USDA Natural Resources
Conservation Service

Ecological site R035XY235UT
Semidesert Very Shallow Gravelly Loam (Utah Juniper)

Accessed: 05/18/2024

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.

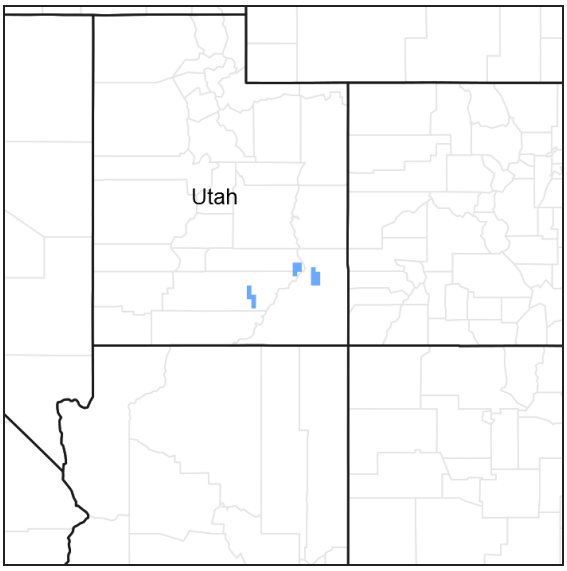


Figure 1. Mapped extent

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 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

R035XY236UT	**Semidesert Shallow Sandy Loam (Utah Juniper, Blackbrush)**

Similar sites

R035XY233UT	**Semidesert Shallow Sandy Loam (Blackbrush)**
R035XY236UT	**Semidesert Shallow Sandy Loam (Utah Juniper, Blackbrush)**

Table 1. Dominant plant species

Tree	(1) *Juniperus osteosperma*

Shrub	(1) *Coleogyne ramosissima* (2) *Eriogonum corymbosum*
Herbaceous	(1) *Achnatherum hymenoides* (2) *Pleuraphis jamesii*

Physiographic features

This ecological site occurs on structural benches and mesas. Areas that express characteristics true to the ESD concept are typically 4900 to 6600 ft in elevation. Slopes are typically 2-30 percent.

Table 2. Representative physiographic features

Landforms	(1) Structural bench (2) Mesa
Elevation	1,433–2,012 m
Slope	2–30%

Climatic features

The climate is characterized by hot summers and cool winters, which can be slightly modified by local topographic conditions, such as aspect. Large fluctuations in daily temperature are common. Mean annual temperatures range from 50 to 56 degrees Fahrenheit. Approximately 70-75% of moisture occurs as rain from October-March as convection thunderstorms and snow. Precipitation is variable from month to month and from year to year but averages between 8-11 inches. Snow packs are generally light and not persistent.

Table 3. Representative climatic features

Frost-free period (average)	180 days
Freeze-free period (average)	204 days
Precipitation total (average)	330 mm

Influencing water features

Due to extreme distance from water, there are no water features influencing this site.

Soil features

The soils are very shallow to shallow, gravelly, and well drained. These soils are typically residuum weathered from sandstone and shale. Runoff is high. The soils temperature and moisture regimes are mesic and ustic aridic respectively. Some biological crusts may be present on the surface, but not in the large quantities found in the Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush) (R035XY236UT).

UT685 - Capitol Reef - Reef;
UT687 — Arches National Park — Reef;

Table 4. Representative soil features

Parent material	(1) Residuum–sandstone and shale
Surface texture	(1) Very gravelly coarse sand
Family particle size	(1) Loamy
Drainage class	Well drained

Permeability class	Moderately rapid
Soil depth	10–43 cm
Surface fragment cover <=3"	0–50%
Surface fragment cover >3"	0%
Available water capacity (0-101.6cm)	0.51–0.76 cm
Calcium carbonate equivalent (0-101.6cm)	10–40%
Electrical conductivity (0-101.6cm)	0–2 mmhos/cm
Sodium adsorption ratio (0-101.6cm)	0
Soil reaction (1:1 water) (0-101.6cm)	7.9–9
Subsurface fragment volume <=3" (Depth not specified)	0%
Subsurface fragment volume >3" (Depth not specified)	0%

Ecological dynamics

This site developed under Colorado Plateau ecological conditions and the natural influences of herbivory, and climate; however due to the remote location, broken topography, and lack of perennial water sources this area rarely served as habitat for large herds of native herbivores. This site's plant species composition is generally dominated by Utah juniper, blackbrush, and twoneedle pinyon. This site typically lacks diverse biological crusts, however, some crusts may be found in areas with fewer surface gravels. Along with the lower production of this site, the lack of crusts distinguishes it from the Semidesert Shallow Sandy Loam (Utah Juniper-Blackbrush) site (R035XY236UT). There is no evidence to indicate that this site historically maintained a short burn frequency. Until further research indicates that fire played a role in the ecosystem processes of this site, this state and transition model will not include fire as a disturbance in the reference state. However, due to modern disturbances such as brush treatments, invasive species, and OHV use, the resilience of the plant communities may be at risk. Disturbances that reduce the presence of blackbrush result in an opportunity for invasive annuals to enter into the system and may produce a fuel load for fire to become an ecological driver.

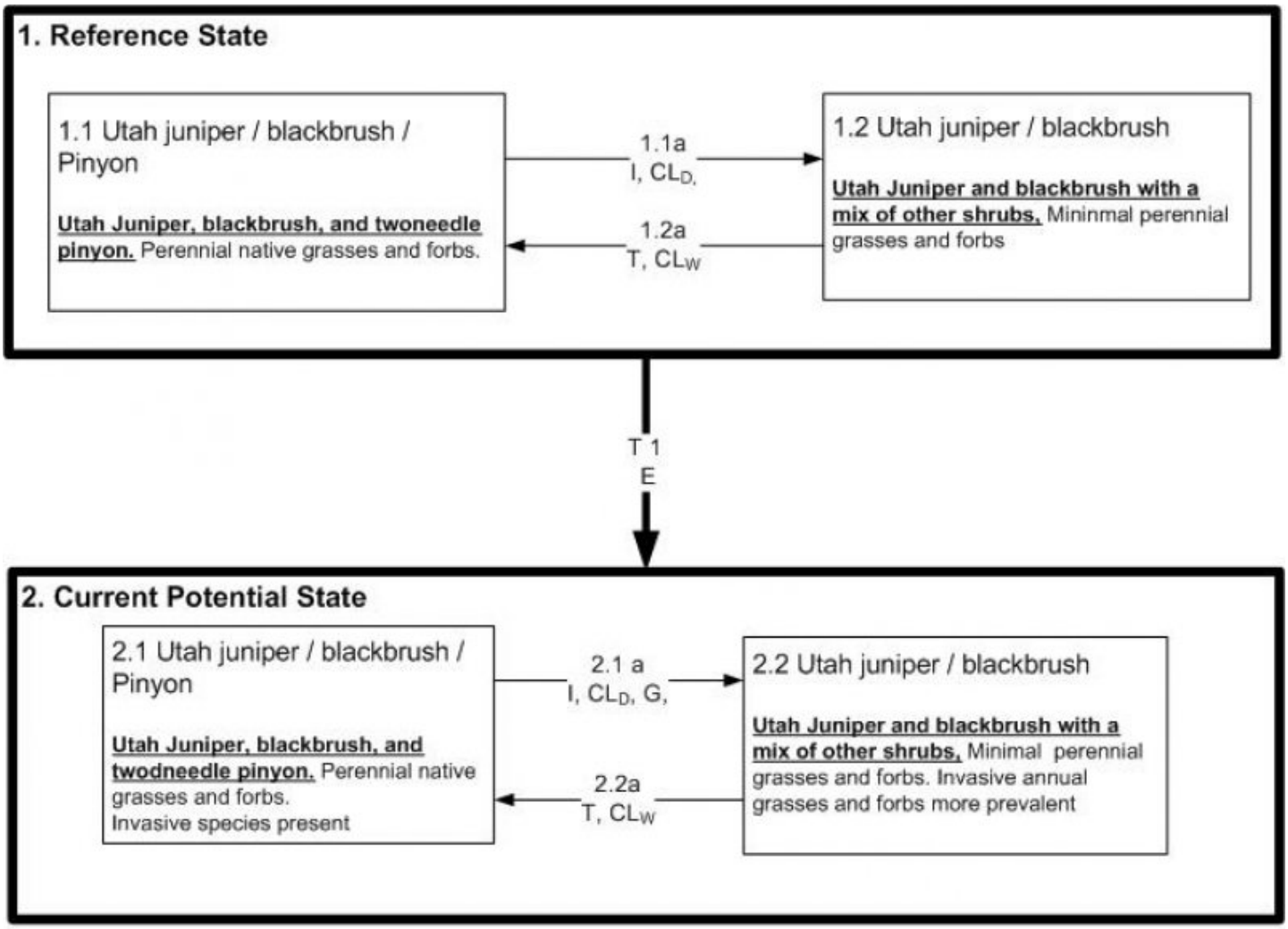
Pinyon and Juniper communities throughout the West have received a lot of attention because many areas have experienced increases in the spatial extent and density of trees (Miller and Wigand, 1994). However, as evidenced by this site, encroachment of Utah juniper and pinyon is not a concern in some blackbrush communities. In this site, pinyon and juniper do not encroach and become dominant. Rather the blackbrush remains a major component of this site with some pinyons and junipers present. This site continues to function similar to a blackbrush site.

Drought and insects appear to be the main driving factors in many of the Pinyon/Juniper communities. Betancourt et al. (1993), noted that Pinyon and Juniper woodlands in the southwest appear to be more susceptible to large die offs during droughts, than in other locations. As severe droughts persist, the Pinyon trees, being more susceptible to drought and insects, seem to die out, while the Utah juniper trees survive.

As vegetation communities respond to changes in management or natural occurrences, thresholds can be crossed, which usually means that a return to the previous state may not be possible. The amount of energy input needed to affect vegetative shifts depends on the present biotic and abiotic features and the desired results. The following diagram does not necessarily depict all the transition and states that this site may exhibit, but it does show some of the most common plant communities that can occur on the site and the transition pathways among the communities. These plant communities may not represent every possibility, but they are the most prevalent and repeatable. As more data is collected, some of these plant communities will be revised or removed, and new ones may be added. None of these plant communities should necessarily be thought of as the desired plant community. The main purpose for including any description of a plant community here is to capture the current knowledge and experience

at the time of this revision.

State and transition model



Legend

CL_D = Climate, drought period CL_M = Climate, wet period
G = Continuous season long grazing of perennial plants
I = Insect infestation
T = Time without disturbance
E = Establishment of non-native species
S = Surface disturbance, i.e. recreational use, OHV, hoof action, ect

State 1
Reference State

This state includes the biotic communities that become established on the ecological site if all successional sequences are completed under the natural disturbance regimes. The reference state is generally dominated by blackbrush, Utah juniper, and twoneedle pinyon, however depending on disturbance history, native grasses, forbs, or other shrubs may occupy significant composition in the plant community. The primary disturbance mechanism is climate fluctuation. During long periods of drought, this site may lose the two-needle pinyon (phase 1.2). 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 variable. Typically, in the reference state this site will fluctuate between community phases 1.1 and 1.2; however once invasive plants establish, return to these community phases may not be possible. Reference State: Plant

communities influenced by insect herbivory, and climate fluctuations. Indicators: A community dominated by Utah juniper and blackbrush where twoneedle pinyon and native perennial grasses and forbs may or may not be present. Feedbacks: Natural fluctuations in climate that allow for a self sustaining juniper-blackbrush and native grass community. Insect herbivory, more frequent fire, or other disturbances that may allow for the establishment of invasive species. At-risk Community Phase: All communities are at risk when native plants are stressed and nutrients become available for invasive plants to establish. Trigger: The establishment of invasive plant species.

Community 1.1
Utah juniper / Blackbrush / Pinyon

This community phase is characterized by a Utah juniper, pinyon, and blackbrush upper canopy. In the lower canopy, commonly seen grasses include Indian ricegrass, galleta, and needleandthread. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Air dry composition of this site is approximately 10 percent forbs, 15 percent grasses, and 75 percent shrubs and trees. Bare ground is variable (7-30%) depending on biological crust cover, which is also variable (0-30%) and surface rock fragments (0-30%).

Table 5. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	27	112	202
Tree	11	34	78
Grass/Grasslike	6	28	45
Forb	6	11	22
Total	**50**	**185**	**347**

Table 6. Ground cover

Tree foliar cover	3-13%
Shrub/vine/liana foliar cover	11-16%
Grass/grasslike foliar cover	0-8%
Forb foliar cover	2-8%
Non-vascular plants	0%
Biological crusts	0-30%
Litter	3-5%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-30%
Bedrock	0-10%
Water	0%
Bare ground	7-30%

Table 7. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	2-5%
>0.15 <= 0.3	–	10-20%	0-5%	0-5%
>0.3 <= 0.6	–	5-15%	0-5%	0-5%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	3-13%	–	–	–
>4 <= 12	3-13%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 1.2
Utah juniper / Blackbrush

This community phase is generally represented by a Utah juniper and blackbrush overstore with only a minor component of Pinyon, if any. Dominant perennial grasses include Indian ricegrass and galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Air dry composition of this site is approximately 10 percent forbs, 15 percent grasses, and 75 percent shrubs and trees. Bare ground is variable (7-30%) depending on biological crust cover, which is also variable (0-30%) and surface rock fragments (0-30%).

Table 8. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	27	112	202
Tree	11	34	78
Grass/Grasslike	6	28	45
Forb	6	11	22
Total	**50**	**185**	**347**

Table 9. Ground cover

Tree foliar cover	3-13%
Shrub/vine/liana foliar cover	11-16%
Grass/grasslike foliar cover	0-8%
Forb foliar cover	2-8%
Non-vascular plants	0%
Biological crusts	0-30%
Litter	3-5%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-30%
Bedrock	0-10%
Water	0%
Bare ground	7-30%

Table 10. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	2-5%
>0.15 <= 0.3	–	10-20%	0-5%	0-5%
>0.3 <= 0.6	–	2-15%	0-5%	0-5%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	3-13%	–	–	–
>4 <= 12	3-13%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 1.1a
Community 1.1 to 1.2

Insect herbivory coupled with long-term drought. During periods of long-term drought, Pinyon trees are susceptible to insect infestations. Insect herbivory decreases the amount on Pinyon in the community. In addition to adversely affecting Pinyon establishment and persistence, drought can also reduce perennial bunchgrass production and eventually eliminate them from the system.

Pathway 2.1a
Community 1.2 to 1.1

If enough time and a moist climate persist, twoneedle pinyons may reestablish, and perennial bunch grasses may increase.

State 2
Current Potential State

The current potential state is similar to the reference state; however invasive species are present in all community phases. This state is generally dominated by Utah juniper, twoneedle pinyon, and blackbrush, however depending on disturbance history, native grasses, forbs, or other shrubs may dominate the site. Primary disturbance mechanisms include climate fluctuations, insect herbivory, domestic livestock grazing, and surface disturbances such as road and pipeline development and off road vehicle (OHV) use. 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. The current potential state is still self sustaining; but is losing resistance to change due to lower resistance to disturbances and lower resilience following disturbances, and new drastic disturbances such as fire being more likely to occur. Typically in the current potential state this site will fluctuate between community phases 2.1 and 2.2. Current Potential State: Plant communities influenced by insect herbivory, climate fluctuations, and surface disturbances. Indicators: A community dominated by Utah juniper and blackbrush where twoneedle pinyon and native perennial grasses and forbs may or may not be present. Invasive grasses and forbs are present. Feedbacks: Natural fluctuations in climate that allow for a self sustaining juniper-blackbrush and grass community.

Community 2.1
Utah juniper / Blackbrush / Pinyon

This community phase is characterized by a Utah juniper, pinyon, and blackbrush upper canopy. In the lower canopy, commonly seen grasses include Indian ricegrass, galleta, and needleandthread. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Some annual grasses and forbs including invasive species are present. Air dry composition of this site is approximately 10 percent forbs, 15 percent grasses, and 75 percent shrubs and trees. Bare ground is variable (7-30%) depending on biological crust cover, which is also variable (0-30%) and surface rock fragments (0-30%).

Table 11. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	27	112	202
Tree	11	34	78
Grass/Grasslike	6	28	45
Forb	6	11	22
Total	**50**	**185**	**347**

Table 12. Ground cover

Tree foliar cover	3-13%
Shrub/vine/liana foliar cover	11-16%
Grass/grasslike foliar cover	0-8%
Forb foliar cover	2-8%
Non-vascular plants	0%
Biological crusts	0-30%
Litter	3-5%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-30%
Bedrock	0-10%
Water	0%
Bare ground	7-30%

Table 13. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	2-5%
>0.15 <= 0.3	–	10-20%	0-5%	0-5%
>0.3 <= 0.6	–	5-15%	0-5%	0-5%
>0.6 <= 1.4	3-13%	0-5%	–	–
>1.4 <= 4	3-13%	–	–	–
>4 <= 12	–	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Community 2.2
Utah juniper / blackbrush

This community phase is generally represented by a Utah juniper and blackbrush overstore with only a minor component of Pinyon, if any. Dominant perennial grasses include Indian ricegrass and galleta. Other perennial grasses, shrubs, and forbs may or may not be present and cover is variable. Some annual grasses and forbs including invasive species are present. . Bare ground is variable (7-30%) depending on biological crust cover, which is also variable (0-30%) and surface rock fragments (20-50%).

Table 14. Annual production by plant type

Plant Type	Low (Kg/Hectare)	Representative Value (Kg/Hectare)	High (Kg/Hectare)
Shrub/Vine	27	112	202
Tree	11	34	78
Grass/Grasslike	6	28	45
Forb	6	11	22
Total	**50**	**185**	**347**

Table 15. Ground cover

Tree foliar cover	3-13%
Shrub/vine/liana foliar cover	11-16%
Grass/grasslike foliar cover	0-8%
Forb foliar cover	2-8%
Non-vascular plants	0%
Biological crusts	0-30%
Litter	3-5%
Surface fragments >0.25" and <=3"	0%
Surface fragments >3"	0-30%
Bedrock	0-10%
Water	0%
Bare ground	7-30%

Table 16. Canopy structure (% cover)

Height Above Ground (M)	Tree	Shrub/Vine	Grass/ Grasslike	Forb
<0.15	–	0-5%	0-5%	2-5%
>0.15 <= 0.3	–	10-20%	0-5%	0-5%
>0.3 <= 0.6	–	5-15%	0-5%	0-5%
>0.6 <= 1.4	–	0-5%	–	–
>1.4 <= 4	3-13%	–	–	–
>4 <= 12	3-13%	–	–	–
>12 <= 24	–	–	–	–
>24 <= 37	–	–	–	–
>37	–	–	–	–

Pathway 2.1a
Community 2.1 to 2.2

Insect herbivory coupled with long-term drought. During periods of long-term drought, pinyon trees are susceptible to insect infestations. Insect herbivory decreases the amount on Pinyon in the community. In addition to adversely affecting Pinyon establishment and persistence, drought can also reduce perennial bunchgrass production and eventually eliminate them from the system.

Pathway 2.2a
Community 2.2 to 2.1

If enough time and a moist climate persist, twoneedle pinyons may reestablish, and perennial bunch grasses may

increase.

Additional community tables

Table 17. Community 1.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			11–78	
	twoneedle pinyon	PIED	*Pinus edulis*	6–45	–
	Utah juniper	JUOS	*Juniperus osteosperma*	6–34	–
Shrub/Vine					
0	**Dominant Shrubs**			4–146	
	blackbrush	CORA	*Coleogyne ramosissima*	4–146	–
3	**Sub-dominant Shrubs**			22–56	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	4–22	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	3–18	–
	sumac	RHUS	*Rhus*	6–13	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	2–11	–
	singleleaf ash	FRAN2	*Fraxinus anomala*	7–11	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–10	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–9	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	7–9	–
	mormon tea	EPVI	*Ephedra viridis*	0–9	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–9	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–7	–
	brickellbush	BRICK	*Brickellia*	0–6	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	2–4	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–4	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	1–2	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
Grass/Grasslike					
0	**Dominant Grass**			6–34	
	James' galleta	PLJA	*Pleuraphis jamesii*	4–22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–11	–
1	**Sub-dominant Grass**			0–12	
	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–7	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–6	–
Forb					
2	**Forbs**			6–22	
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–

	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–7	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–7	–
	buckwheat	ERIOG	*Eriogonum*	0–6	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–6	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–6	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–6	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	rock goldenrod	PEPUP	*Petradoria pumila ssp. pumila*	0–2	–
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	0–2	–
	northwestern Indian paintbrush	CAAN7	*Castilleja angustifolia*	0–2	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–2	–

Table 18. Community 1.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Tree**			6–34	
	Utah juniper	JUOS	*Juniperus osteosperma*	6–34	–
Shrub/Vine					
0	**Dominant Shrubs**			4–22	
	blackbrush	CORA	*Coleogyne ramosissima*	4–146	–
3	**Sub-dominant Shrub**			22–56	
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	3–18	–
	sumac	RHUS	*Rhus*	6–13	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	2–11	–
	singleleaf ash	FRAN2	*Fraxinus anomala*	7–11	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–10	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–9	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–9	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–7	–
	brickellbush	BRICK	*Brickellia*	0–6	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	2–4	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–4	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	1–2	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
Grass/Grasslike					
0	**Dominant Grass**			6–34	
	James' galleta	PLJA	*Pleuraphis jamesii*	4–22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–11	–
1	**Sub-dominant Grass**			0–12	

	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–7	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–6	–
Forb					
2	**Forbs**			6–22	
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–7	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–7	–
	buckwheat	ERIOG	*Eriogonum*	0–6	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–6	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–6	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–6	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	rock goldenrod	PEPUP	*Petradoria pumila ssp. pumila*	0–2	–
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	0–2	–
	northwestern Indian paintbrush	CAAN7	*Castilleja angustifolia*	0–2	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–2	–

Table 19. Community 2.1 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			11–78	
	twoneedle pinyon	PIED	*Pinus edulis*	6–45	–
	Utah juniper	JUOS	*Juniperus osteosperma*	6–34	–
Shrub/Vine					
0	**Dominant Shrubs**			4–146	
	blackbrush	CORA	*Coleogyne ramosissima*	4–146	–
3	**Sub-dominant Shrubs**			22–56	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	4–22	–
	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	3–18	–
	sumac	RHUS	*Rhus*	6–13	–
	singleleaf ash	FRAN2	*Fraxinus anomala*	7–11	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	2–11	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–10	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–9	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–9	–
	mormon tea	EPVI	*Ephedra viridis*	0–9	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–7	–
	brickellbush	BRICK	*Brickellia*	0–6	–

	Torrey's jointfir	EPTO	*Ephedra torreyana*	2–4	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–4	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	1–2	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
Grass/Grasslike					
0	**Dominant Grass**			6–34	
	James' galleta	PLJA	*Pleuraphis jamesii*	4–22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–11	–
	cheatgrass	BRTE	*Bromus tectorum*	1–6	–
1	**Sub-dominant Grass**			0–12	
	Grass, annual	2GA	*Grass, annual*	0–11	–
	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–7	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–6	–
Forb					
2	**Forb**			6–22	
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–7	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–7	–
	buckwheat	ERIOG	*Eriogonum*	0–6	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–6	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–6	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–6	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	rock goldenrod	PEPUP	*Petradoria pumila ssp. pumila*	0–2	–
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	0–2	–
	northwestern Indian paintbrush	CAAN7	*Castilleja angustifolia*	0–2	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–2	–

Table 20. Community 2.2 plant community composition

Group	Common Name	Symbol	Scientific Name	Annual Production (Kg/Hectare)	Foliar Cover (%)
Tree					
0	**Trees**			6–34	
	Utah juniper	JUOS	*Juniperus osteosperma*	6–34	–
Shrub/Vine					
0	**Dominant Shrub**			4–146	
	blackbrush	CORA	*Coleogyne ramosissima*	4–146	–
3	**Sub-dominant Shrubs**			22–56	
	rubber rabbitbrush	ERNA10	*Ericameria nauseosa*	4–22	–

	roundleaf buffaloberry	SHRO	*Shepherdia rotundifolia*	3–18	–
	sumac	RHUS	*Rhus*	6–13	–
	singleleaf ash	FRAN2	*Fraxinus anomala*	7–11	–
	crispleaf buckwheat	ERCO14	*Eriogonum corymbosum*	2–11	–
	Utah serviceberry	AMUT	*Amelanchier utahensis*	0–10	–
	Bigelow sage	ARBI3	*Artemisia bigelovii*	0–9	–
	Stansbury cliffrose	PUST	*Purshia stansburiana*	0–9	–
	mormon tea	EPVI	*Ephedra viridis*	0–9	–
	broom snakeweed	GUSA2	*Gutierrezia sarothrae*	0–9	–
	yellow rabbitbrush	CHVI8	*Chrysothamnus viscidiflorus*	0–7	–
	brickellbush	BRICK	*Brickellia*	0–6	–
	Torrey's jointfir	EPTO	*Ephedra torreyana*	2–4	–
	shadscale saltbush	ATCO	*Atriplex confertifolia*	0–4	–
	Fremont's mahonia	MAFR3	*Mahonia fremontii*	1–2	–
	narrowleaf yucca	YUAN2	*Yucca angustissima*	0–2	–
	Whipple's fishhook cactus	SCWH	*Sclerocactus whipplei*	0–1	–
	plains pricklypear	OPPO	*Opuntia polyacantha*	0–1	–
Grass/Grasslike					
0	**Dominant Grass**			6–34	
	James' galleta	PLJA	*Pleuraphis jamesii*	4–22	–
	Indian ricegrass	ACHY	*Achnatherum hymenoides*	1–11	–
	cheatgrass	BRTE	*Bromus tectorum*	1–6	–
2	**Sub-dominant Grass**			0–12	
	Grass, annual	2GA	*Grass, annual*	0–11	–
	Grass, perennial	2GP	*Grass, perennial*	0–11	–
	purple threeawn	ARPU9	*Aristida purpurea*	0–7	–
	needle and thread	HECOC8	*Hesperostipa comata ssp. comata*	0–6	–
Forb					
2	**Forbs**			6–22	
	Forb, annual	2FA	*Forb, annual*	0–11	–
	Forb, perennial	2FP	*Forb, perennial*	0–11	–
	Brenda's yellow cryptantha	CRFL5	*Cryptantha flava*	0–7	–
	Comb Wash buckwheat	ERCL2	*Eriogonum clavellatum*	0–7	–
	buckwheat	ERIOG	*Eriogonum*	0–6	–
	wedgeleaf draba	DRCU	*Draba cuneifolia*	0–6	–
	pointed gumweed	GRFA	*Grindelia fastigiata*	0–6	–
	thrift mock goldenweed	STARA	*Stenotus armerioides var. armerioides*	0–6	–
	longbeak streptanthella	STLO4	*Streptanthella longirostris*	0–2	–
	rock goldenrod	PEPUP	*Petradoria pumila ssp. pumila*	0–2	–
	Wetherill's buckwheat	ERWE	*Eriogonum wetherillii*	0–2	–
	northwestern Indian paintbrush	CAAN7	*Castilleja angustifolia*	0–2	–
	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–2	–

	Parry's sandmat	CHPA28	*Chamaesyce parryi*	0–2	–

Animal community

--Wildlife Interpretation--
The scarcity of water up on the mesas limits the species richness and the abundance of large mammals. This site provides thermal cover and limited forage opportunities for mule deer. Birds, Bats, lizards, snakes and rodents are more common. Birds from several families from hawks to sparrows are typical. Golden eagles are red-tailed hawks are common as well as the great horned-owl. Species typical of pinyon juniper areas including black-chinned and rufous hummingbirds, and several fly catchers, wood peckers, and corvids will use this site for nesting and foraging. Several species of rodents forage and occupy this site including desert cottontail, black tailed jack rabbit, Colorado chipmunk, white–tailed Antelope squirrel, Apache pocket mouse, several species of Peromyscus. Coyotes and kit foxes will also forage in the area. Dens are probably located in other ecological sites due to the shallow soils and/or the presence rocks or rock out crops. Bats (Myotis, Pipisturellus, and others) can be observed in this ecological site, but are likely limited to areas near water or canyons.

--Grazing Interpretations--
This site provides fair/poor grazing conditions for livestock and wildlife due to large amounts of bare ground, and low available nutritious forage. This site also often lacks natural perennial water sources, which can influence the suitability for livestock and wildlife grazing. Care should be taken to maintain the native perennial grasses and shrubs due to the poor suitability for re-seeding or restoring this site. Reseeding and/or restoration are difficult due to the extreme temperatures and variability in time and amount of precipitation. This site may occur in mule deer, elk, pronghorn antelope, and desert bighorn sheep habitat; however in many places the populations will be small and have little grazing impact on the site.

The plant community is primarily Utah Juniper, blackbrush, and pinyon; sub dominants include Torrey jointfir and Bigelow's sagebrush. These shrubs provide good winter browse for cattle, sheep, goats, pronghorn antelope, elk, mule deer, and bighorn sheep. Grasses include Indian ricegrass, galleta, and needleandthread, and when present provide good grazing conditions for all classes of livestock and wildlife. Utah juniper and pinyon pine provide good cover for livestock and wildlife; mule deer, pronghorn antelope, and goats may also graze these trees. 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.

Hydrological functions

The soils associated with this ecological site are generally in Hydrologic Soil Group D.
Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. All soils with a depth to a water impermeable layer less than 50 centimeters [20 inches]. In this case the shallow soil over bedrock puts this ESD in group D. 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. (NRCS National Engineering Handbook). In areas similar to the reference state where ground cover is adequate, infiltration is increased and runoff potential is decreased. In areas where ground cover is less, infiltration is reduced and runoff potential is increased. Surface disturbance including ATV and off-road vehicles tracks, dirt roads, and heavy use by domestic livestock, can affect the hydrology. The trampling/compaction increases bulk density and breaks down soil aggregates. This results in decreased infiltration rates and increased runoff. The actual removal of the plants due to the tire tracks, or grazing can alter the hydrology by decreasing plant cover and increasing bare ground. Fire can also affect hydrology, but it is 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

Recreation activities include aesthetic value; and fair opportunities for hiking and hunting. Trees provide screening values for camping and picnicking. In good condition there are several forbs and shrubs that bloom in the spring.

Shallow soils limit this site’s ability to be used for vacation homes, other residences, or deep ponds.

Wood products

Some wood products are available in this site, however, most junipers are not large enough to produce good fenceposts.

Other information

--Poisonous and Toxic Plant Communities--
Toxic plants that may be associated with this site include woolly locoweed, broom snakeweed, and wavy leaf (shinnery) oak. 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). Wavy leaf oak is thought to contain tannins that can be detrimental to cattle, sheep, and occasionally horses if grazed as more than 50% of the diet. Oak is highly toxic during the budding stage, leafing stage, and when acorns are available. Symptoms include lack of appetite, weakness, excessive thirst, edema, reluctance to follow the herd, and emaciation

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. (Knight and Walter, 2001)

--Invasive Plant Communities--
Generally as ecological conditions deteriorate and perennial vegetation decreases due to disturbance (fire, over grazing, drought, off road vehicle overuse, erosion, etc.) annual forbs and grasses will invade the site. Of particular concern in semi-arid environments are the annual invaders including cheatgrass, Russian thistle, kochia, halogeton, and annual mustards. The presence of these species will depend on soil properties and moisture availability; however, these invaders are highly adaptive and can flourish in many locations. Once established, complete removal is difficult but suppression may be possible. On well developed Utah juniper and pinyon pine communities soils are complete occupied by lateral roots, which inhibit an herbaceous understory as well as annual invasions. However once these sites are disturbed and pinyon-juniper communities begin to decline invasion is possible.

--Fire Ecology--
The ability for an ecological site to carry fire depends primarily on the present fuel load and plant moisture content—sites with small fuel loads will burn more slowly and less intensely than sites with large fuel loads. Many semi-desert 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.

There is no evidence that this site historically mainained a short burn frequency. Only a few species in the association show fire scars and can be aged. This ecological site is comprised of scatterd shrubs with bare interspaces to patchy occurrence of grasses, which is unlikely to carry a fire unless under high winds, high temperature, and low humidity. 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 (Anderson, 2001). 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 and scatterd junipers and pinyons 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 (Callison, 1985). Currently, burning is not a recommended brush management tool. 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.

Type locality

Location 1: Wayne County, UT	
UTM zone	N
UTM northing	4226852
UTM easting	389354
General legal description	Canyonlands National Park

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Contributors

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Jacob Owens

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)
Contact for lead author	shane.green@ut.usda.gov
Date	12/07/2009
Approved by	Shane A. Green
Approval date	
Composition (Indicators 10 and 12) based on	Annual Production

Indicators

1. **Number and extent of rills:** Few occasional occurrences throughout site. Gravelly surface prohibits the formation of most rills. Rills that occur may be 8 feet in length. Sides of rills may be up to 2-3 inches high. Rills are most likely to form below exposed bedrock or water flow patterns where sufficient water accumulates to cause erosion.

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2. **Presence of water flow patterns:** Occasional occurrences throughout area on gentle slopes (<10 %). Occur in Interspaces between plants and well developed biological soil crusts. Are evidenced in some areas by exposed rock from which the soil has eroded. Evidence of flow will increase somewhat with slope.

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

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4. **Bare ground from Ecological Site Description or other studies (rock, litter, lichen, moss, plant canopy are not bare ground):** 7 – 30 %. Most bare ground is associated with water flow patterns, rills, and gullies. Areas with well developed biological soil crusts should not be counted as bare ground. Poorly developed biological soil crusts that are interpreted as functioning as bare ground (therefore they would be susceptible to raindrop splash erosion) should be recorded as bare ground. Ground cover is based on first raindrop impact, and bare ground is the opposite of ground

cover.

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5. **Number of gullies and erosion associated with gullies:** None to few. On steeper slopes and areas below adjacent to sites with concentrated water flow (such as exposed bedrock), gullies may increase. Length may often extend from the adjacent site until the gully reaches a stream or an area where water and sediment accumulate. Gullies may remove soil from the base of trees exposing roots.

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6. **Extent of wind scoured, blowouts and/or depositional areas:** None to very few. Trees break the wind and reduce the potential for wind erosion. Soil surface is gravelly and not likely to be influence by wind erosion.

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7. **Amount of litter movement (describe size and distance expected to travel):** On gentle slopes (< 10 %) most litter (juniper leaves) accumulates at the base of plants. Woody stems from trees are not usually moved unless present in water flow patterns or rills. On steeper slopes, woody stems may be washed from site.

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8. **Soil surface (top few mm) resistance to erosion (stability values are averages - most sites will show a range of values):** This site should have a soil stability rating of 4 or 5 under 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 gravelly loam. Vegetation cover, litter, and surface rock reduce erosion.

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9. **Soil surface structure and SOM content (include type of structure and A-horizon color and thickness):** Soil surface is 0 to 3 inches deep. Structure is weak fine platy parting to moderate fine and medium granular. Color is brown (7.5YR5/4). 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:** Spatial distribution of perennial plants and intercept raindrops preventing splash erosion and provide areas of surface detention to store water allowing additional time for infiltration. Crowns of trees and accumulating litter at base of trees appear to create a micro-topography that may enhance development of water flow patterns below the drip line of the canopy. Significant increases in Pinyon-juniper canopy reduces understory vegetation and increases runoff.

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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. Soil is shallow to bedrock.

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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: Dominance by average annual production, air dry weight: Shrubs > warm season perennial grasses = cool season perennial grasses > Trees (Juniper > Pinyon) > 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, Russian wildrye, etc.)

Sub-dominant:

Other:

Additional: 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 functional community phase within the reference state.
Dominants—Utah Juniper, Pinyon Pine, Blackbrush, Indian ricegrass, Jame's galleta. Sub Dominants—shadscale saltbrush, Torrey's jointfir. 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):** Community is made up of young, mid, and old aged juniper and pinyon trees and shrubs. Several standing dead trees may be present on the site and approximately 20 % of the trees can show evidence of decadence. All age classes of perennial grasses should be present under average to above average growing conditions with age class expression likely subdued during below average years. In drought tree mortality may increase with the first sign being a yellowish to reddish leaf color.

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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):** 165-310 #/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:** Few invasives capable of dominating this site. Cheatgrass may invade this site.

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