dominant Grasses**			28–73	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–17	0–1
1	**Sub-dominant Grasses**			0–22	
	Grass, perennial	2GP	*Grass, perennial*	0–17	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–10	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–10	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–10	0–1
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–6	0–1
Forb					
2	**Forbs**			11–34	
	Forb, annual	2FA	*Forb, annual*	0–17	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–17	0–1
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	0–11	0–1
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–11	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1
	rusty lupine	LUPU	*Lupinus pusillus*	0–6	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–6	0–1
	cold-desert phlox	PHST11	*Phlox stansburyi*	0–6	0–1

	cold-desert phlox	PHGL11	*Phlox stansburyi*	0–6	0–1
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–6	0–1
	Indian paintbrush	CASTI2	*Castilleja*	0–6	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–6	0–1
	Canyonlands prairie clover	DAFL	*Dalea flavescens*	0–6	0–1
	pretty buckwheat	ERBI	*Eriogonum bicolor*	0–6	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–3	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**			140–308	
	blackbrush	CORA	*Coleogyne ramosissima*	140–308	12–20
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–22	0–2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	10–17	–
3	**Sub-Dominant Shrubs**			0–45	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–22	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–22	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–17	0–1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0–11	0–1
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–6	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
Grass/Grasslike					
1	**Grasses**			6–28	
	James' galleta	PLJA	*Pleuraphis jamesii*	0–17	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–11	0–1
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–6	0–1
	Grass, annual	2GA	*Grass, annual*	0–6	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–3	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–3	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–3	0–1
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–3	0–1
Forb					
2	**Forbs**			0–11	
	Forb, annual	2FA	*Forb, annual*	0–11	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–11	0–1
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–3	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–2	0–1

	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	0–2	0–1
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–2	0–1
	Indian paintbrush	CASTI2	*Castilleja*	0–2	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–2	0–1
	Canyonlands prairie clover	DAFL	*Dalea flavescens*	0–2	0–1
	pretty buckwheat	ERBI	*Eriogonum bicolor*	0–2	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	0–1
	rusty lupine	LUPU	*Lupinus pusillus*	0–2	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–2	0–1
	cold-desert phlox	PHST11	*Phlox stansburyi*	0–2	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**			140–252	
	blackbrush	CORA	*Coleogyne ramosissima*	140–252	8–16
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–22	0–2
3	**Sub-dominant shrubs**			0–45	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–22	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–22	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–17	0–1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0–11	0–1
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	0–1
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–6	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–6	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
Grass/Grasslike					
0	**Dominant Grasses**			28–73	
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–17	0–1
1	**Sub-dominant Grasses**			0–22	
	Grass, perennial	2GP	*Grass, perennial*	0–17	0–1
	red brome	BRRU2	*Bromus rubens*	0–11	0–1
	cheatgrass	BRTE	*Bromus tectorum*	0–11	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–10	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–10	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–10	0–1
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–6	0–1
Forb					

2	**Forbs**			11–34	
	Forb, annual	2FA	*Forb, annual*	0–17	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–17	0–1
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	0–11	0–1
	prickly Russian thistle	SATR12	*Salsola tragus*	0–11	0–1
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–11	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–6	0–1
	rusty lupine	LUPU	*Lupinus pusillus*	0–6	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–6	0–1
	cold-desert phlox	PHST11	*Phlox stansburyi*	0–6	0–1
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–6	0–1
	Indian paintbrush	CASTI2	*Castilleja*	0–6	0–1
	Fendler's lipfern	CHFE2	*Cheilanthes fendleri*	0–6	0–1
	Canyonlands prairie clover	DAFL	*Dalea flavescens*	0–6	0–1
	pretty buckwheat	ERBI	*Eriogonum bicolor*	0–6	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–3	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**			140–308	
	blackbrush	CORA	*Coleogyne ramosissima*	140–308	12–20
	Torrey's jointfir	EPTO	*Ephedra torreyana*	3–22	0–2
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	10–17	–
3	**Sub-dominant Shrubs**			0–45	
	Shrub (>.5m)	2SHRUB	*Shrub (>.5m)*	0–22	0–2
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–22	0–2
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–17	0–1
	crispleaf buckwheat	ERCOA	*Eriogonum corymbosum var. aureum*	0–11	0–2
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	0–11	0–1
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–6	0–1
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	0–6	0–1
	fourwing saltbush	ATCA2	*Atriplex canescens*	0–6	0–1
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–3	0–1
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–3	0–1
Grass/Grasslike					
1	**Grasses**			6–28	
	James' galleta	PLJA	*Pleuraphis jamesii*	0–17	0–1
	Grass, annual	2GA	*Grass, annual*	0–11	0–1
	Grass, perennial	2GP	*Grass, perennial*	0–11	0–1
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	0–6	0–1
	red brome	BRRU2	*Bromus rubens*	0–6	0–1

	red brome	BRRU2	*Bromus rubens*	0–6	0–1
	cheatgrass	BRTE	*Bromus tectorum*	0–6	0–1
	squirreltail	ELEL5	*Elymus elymoides*	0–3	0–1
	sand dropseed	SPCR	*Sporobolus cryptandrus*	0–3	0–1
	sixweeks fescue	VUOC	*Vulpia octoflora*	0–3	0–1
	purple threeawn	ARPU9	*Aristida purpurea*	0–3	0–1
Forb					
2	**Forbs**			0–17	
	Forb, annual	2FA	*Forb, annual*	0–17	0–1
	Forb, perennial	2FP	*Forb, perennial*	0–11	0–1
	prickly Russian thistle	SATR12	*Salsola tragus*	0–11	0–1
	gooseberryleaf globemallow	SPGR2	*Sphaeralcea grossulariifolia*	0–3	0–1
	desert princesplume	STPI	*Stanleya pinnata*	0–2	0–1
	Mojave woodyaster	XYTO2	*Xylorhiza tortifolia*	0–2	0–1
	snowball sand verbena	ABFR2	*Abronia fragrans*	0–2	0–1
	Indian paintbrush	CASTI2	*Castilleja*	0–2	0–1
	Fendler's sandmat	CHFE3	*Chamaesyce fendleri*	0–2	0–1
	Canyonlands prairie clover	DAFL	*Dalea flavescens*	0–2	0–1
	pretty buckwheat	ERBI	*Eriogonum bicolor*	0–2	0–1
	desert trumpet	ERIN4	*Eriogonum inflatum*	0–2	0–1
	rusty lupine	LUPU	*Lupinus pusillus*	0–2	0–1
	tufted evening primrose	OECA10	*Oenothera caespitosa*	0–2	0–1
	cold-desert phlox	PHST11	*Phlox stansburyi*	0–2	0–1

Animal community

--Livestock and Wildlife Grazing--

This site provides poor/fair grazing conditions for livestock due to the high tannins, and low available nutrition in blackbrush. However is has relatively high importance for winter livestock grazing due to the preferable climate. For goats, the grazing value is increased (fair to good). For any class of livestock, the carrying capacity is always low. This site 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 desert bighorn sheep and pronghorn antelope ranges, and can be important winter areas for bighorn sheep. However, in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily shrubs, with the majority of canopy cover being attributed to blackbrush; sub dominants include shadscale, fourwing saltbush, broom snakeweed, and Torrey jointfir. These shrubs provide good year round browse for cattle, sheep, goats, bighorn sheep, and pronghorn antelope. When present, grasses, primarily Indian ricegrass and galleta, provide fair year round grazing conditions for horses, cattle, sheep, and bighorn sheep. 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.

West, N. E. 1983. Colorado plateau-Mohavian blackbrush semi-desert. In: West, Neil E., ed. Temperate deserts and semi-deserts. New York: Elsevier Scientific Publishing Company: 399-411. (Goodall, David W., ed. in chief; Ecosystems of the world; vol. 5). [2508]

Hydrological functions

The soil is in hydrologic group b. The runoff curve numbers are 61 through 79 depending on the condition of the watershed.

Recreational uses

Recreation values are hiking and hunting.

Wood 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. P

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 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. At this time, in most of the Colorado Plateau area, cheatgrass is not known to invade blackbrush associations as it does in areas of southwest Utah and the Mojave.

--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 communities in the Colorado Plateau may have evolved without the influence of fire. However a year of exceptionally heavy winter rains can generate fuels by producing heavy stands of annual forbs and grasses. When fires do occur, the effect on the plant community may be extreme due to the harsh environment and slow rate of recovery.

The fire regime for blackbrush is not well understood due to few species in the association that show fire scars and can be aged. Research has noted that a burned blackbrush site in Arizona has recovered, and in Nevada, fire in blackbrush communities has increased forage diversity. In these areas, a fire return interval has been suggested at 35-100 years. However, communities in southeastern Utah do not show evidence of burning within that time frame. This ecological site is comprised of dense to scattered low stature blackbrush plants with bare interspaces to patchy occurrence of grasses, which is unlikely to carry a fire unless under high winds, high temperature, and low humidity. Blackbrush is a non-sprouter and is slow to re-establish on burned sites. Studies indicate that blackbrush sites do not recover well in Utah. So currently burning is not a recommended brush management tool. Because of the apical dominance trait, removal through grazing or mechanical treatment will increase sprouting/new growth. If at sometime there are species that can be used successfully to re-vegetate the community, then mechanical treatment could be used. Of caution, blackbrush is thought to be very flammable due to the dense spacing of the brush and the tinder-like nature, and resinous foliage. So, if annual grasses or forbs dominate the area after disturbance, re-vegetating efforts could be hampered due to several factors including an increase in fire frequency.

--References--

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

USDA, Forest Service. 2007. Fire effects information: plant species life form. Available at http://www.fs.fed.us/database/feis/plants/index.html. Accessed 7 August 2007.

Other references

Anderson, Michelle D. 2001. Coleogyne ramosissima. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ [2012, September 6].

Contributors

George Cook
Jamin Johanson

Rangeland health reference sheet

Interpreting Indicators of Rangeland Health is a qualitative assessment protocol used to determine ecosystem condition based on benchmark characteristics described in the Reference Sheet. A suite of 17 (or more) indicators are typically considered in an assessment. The ecological site(s) representative of an assessment location must be

known prior to applying the protocol and must be verified based on soils and climate. Current plant community cannot be used to identify the ecological site.

Author(s)/participant(s)	Robert D. Stager (BLM), Shane A. Green (NRCS), Dana Truman (NRCS), Randy Beckstrand (BLM), Paul Curtis (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	Annual Production

Indicators

1. **Number and extent of rills:** Rare. Any rills are most likely to form below adjacent exposed bedrock or where water flow patterns converge to produce sufficient water accumulates to cause erosion.

---

2. **Presence of water flow patterns:** Frequent and occur throughout area. Flow patterns are short and sinuous and wind between the surface rocks and plant bases. They are short (up to 10 feet), narrow (under 6 inches wide), and spaced 7 to 15 feet apart.

---

3. **Number and height of erosional pedestals or terracettes:** Very Rare. Any pedestalled plants may show very minor (<.5 inch) pedestalling on their down slope side, or adjacent to water flow patterns. Terracettes should be few where debris and litter obstructs water flow patterns.

---

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 30-80% rock). Ground cover is measured as first raindrop impact, bare ground is the inverse of cover. 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.

---

5. **Number of gullies and erosion associated with gullies:** None to very rare. If present, concentrated flows from adjacent sites (such as exposed bedrock) are the cause. Length may extend from exposed bedrock until gully reaches a stream or an area where water and sediment accumulate, and gullies may be wide and shallow and armored with very large rocks.

---

6. **Extent of wind scoured, blowouts and/or depositional areas:** Very minor evidence of wind generated soil movement Short coppice dunes may accumulate, especially under Blackbrush plants. Wind caused blowouts are not present.

---

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

Wind removes most fine (grass) litter.

---

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 to 4 under plant canopies and a rating of 3 to 4 in the interspaces using the soil stability kit test. The average should be a 4. Surface texture is fine sandy loam to very gravelly sandy clay loam.

---

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 medium platy to moderate or weak medium or fine granular. Color is typically yellowish red (5YR5/6) to very pale brown (10YR7/3). The A horizon would be expected to be more strongly developed under plant canopies. It is important if you are sampling to observe the A horizon under plant canopies as well as the interspaces. Use the specific information for the soil you are assessing found in the published soil survey to supplement this description.

---

10. **Effect of community phase composition (relative proportion of different functional groups) and spatial distribution on infiltration and runoff:** Distribution of vascular plants is expected to intercept some raindrops reducing splash erosion somewhat. Vegetation distribution along with surface rocks help create sinuous water flow patterns to reduce or eliminate runoff and erosion in all but the most extreme storm events. Plants have even distribution across the site. Where present, 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.

---

11. **Presence and thickness of compaction layer (usually none; describe soil profile features which may be mistaken for compaction on this site):** None. There may be layers of calcium carbonate or other naturally occurring hard layers found in the soil subsurface. These should not be considered to be compaction layers.

---

12. **Functional/Structural Groups (list in order of descending dominance by above-ground annual-production or live foliar cover using symbols: >>, >, = to indicate much greater than, greater than, and equal to):**

    Dominant: Non-sprouting shrubs (Blackbrush) > Warm season perennial bunchgrasses (Galleta)

    Sub-dominant: sprouting shrubs (Torrey jontfir, Bigelow sage) >= Cool season perennial bunchgrasses (Indian ricegrass, Squirreltail) > native perennial and annual forbs > Biological soil crusts

    Other: Functional/structural groups may appropriately contain non-native species if their ecological function is the same as the native species in the reference state (e.g. Siberian Wheatgrass, Forage kochia etc.)Biological soil crust is variable in its expression where present on this site and is measured as a component of ground cover.
    Forbs can be expected to vary widely in their expression in the plant community based upon departures from average growing conditions.

    Additional: Temporal variability factors include insects, drought, and very infrequent fire. Spatial variability factors include amount and size of rock fragments, slope, etc.
    Following a recent disturbance 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 reflect a

community phase within the reference state.

---

13. **Amount of plant mortality and decadence (include which functional groups are expected to show mortality or decadence):** During years with average to above-average precipitation, there should be very little recent mortality or decadence apparent in either the shrubs or grasses. During severe (multi-year) drought up to 20% of the blackbrush stems may die. Some mortality of bunchgrass and other shrubs may also occur during severe droughts, particularly on the shallower and coarser soils associated with this site. There may be partial mortality of individual bunchgrasses and other shrubs during less severe drought. Because woody stems may persist for many years, blackbrush will normally have dead stems within the plant canopy. Blackbrush will drop its leaves when water stressed.

---

14. **Average percent litter cover (%) and depth (in):** Litter cover (including under plants) nearly all of which should be fine litter. Depth should be 1 leaf thickness in the interspaces and up to ¼" under canopies. Litter cover may increase up to 20% immediately following leaf drop. Litter redistribution following natural extreme runoff events can reduce litter cover by concentrating it in low-lying areas. Litter cover may increase to 10-15% followings seasons with above average production due to a high production of annuals.

---

15. **Expected annual annual-production (this is TOTAL above-ground annual-production, not just forage annual-production):** 200-300 #/acre on an average year

---

16. **Potential invasive (including noxious) species (native and non-native). List species which BOTH characterize degraded states and have the potential to become a dominant or co-dominant species on the ecological site if their future establishment and growth is not actively controlled by management interventions. Species that become dominant for only one to several years (e.g., short-term response to drought or wildfire) are not invasive plants. Note that unlike other indicators, we are describing what is NOT expected in the reference state for the ecological site:** Cheatgrass, Russian thistle, and other introduced annual forbs are most likely to invade this site.

---

17. **Perennial plant reproductive capability:** All perennial plants should have the ability to reproduce sexually or asexually in all years, except in drought years. Blackbrush reproduction is naturally very episodic and no young plants may be apparent.
